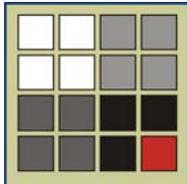


# **Social and Economic Assessment for Michigan's State Forests**

**Prepared for: Michigan Department of Natural Resources  
Forest, Mineral, and Fire Management Division**

**Lansing, Michigan**

**September 5, 2006**



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## Preface

Public Act 125 of 2004, Section 52505, requires the Michigan Department of Natural Resources (MiDNR) to seek and maintain third-party sustainable forestry certification. Forest certification requires that MiDNR forest management plans take into consideration social and economic parameters that affect future forest management operations. Currently, the MiDNR is preparing a statewide forest management plan, and each of three eco-teams are drafting ecoregional management plans. The social and economic information provided in this report will be used to assess current social and economic conditions and to develop future management directions within each of the plans.

The report focuses primarily on three ecoregions: the Western Upper Peninsula, Eastern Upper Peninsula, and Northern Lower Peninsula as defined by the MiDNR along county boundaries. It covers social and economic conditions within these ecoregions in aggregate and on a county-level basis. As a result data for the areas in and around Michigan state forests are highlighted.

The “Social and Economic Assessment for the Michigan National Forests” (July 25, 2003), by Larry Leefers, Karen Potter-Witter, and Maureen McDonough from Michigan State University, provides a general model for this report.

The assessment report is based on secondary data. No primary data collection was done. MiDNR personnel provided unpublished data from MiDNR records. The report presents analyses of existing data and discusses relationships and trends in the variables of interest, and contains some projections based on existing literature.

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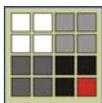
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## 5. Natural Resources Production

### Introduction

The USDA Forest Service conducts a continuous inventory of forest lands throughout the United States. According to 2002 USDA-Forest Service statistics (Smith et al. 2003), Michigan ranks sixth in the nation in terms of timberland. Michigan is the only Midwestern or Northeastern state listed in the in the top ten (Table 5.1).

**Table 5.1. Top twenty states in terms of timberland area (thousand acres) in 2002.**

State	Timberland	State	Timberland
1. Oregon	23,831	11. Maine	16,952
2. Georgia	23,802	12. Idaho	16,824
3. Alabama	22,922	13. Pennsylvania	15,853
4. Montana	19,185	14. Wisconsin	15,701
5. North Carolina	18,664	15. Virginia	15,371
<b>6. Michigan</b>	<b>18,616</b>	16. Minnesota	14,723
7. Mississippi	18,572	17. Florida	14,636
8. Arkansas	18,373	18. Tennessee	13,956
9. California	17,781	19. Louisiana	13,722
10. Washington	17,347	20. Kentucky	12,347
	16,952	United States	503,540

Source: Smith, et al. 2003.

Michigan timberland is slightly more than one-third in public ownership (35%) with 14% in National Forests and 20% in State ownership according to 2002 USDA statistics (Smith et al. 2003), shown in Table 5.2. County and municipal ownership is minor in Michigan, about 1%, with most land in this ownership category located in Gogebic county. Private timberland makes up 65%. More than half of all timberland (57%) is owned by nonindustrial private owners (NIPF).

Michigan's timberland area has declined slightly since 1953, however, timberland area has increased from levels in the 1980's. Although timberland area statistics are reported for 2002 by the Forest Service in this national report, the inventory data are actually based on the most recent periodic forest inventory measurements (1993) available at the time the data were compiled. Additional information on trends based on more recent inventory data are presented below.

The USDA classifies timberland as follows: forest land that is producing or is capable of producing crops of industrial wood and not withdrawn from timber utilization by statute or administrative regulation. Areas qualifying as timberland are capable of producing in excess of 20 cubic feet per acre per year of industrial wood in natural stands. Currently inaccessible and inoperable areas are included.

**Table 5.2. Trends in Michigan timberland area and ownership, 1953 to 2002.**

Year	All owners	Total public	National Forest	State	County/Municipal	Total Private	Forest Industry	NIPF
1953	19,121	33%	13%	19%	0%	67%	8%	59%
1977	18,199	35%	13%	21%	1%	65%	12%	53%
1987	17,364	36%	14%	21%	1%	64%	11%	52%
1997	18,667	36%	14%	20%	1%	64%	8%	56%
2002	18,616	35%	14%	20%	1%	65%	8%	57%

Source: Smith, et al. 2003.

### **Land use**

A recent study of land cover conducted by the USDA-Forest Service, North Central Research Station, in collaboration with scientists at the University of Michigan provides a look at Michigan's changing landscape (Potts, et al. 2004). The researchers used satellite imagery from 1980 and 2000 to classify land cover into six classes: urban or built-up, agriculture, forest, non-forest wetlands, open water, and barren. Figures 5.1 and 5.2 present comparative images of land cover changes for 1980 and 2000. These maps were constructed with a one square kilometer grid. GIS datasets are available for download from the author's web site (<http://esa.snre.umich.edu/projects/NCLands/CMAWebpage11.4.html>).

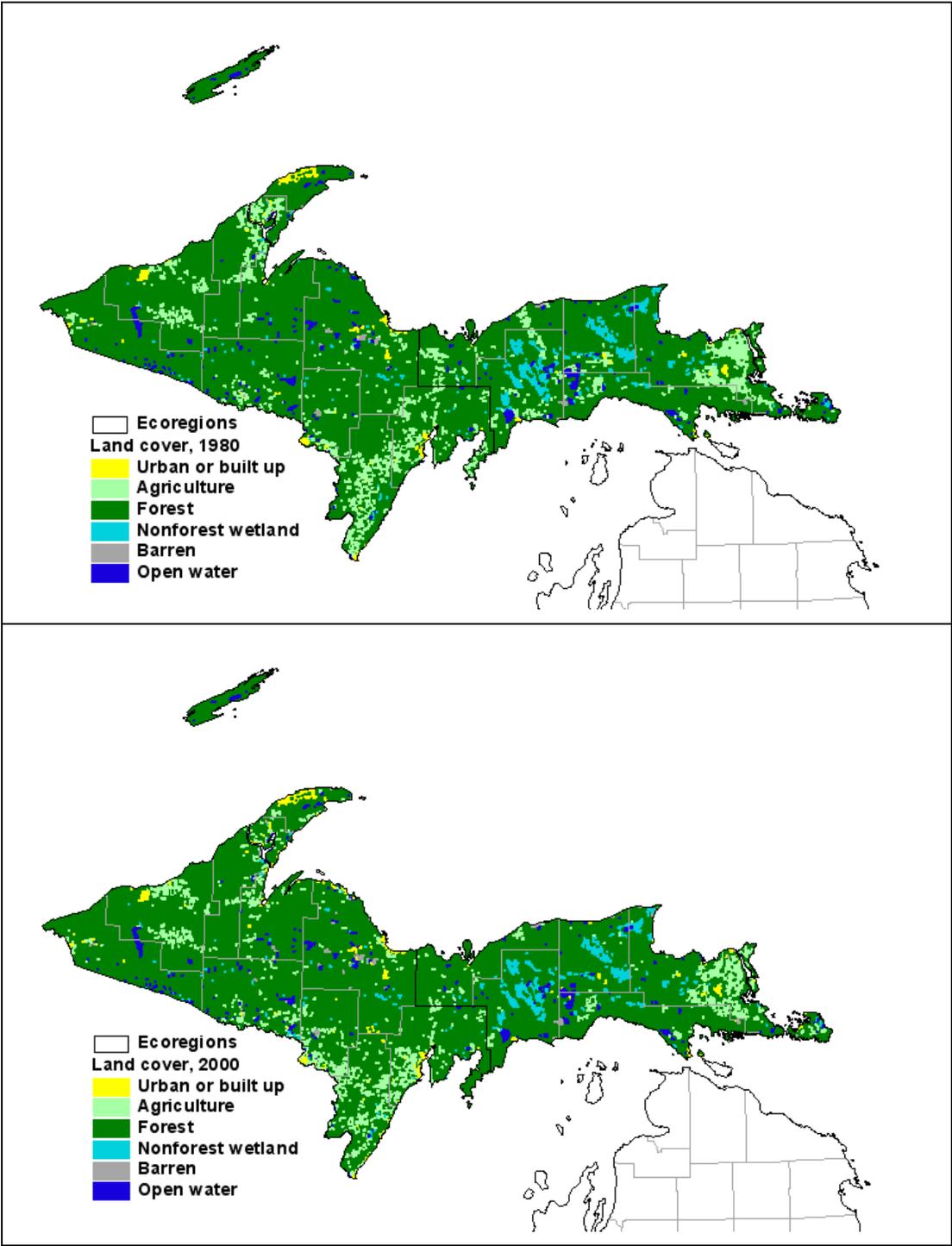
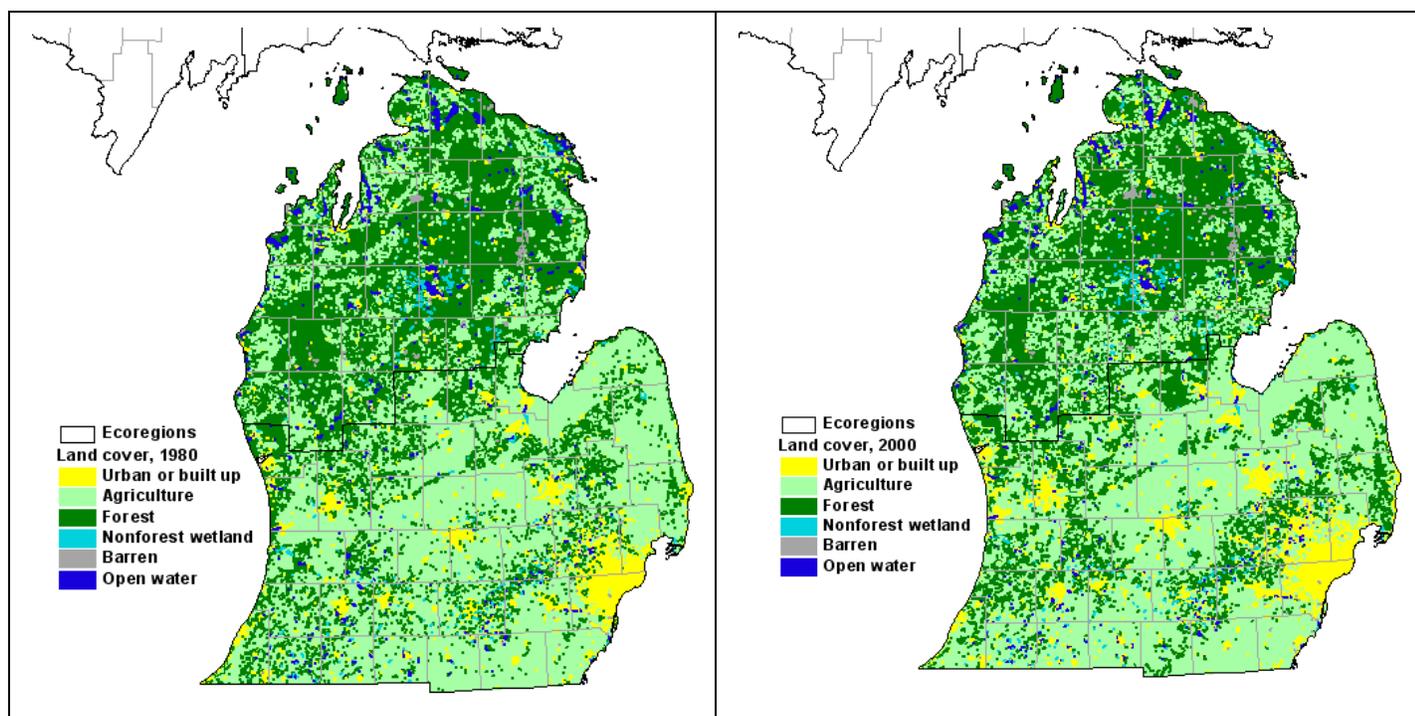


Figure 5.1. Distribution of land cover in the Upper Peninsula, 2000.



**Figure 5.2. Distribution of land cover in the Lower Peninsula, 1980 and 2000.**

Based on comparative analysis of remotely sensed data, forest cover increased statewide from 52% in 1980 to 54% in 2000. Table 5.3 compares 1980 and 2000 land cover data by ecoregion. The Eastern UP increased by one percent from 86% to 87% and the Northern LP increased from 70% to 74%. These gains in forest land mostly came at the expense of declines in agricultural lands.

Urban or built-up land increased from 3% of Michigan's total surface area in 1980 to 5% in 2000. Urban growth was particularly high in the Southern Lower Peninsula which increased from 7% to 9% of that region. Urban land in the Northern Lower Peninsula increased from 1% to 2%. No significant change was found in the amount of urban land in the Upper Peninsula.

These land cover classifications were based on interpretation of satellite imagery. The methods have some inherent limitations and the potential for misclassification exists. For example, cutover lands that have not yet regenerated may be classified as agricultural in some cases. Also, the methods may classify areas with low-density housing but continuous or nearly continuous forest canopy as forest cover. County level data are available in appendix table A5.1.

**Table 5.3. Percent of ecoregions by land cover, 1980 and 2000**

Year	Urban or Built-up	Agriculture	Forest	Nonforest wetlands	Open water	Barren
<b>Western Upper Peninsula</b>						
1980	1%	5%	92%	0%	1%	0%
2000	1%	5%	92%	0%	1%	0%
<b>Eastern Upper Peninsula</b>						
1980	0%	7%	86%	5%	2%	0%
2000	0%	6%	87%	5%	2%	0%
<b>Northern Lower Peninsula</b>						

Year	Urban or Built-up	Agriculture	Forest	Nonforest wetlands	Open water	Barren
1980	1%	25%	70%	1%	3%	1%
2000	2%	20%	74%	1%	3%	1%
<b>Southern Lower Peninsula</b>						
1980	7%	79%	13%	1%	1%	0%
2000	9%	74%	15%	1%	1%	0%
<b>State</b>						
1980	3%	42%	52%	1%	1%	0%
2000	5%	39%	54%	1%	1%	0%

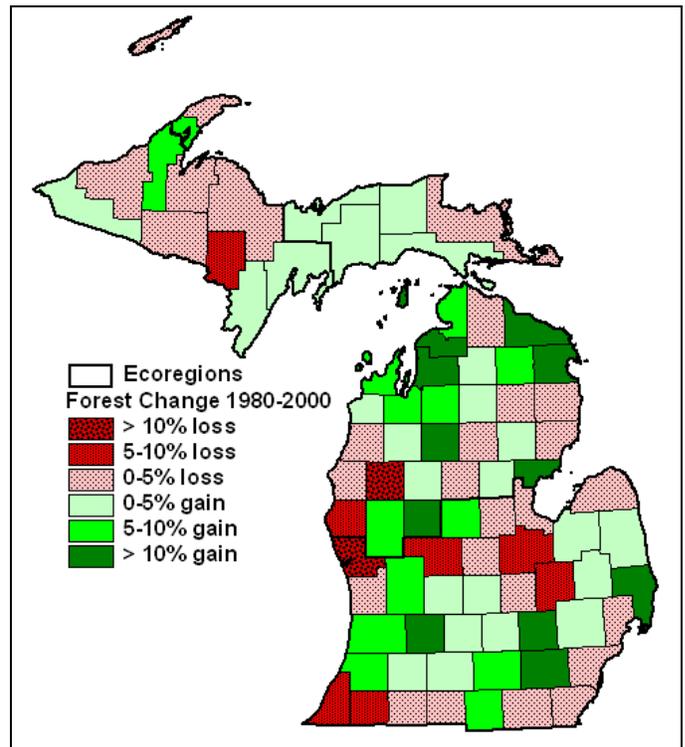
Source: Land coverage summary data for 1980 and 2000 were compiled from land coverage GIS layers produced for the Changing Midwest Assessment. GIS data are available from <http://esa.snre.umich.edu/projects/NClands/CMAWebpage11.4.html>. The Changing Midwest Assessment is documented in Potts, et al. 2004.

Analysis of the GIS data by the authors of this report show that forest cover changed considerably in several counties over the 1980 to 2000 time span. In the Western UP, Dickinson county showed a 6.9% decline in forest area though this is likely due to classification of cutover lands as nonforest. Forest area in Houghton county showed a 5.9% increase. In the Northern LP, forest area in Lake county declined by 15.3% and Oceana county declined by 5.4%. This finding is likely due to classification of harvested lands as agriculture. These remote sensing classifications should be followed up to verify specific conditions on the ground.

Forest area in Newaygo, Grand Traverse, Montmorency, Emmet, Kalkaska and Leelanau counties increased from 5 to 10% over the same time period. Alpena, Presque Isle, Arenac, Mecosta, Antrim, and Missaukee counties increased forest area more than 10%. No changes greater than 5% were found in the Eastern UP.

**Table 5.4. Counties by ecoregion with greater than 5% change in forest area from 1980 to 2000.**

Ecoregion/ County	Forest Area Change 1980-2000
<b>Western Upper Peninsula</b>	
Dickinson	-6.9%
Houghton	5.9%
<b>Northern Lower Peninsula</b>	
Lake	-15.3%
Oceana	-5.4%
Newaygo	5.2%
Grand Traverse	5.4%
Montmorency	5.9%
Emmet	6.4%
Kalkaska	7.5%
Leelanau	9.5%
Alpena	12.7%
Presque Isle	13.6%
Arenac	14.3%
Mecosta	16.6%
Antrim	19.1%
Missaukee	20.2%
Charlevoix	20.6%



**Figure 5.3. Change in forest cover from 1980 to 2000 by county.**

Source: Potts, et al. 2004.

### Forest area, type, distribution and ownership

The series of inventories conducted by the USDA Forest Service provide a detailed look at changing forest conditions in the State over the past several decades. Periodic inventories were conducted in 1980 and 1993 with plots throughout Michigan measured over a relatively short period (1 to 2 years). Earlier periodic inventories conducted in 1935, 1955, and 1966 are not reported here. Results of the 1980 inventory is documented in (Raile and Smith, 1983). The 1993 inventory is documented in (Leatherberry and Spencer, 1996). Some of the plots in these inventories were remeasured from earlier inventories and some plots were modeled. Starting in 2000, the Forest Service, Forest Inventory and Analysis (FIA) staff, implemented the sixth Michigan inventory cycle as an annual inventory in which one-fifth of the plots throughout the State are measured each year. With this system, some plots are measured each year and a full inventory requires plot measurements over a five-year period. The 2004 inventory reflects results measured over a five-year period, 2000 to 2004. The annual inventory changed some inventory procedures to conform to national standards. For example, changes were made in forest type, size, and landowner classification standards.

In 2006, the Forest Service released a “snapshot” report of the entire state based on the first five years of plot measurements. The 2004 inventory is documented in Hansen and Brand, 2006. The dataset for the 2004 collection of plot measurements was analyzed along with datasets for the 1980 and 1993 inventories to compile the information reported below. A glossary of specific FIA forest inventory terms is included in the appendix.

As with any inventory, there are errors associated with estimates derived from summaries of sampled plot data. The magnitude of errors typically increase as data are more finely subdivided for any grouping represented by fewer plots. For example, the error percent for estimates of timberland are smaller for the entire State than for an

individual ecoregion, and an individual county. Although a detailed analysis of the error terms and confidence intervals is beyond the scope of this study, the reader is cautioned that all estimates presented in this report (and in all other similar analyses of these inventory data) contain estimation errors due to sampling and analysis methods.

One specific difference between the 2004 inventory and earlier inventories involves the determination of reserved lands and some other categories where the extent of the land base is known (such as area of National or State forests). In the 1980 and 1993 inventories, classification of reserved lands was enumerated, or adjusted to the known area of legally reserved forest area. In the 2004 inventory, the extent of reserved land is based on the sampled data and not adjusted for known areas of reserved land. Also, for the 2004 inventory, the industrial landowner class was grouped with all other private in order to protect landowner privacy. This change, in effect, obscures the separate identification of the industrial land base in the most recent inventory data. While industrial timberland was once a clearly defined landowner category related to mill ownership, the distinction is no longer quite as clear. Changes in land ownership, particularly by institutions that do not own or operate mills, yet manage timberland for timber and other values blur the industrial landowner distinction. For example, some lands in Michigan are owned by timber investment and management companies who have no controlling interest in processing mills, but produce timber as one of their primary management objectives.

The forest inventory data represents a rich source of information to describe the characteristics of forest resources and many descriptive subdivisions are possible. This study presents basic data on area classification of forest land, timber volumes, growth, and removals summarized by ecoregions and broad forest types for the three most recent inventories – 1980, 1993, and 2004.

The total land base of Michigan is about 36.4 million acres as shown in Table 5.5. According to the 2004 forest inventory, the State is 53% forested with 19.3 million acres of forest land for all land ownership classes. The Western UP is 87% forest; the Eastern UP is 83% forest, and the Northern Lower Peninsula is 67% forest according to the most recent forest inventory (FIA) conducted by the USDA-Forest Service. Ninety seven percent of the forest land in the state, or 18.7 million acres, is classified as timberland. Michigan timberland increased from 17.4 million acres in 1980 to 18.7 million acres in 2004. Thirty percent of the State's timberland is located in the Western Upper Peninsula ecoregion; 15% of the timberland is located in the Eastern Upper Peninsula, and 37% is in the Northern Lower Peninsula. Comparable county-level data are contained in appendix table A5.2.

The area of timberland increased slightly by 1 percent statewide from 1993 to 2004. Change in timberland was less than 1 percent in all regions, except the Eastern Upper Peninsula ecoregion. The area of timberland in the Eastern UP increased by 8% from 2.7 to 2.9 million acres from 1993 to 2004. The Eastern UP also showed a decline in reserved timberland area which could be due to sampling error since this is the smallest ecoregion with only five counties.

**Table 5.5. Forest area (thousand acres) by land class for all owner groups, by ecoregion, 1980, 1993, and 2004.**

Year	Total Land	Timberland	Reserved Timberland	Other Forest Land	Non-forest Land	Total Forest	Percent Forest
<b>Western Upper Peninsula</b>							
1980	6,806	5,606	271	54	875	5,930	87.1%
1993	6,937	5,708	232	23	973	5,963	86.0%
2004	6,917	5,686	240	80	911	6,006	86.8%
<b>Eastern Upper Peninsula</b>							
1980	3,526	2,734	144	57	592	2,935	83.2%
1993	3,572	2,690	118	41	723	2,849	79.8%
2004	3,613	2,903	29	65	617	2,996	82.9%
<b>Northern Lower Peninsula</b>							
1980	10,361	6,449	180	77	3,656	6,706	64.7%

Year	Total Land	Timberland	Reserved Timberland	Other Forest Land	Non-forest Land	Total Forest	Percent Forest
1993	10,360	6,896	170	27	3,267	7,093	68.5%
2004	10,402	6,870	44	98	3,390	7,012	67.4%
<b>Southern Lower Peninsula</b>							
1980	15,433	2,704	87	7	12,634	2,799	18.1%
1993	15,489	3,321	54	0	12,114	3,375	21.8%
2004	15,475	3,286	8	2	12,178	3,297	21.3%
<b>State</b>							
1980	36,126	17,493	682	194	17,757	18,369	50.8%
1993	36,358	18,616	575	90	17,077	19,281	53.0%
2004	36,408	18,746	321	245	17,096	19,312	53.0%

Source: 1980 and 1993 data are derived from the Eastwide Forest Inventory datasets. 2004 data are derived from the 2004 FIA Snapshot dataset (<http://www.ncrs2.fs.fed.us/FIADatamart/fiadatamart.aspx>) which includes plots taken in 2000 to 2004.

Table 5.6 provides a breakdown of Michigan forest land in State ownership for 1980, 1993, and 2004. Ninety to 98% of the forest land in State ownership is classified as timberland, depending on ecoregion. The WUP has 898 thousand acres of state-owned forest land; the EUP has 998 thousand acres of forest land; and the NLP has 1.93 million acres of forest land. Collectively, state ownership makes up 24% of all forest land in the three northern ecoregions. The Western UP has 20% of State-owned timberland. The Eastern UP has 24% of State-owned timberland, and the Northern LP has 47% of the State-owned timberland. Estimates for reserved land varied considerably between inventories due to sampling error and further investigation is merited. Overall, land in State ownership climbed almost 13% from 3.57 million acres in 1980 to 4.03 million acres in 2004, based on FIA sample data. Figure 5.4 shows the distribution of state-owned timberland for 2004. County-level data on area by land class for state-owned lands is available in appendix Table A5.4.

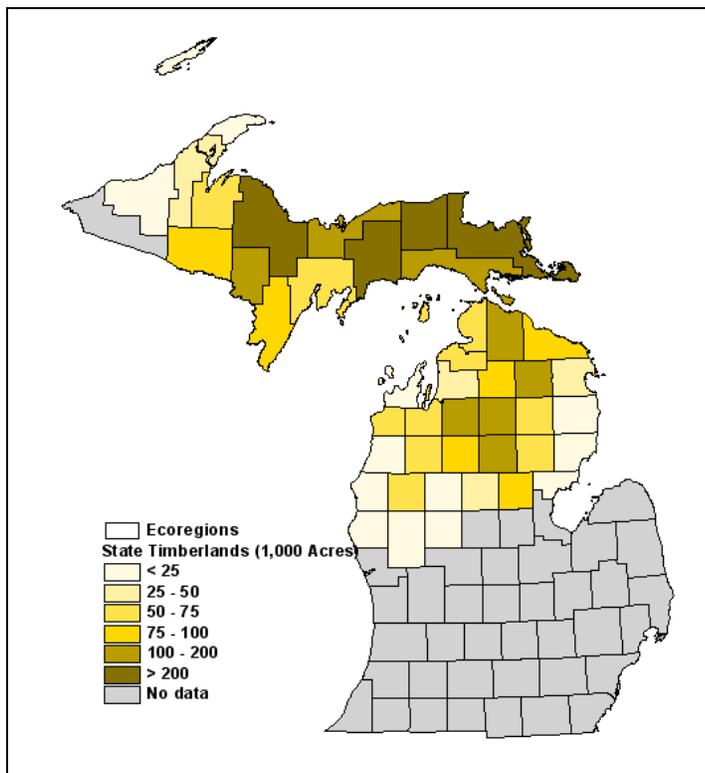
**Table 5.6. Forest area (thousand acres) by land class for State ownership, by ecoregion, 1980, 1993, and 2004.**

Year	Timberland	Reserved Timberland	Other Forest	Nonforest	Total Forest
<b>Western Upper Peninsula</b>					
1980	763	69	12	6	844
1993	751	69	8	7	828
2004	823	70	5	NA	898
<b>Eastern Upper Peninsula</b>					
1980	834	56	34	43	924
1993	803	28	19	13	849
2004	978	3	17	NA	998
<b>Northern Lower Peninsula</b>					
1980	1,788	5	12	51	1,805
1993	1,886	38	8	22	1,932
2004	1,887	6	42	NA	1,934
<b>Southern Lower Peninsula</b>					
1980	186	11	2	2	199
1993	288	48	0	10	336

Year	Timberland	Reserved Timberland	Other Forest	Nonforest	Total Forest
2004	339	2	0	NA	342
<b>State</b>					
1980	3,571	141	61	102	3,773
1993	3,728	182	35	51	3,946
2004	4,027	82	64	NA	4,172

Source: 1980 and 1993 data are derived from the Eastwide Forest Inventory datasets. 2004 data are derived from the 2004 FIA Snapshot dataset (<http://www.ncrs2.fs.fed.us/FIADatamart/fiadatamart.aspx>) which includes plots taken in 2000 to 2004.

Table Notes: Nonforest areas were not assigned to landowner group in the 2004 FIA Snapshot dataset and are indicated as NA above.



**Figure 5.4. Distribution of State-owned timberlands as determined by the USDA-Forest Service Inventory, 2000-2004.**

### Timberland area by forest type

Figures 5.5 and 5.6 present information on the timberland area by softwood and hardwood forest types for all owners for 1980, 1993, and 2004 inventories. Figures 5.7 and 5.8 present comparable information for State-owned timberlands. Tabular summaries of timberland areas by forest type are contained in appendix Tables A5.5 to A5.8.

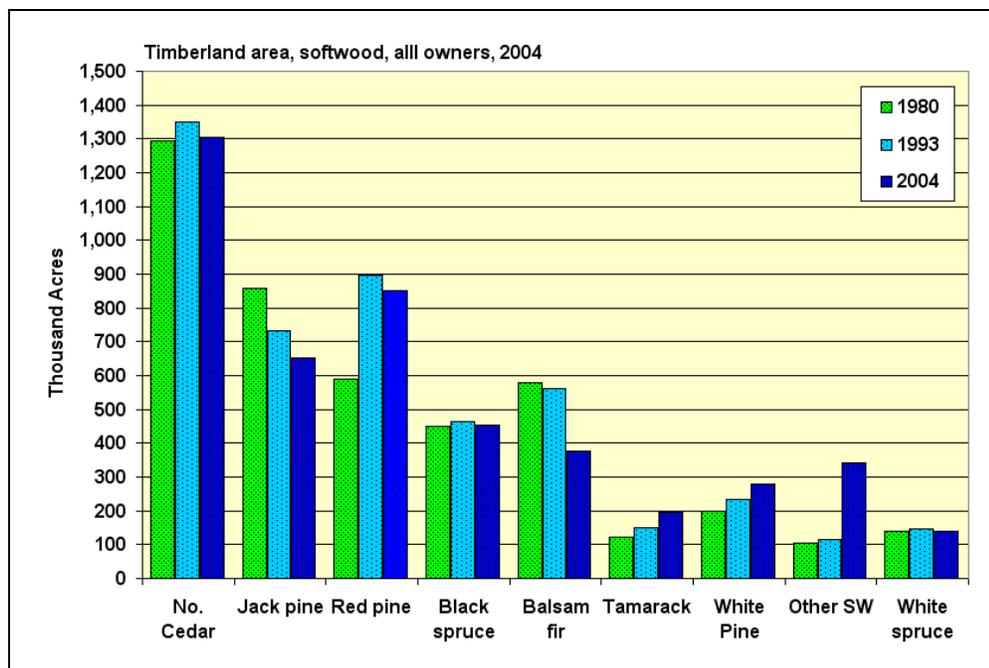
Because the methods used for classifying forest type changed with the implementation of an annual inventory, some differences in metrics by forest type occurred between 1993 and 2004. For example, the oak-pine type is classified in the 2004 inventory but was not classified at all in earlier inventories because of type definition changes.

The most common softwood forest type in 2004 on all ownerships throughout the State was Northern white cedar with 1.31 million acres. Red pine was the second most common type with 850 thousand acres.

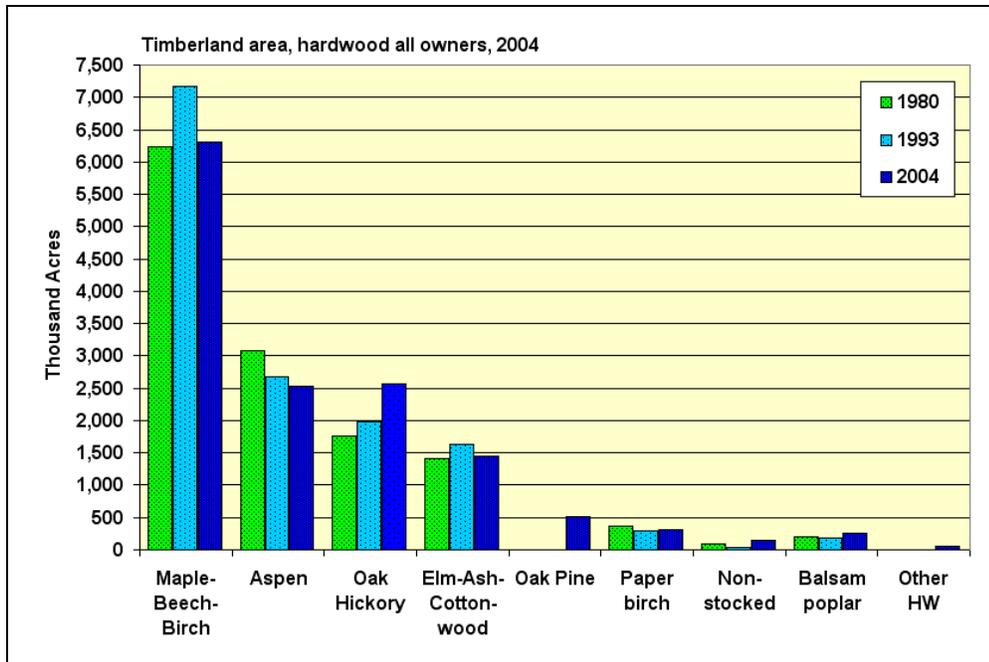
Northern white cedar (527 thousand acres) is the most common type in the Western UP, followed by black spruce (243) and balsam fir (186) in the Western UP. The most recent inventory shows a significant decline for all owners in balsam fir type but a considerable increase in the other softwoods type. This is most likely due to changes in the methods for determining forest type implemented with the 2004 inventory.

In the Eastern UP, Northern white cedar (423 thousand acres) is most common followed by jack pine (185) and black spruce (183) types. Area of northern white cedar type increased in this region as did tamarack from the previous inventory.

Softwood types in the Northern Lower Peninsula are dominated by red pine with 557 thousand acres on all ownerships. Jack pine is the second most common type (361 thousand acres) followed by northern white cedar (350). The northern white cedar type declined from 417 thousand acres in 1993 and the white pine type increased from 95 to 115 thousand acres in the Northern Lower Peninsula.

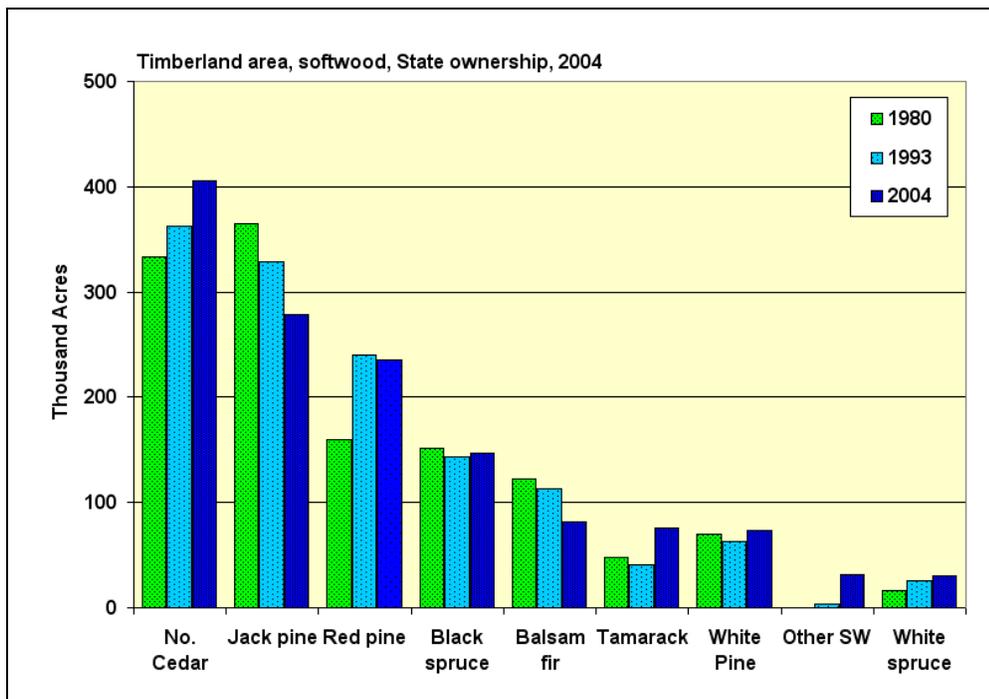


**Figure 5.5. Timberland area by softwood forest types for all owners, 1980, 1993, and 2004.**



**Figure 5.6. Timberland area by hardwood forest types for all owners, 1980, 1993, and 2004.**

On state-owned lands, the most common softwood forest type is northern white cedar (406 thousand acres) followed by jack pine (278) and red pine (235) as shown in Figure 5.7. Northern white cedar is fairly evenly distributed on State lands through all three northern ecoregions with 143 thousand acres in the Eastern UP, 136 thousand acres in the Western UP, and 127 thousand acres in the Northern Lower Peninsula. The Northern Lower Peninsula dominates the red and jack pine forests on State lands with 165 thousand acres of red pine (70%) and 161 thousand acres of jack pine (58%).



**Figure 5.7. Timberland area by softwood forest types for State ownership, 1980, 1993, and 2004.**

The most common State-owned hardwood forest types in 2004 were maple-beech-birch (915 thousand acres), aspen (725), and oak-hickory (497) as shown in Figure 5.8. The oak-hickory type has shown a steady increase in the FIA estimates over the 1980 to 2004 period from 336 thousand acres in 1980.

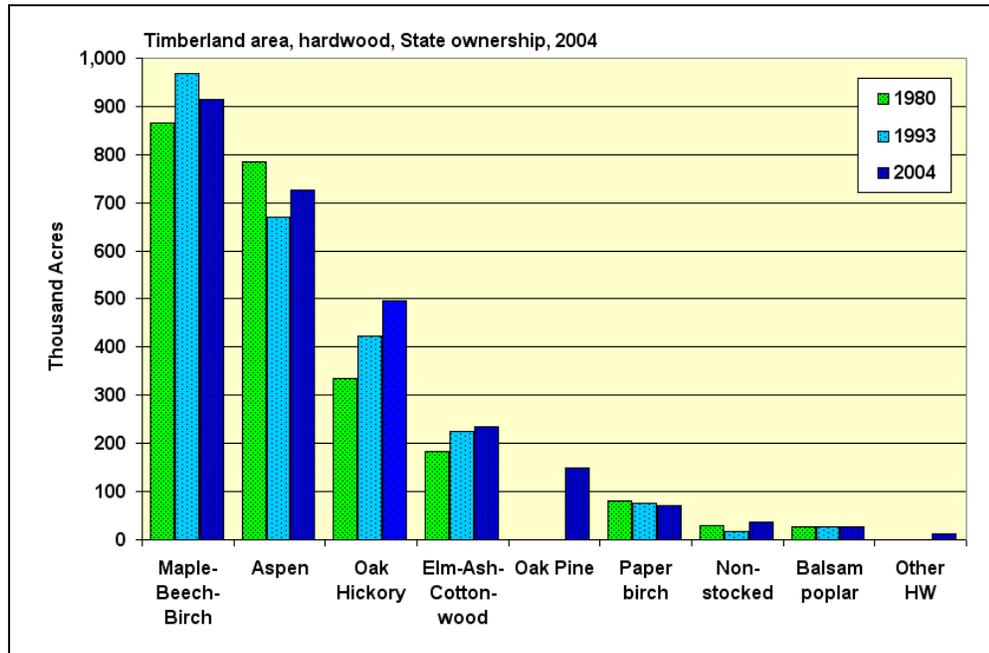
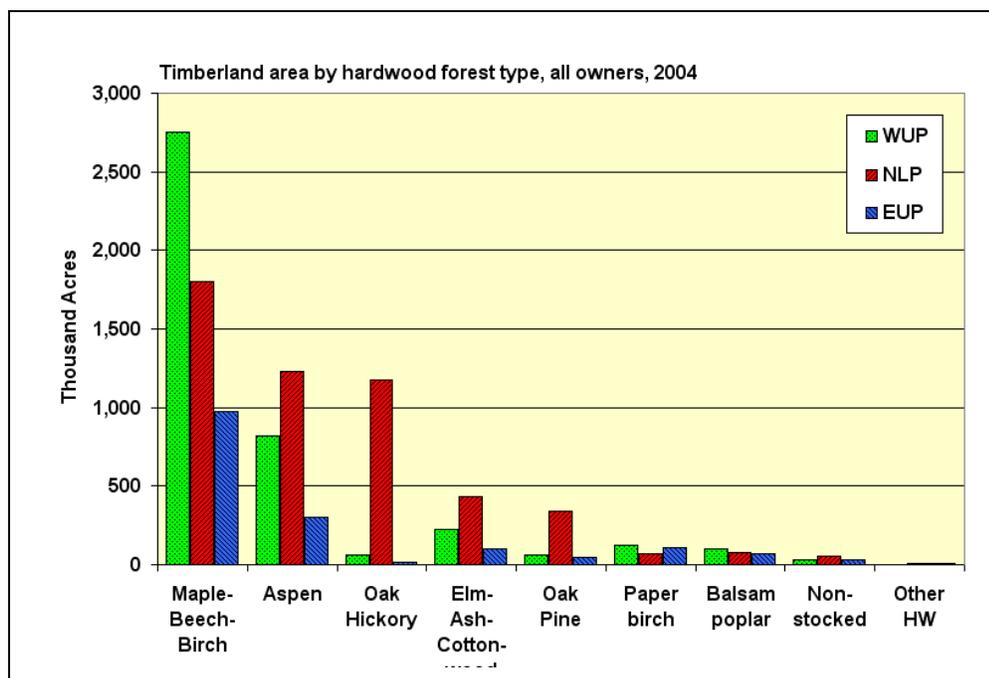
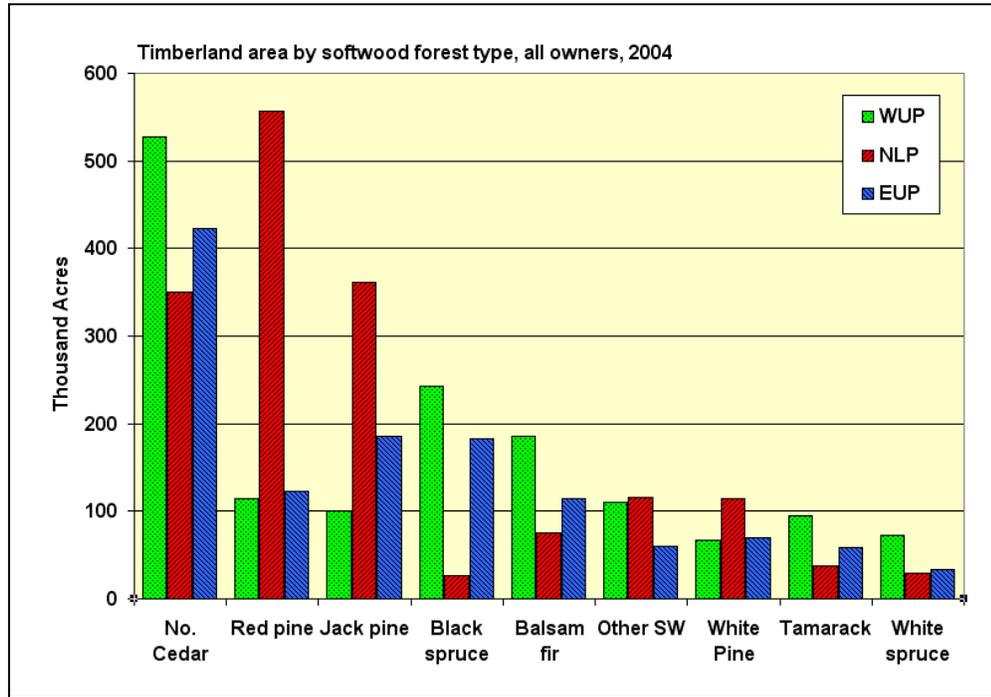


Figure 5.8. Timberland area by hardwood forest types for State ownership, 1980, 1993, and 2004.

Figures 5.9 to 5.12 compares timberland area by forest type and ecoregion for all owners and State-owned lands. Maple-beech-birch type dominates on all ownerships in all three ecoregions. In the Western UP there are 2.75 million acres of this type. Aspen is the second most common hardwood type in all ecoregions. The Western UP has 817 thousand acres of aspen type and the Northern LP has 1.2 million acres. Maple-beech-birch is also the most common in the Eastern UP with 978 thousand acres followed by aspen with 302 thousand acres.



**Figure 5.9. Timberland area by hardwood forest type and ecoregion, all owners, 2004.**



**Figure 5.10. Timberland area by softwood forest type and ecoregion, all owners, 2004.**

Aspen is the most common hardwood type in the Northern Lower Peninsula, followed by maple-beech-birch and oak-hickory. Red pine and jack pine are the most common softwood types followed by northern white cedar in the NLP. In the WUP, maple-beech-birch and aspen are the most common hardwood types. Northern white cedar and black spruce are the most common softwood types. Maple-beech-birch and aspen are the most common hardwood types and northern white cedar, jack pine, and red pine are the most common softwood types in the EUP.

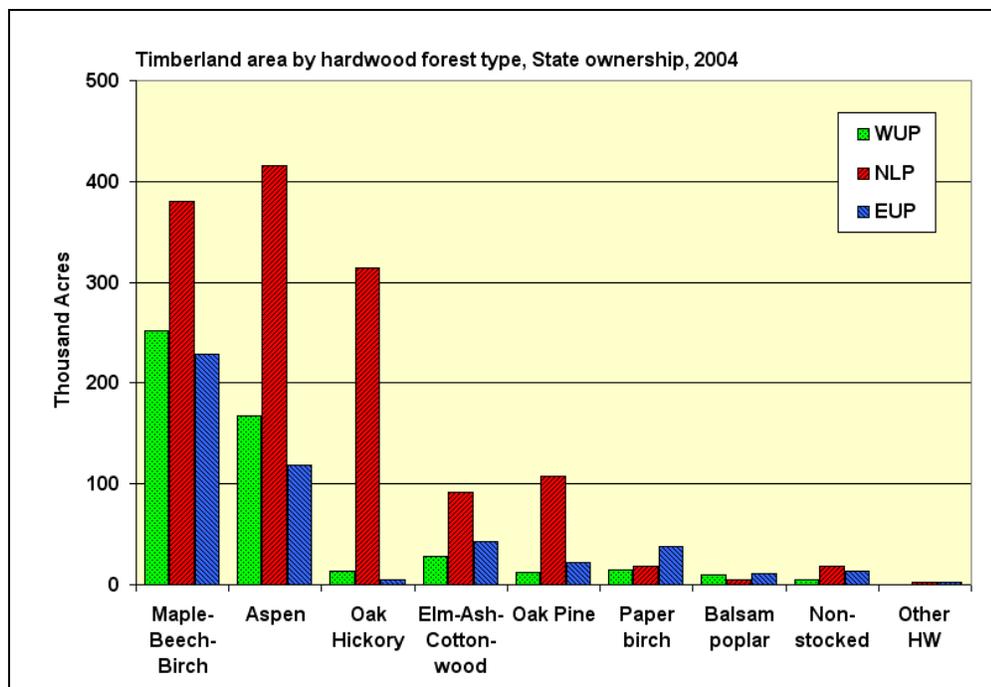


Figure 5.11. Timberland area by hardwood forest type and ecoregion, State ownership, 2004.

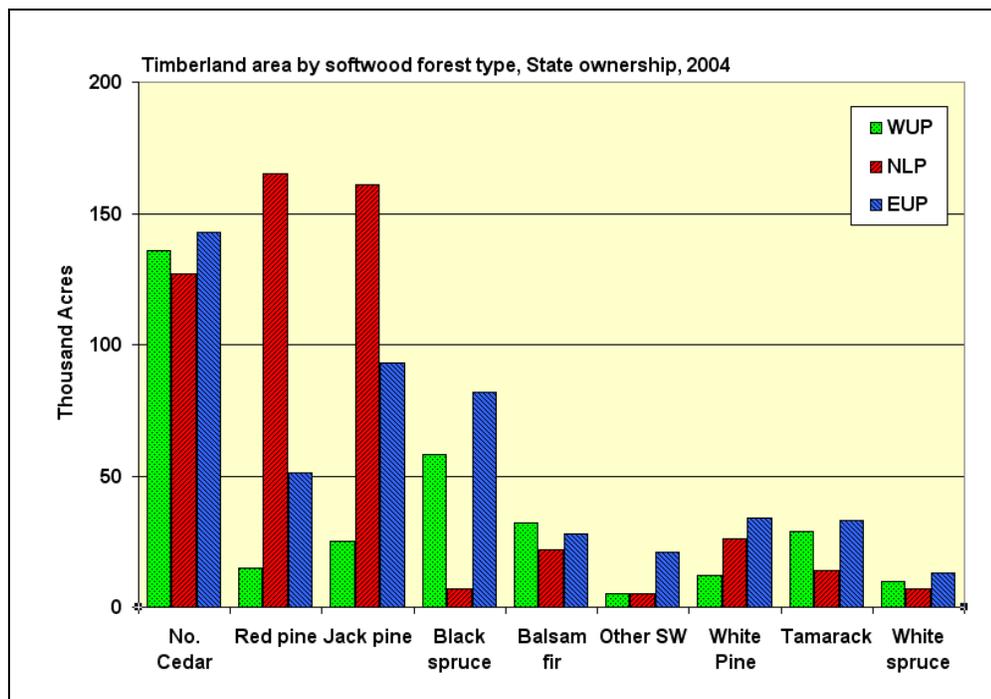


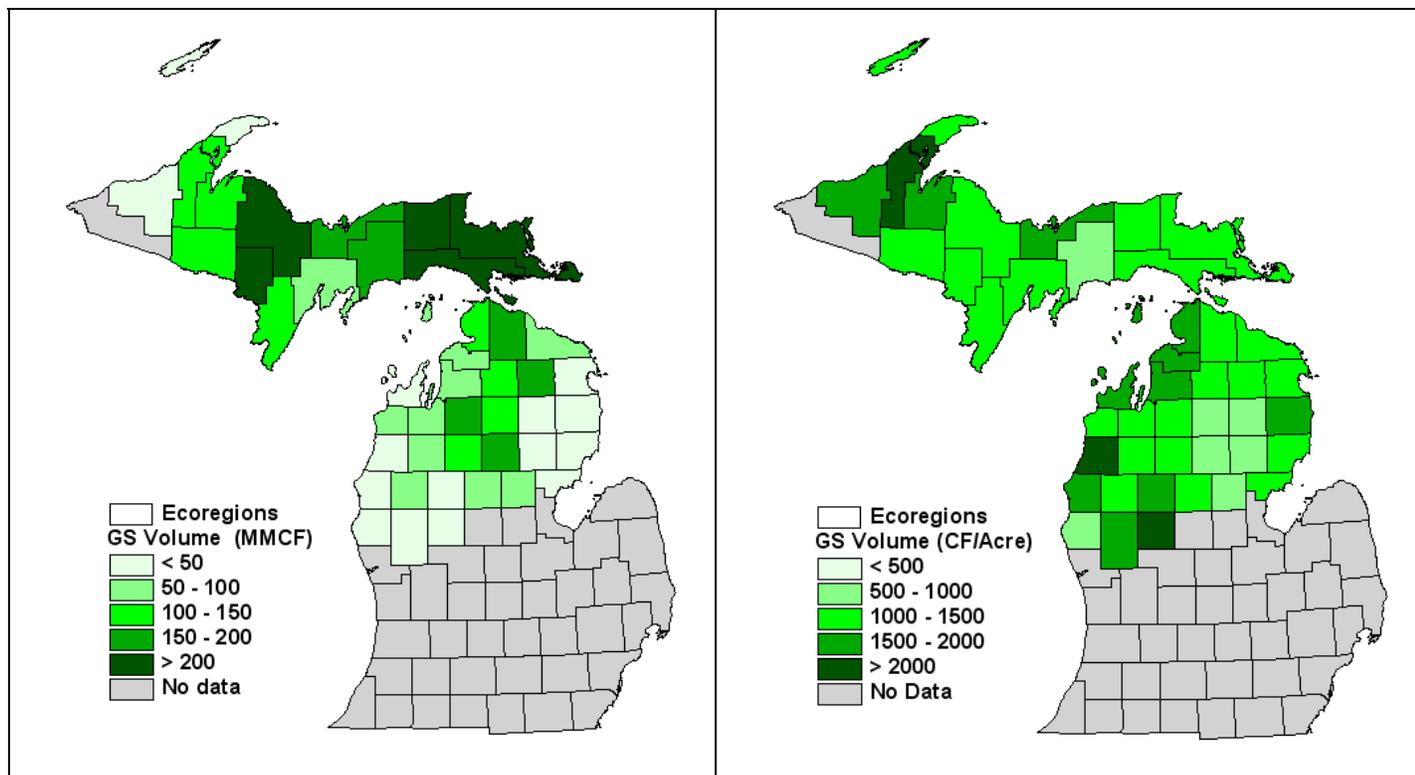
Figure 5.12. Timberland area by softwood forest type and ecoregion, State ownership, 2004.

### Volume of growing stock trees

The volume of growing stock timber on Michigan's 18.75 million acres of timberland is very large – about 27.3 billion cubic feet on all ownerships. That translates into 1,456 cubic feet per acre or roughly 18 cords of wood per

acre. On the 4.03 million acres of State-owned timberland, there are 5.1 billion cubic feet of timber or roughly 1,275 cubic feet of growing stock volume per acre.

All this timberland and wood volume is not evenly distributed geographically or by forest type because of physical, biological and human factors. Figure 5.13 shows the distribution of growing stock volume by county in the three ecoregions. County-level data on timber volume and growth are shown in appendix Table A5.3.



**Figure 5.13. Total growing stock volume and volume per acre for all forest types on State-owned timberlands, 2004.**

The distribution of growing stock volume by ecoregion and forest type is detailed in Table 5.7 for all owners and State-owned timberlands. Although the State owns about 21% of all timberland in Michigan, state forests contain about 19% of the total growing stock timber volume with 5.1 billion cubic feet on DNR timberlands. Sixty two percent of the volume on DNR timberlands is in four forest types – maple-beech-birch (29.6%), aspen (11.6%), oak-hickory (11.3%), and red pine (10.1%). For comparison, volume of all live trees by forest type are shown for all owners in appendix Table A5.9 and for state-owned lands in Table A5.10.

**Table 5.7. Volume of all growing stock trees (million cubic feet) on timberland, all owners and State ownership, by forest type and ecoregion, 2004.**

Forest type group	EUP	NLP	WUP	State	EUP	NLP	WUP	State
	<b>All Owners</b>				<b>State Ownership</b>			
Aspen	311	1,371	798	2,678	120	328	131	598
Balsam fir	90	55	169	315	22	20	18	60
Balsam poplar	75	67	61	204	11	4	5	21
Black spruce	147	19	205	372	57	3	48	108
Elm-Ash-Cottonwood	92	492	266	1,878	45	95	37	284
Jack pine	160	263	91	521	82	111	21	214

Forest type group	EUP	NLP	WUP	State	EUP	NLP	WUP	State
	All Owners				State Ownership			
Maple-Beech-Birch	1,624	2,866	5,065	10,733	396	578	468	1,521
Nonstocked	1	2	3	9	1	1	1	3
Northern white-cedar	777	599	978	2,363	217	218	244	679
Oak Hickory	13	1,532	90	3,802	5	295	23	583
Oak Pine	37	427	75	614	12	89	7	116
Other Hardwoods	8	13		99	4	3		23
Other Softwoods	142	124	244	597	45	3	12	61
Paper birch	134	95	160	395	47	24	23	93
Red pine	204	1,231	237	1,797	84	377	41	519
Tamarack	42	26	86	155	29	8	36	73
White Pine	138	226	173	599	56	43	37	139
White spruce	46	26	88	173	18	11	17	45
Total	4,043	9,437	8,787	27,303	1,250	2,210	1,168	5,141

## Growth

Net annual growth of growing stock trees on timberland is detailed in Table 5.8. Growth on all timberlands and all forest types averages 49 cubic feet per acre per year. Annual growth on State-owned timberlands averages 41 cubic feet per acre. Net annual timber growth on DNR lands is 163.5 million cubic feet annually, more than 2 million cords annually, based on FIA inventory data for the 2000 to 2004 measurement period. Average annual removals from DNR timberlands are estimated by FIA at 58.4 million cubic feet, roughly 730,000 cords.

**Table 5.8. Average net annual growth (million cubic feet) on timberland, all owners and State ownership, by forest type group and ecoregion, 2004.**

Forest type group	EUP	NLP	WUP	State	EUP	NLP	WUP	State
	All owners				State ownership			
Aspen	3.0	55.2	30.3	97.2	2.5	19.0	7.4	31.2
Balsam fir	1.8	5.1	4.7	11.6	0.3	0.1	0.5	0.8
Balsam poplar	3.0	2.7	4.6	10.3	0.2	0.5	1.7	2.4
Black spruce	6.9	0.3	5.5	12.7	3.5		0.1	3.6
Elm-Ash-Cottonwood	0.8	8.9	9.4	61.7	0.5	0.8	0.4	4.9
Jack pine	2.9	6.8	5.7	15.8	1.8	3.7	2.7	8.2
Maple-Beech-Birch	50.6	74.0	142.8	325.3	10.0	12.2	14.5	47.9
Nonstocked	-0.1	0.8	1.0	1.7	-0.1	0.6	0.7	1.2
Northern white-cedar	25.2	6.5	31.6	63.2	5.9	-1.7	4.8	9.0
Oak Hickory	0.1	51.9	2.6	142.2	0.1	8.0		16.5
Oak Pine	1.5	14.0	1.2	19.4	0.9	1.8	0.2	3.0
Other Hardwoods				3.0				0.0
Other Softwoods	6.1	4.8	11.2	29.9	5.0	0.5	0.9	6.5
Paper birch	2.1	3.5	4.1	10.8	0.7			0.7
Red pine	6.4	67.2	5.5	85.4	0.7	15.2	1.1	18.6

Forest type group	EUP	NLP	WUP	State	EUP	NLP	WUP	State
	All owners				State ownership			
Tamarack	1.3	1.2	4.5	7.6	0.5	0.4	2.0	3.0
White Pine	3.7	2.2	4.0	12.9	2.3		0.2	2.5
White spruce	2.5	0.1	8.5	11.1	0.8		2.8	3.5
Unclassified	0.1	0.8	-0.2	1.7				
Total	117.8	306.0	276.9	923.3	35.6	61.2	40.0	163.5

## Removals

Annual timber removals is described in Table 5.9. Net annual growth exceeds annual removals by a considerable margin for all species combined. On state lands, the growth/removals ratio is 2.8 and on all lands, the ratio is almost 3.2. The 2004 inventory shows total annual removals of 291.2 million cubic feet on all lands and 58.4 million cubic feet on State lands. Average removals from all lands were 15.6 cubic feet per acre in the 2004 inventory. On State lands, average annual removals averaged 14.4 cubic feet. Removals from the maple-beech-birch forest type exceeded any other type on both all lands (111.1 million cubic feet) and State lands (16.3 million cubic feet). Removals from the oak-hickory type ranked second with 43 million cubic feet statewide and 11 million cubic feet annually from State lands.

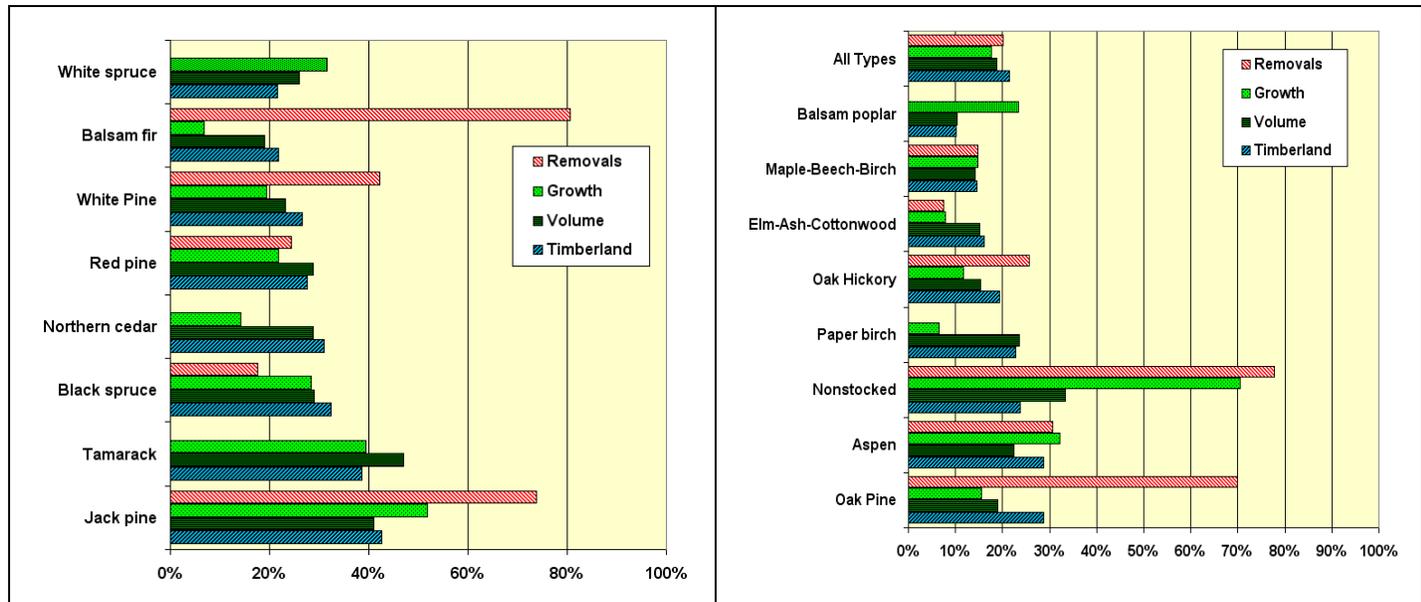
**Table 5.9. Average annual removals of merchantable volume (million cubic feet) from growing stock trees on timberland, all owners and State ownership, by forest type and ecoregion, 2004.**

Forest type group	EUP	NLP	WUP	State	EUP	NLP	WUP	State
	All owners				State ownership			
Aspen	2.4	13.3	12.6	28.4	0.9	4.6	3.1	8.7
Balsam fir	0.8	0.3	2.0	3.1	0.8		1.7	2.5
Balsam poplar		1.4	3.1	4.5				0.0
Black spruce	1.1		0.6	1.7	0.3			0.3
Elm-Ash-Cottonwood	2.0	3.8	1.5	13.5	0.3		0.8	1.0
Jack pine	1.5	3.2	1.8	6.5	1.5	3.0	0.3	4.8
Maple-Beech-Birch	17.4	26.7	54.1	111.1	3.4	2.4	8.8	16.3
Nonstocked		5.1	0.4	5.4		3.8	0.4	4.2
Northern white-cedar	3.8		5.0	8.8				0.0
Oak Hickory	0.4	32.4	1.4	43.0	0.4	10.6		11.0
Oak Pine		1.2	2.9	4.0		0.5	2.3	2.8
Other Hardwoods				0.0				0.0
Other Softwoods	2.9	2.7	5.2	10.8		0.1		0.1
Paper birch			0.4	0.4				0.0
Red pine	0.9	12.9	5.2	19.3		4.7		4.7
Tamarack			1.8	1.8				0.0
White Pine	1.6	0.6	2.3	4.5	1.6		0.3	1.9
White spruce	1.1	1.0	0.2	2.2				0.0
Unclassified	0.7	6.7	0.8	22.0				
Total	36.8	111.2	101.2	291.2	9.3	29.8	17.7	58.4

Timberland, volume, growth, and removals from State-owned timberlands are not proportional to similar measures for all timberlands in the State. Figure 5.14 compares the value of these measures on State-owned timberlands with all lands as a percentage. For example, the State owns 21% of all timberland, but these lands hold only 19% of the total growing stock volume. Growth on State-owned timberlands was 18% of the State total from all lands and removals were 20%.

For the jack pine forest type, the State owns 43% of the total timberland which holds 41% of the growing stock volume, produces 52% of the growth, and accounts for 74% of the removals.

Data used for Figure 5.14 on timber volume, growth, and removals by forest type on state-owned lands for the 2004 FIA inventory are shown in appendix Table A5.11.



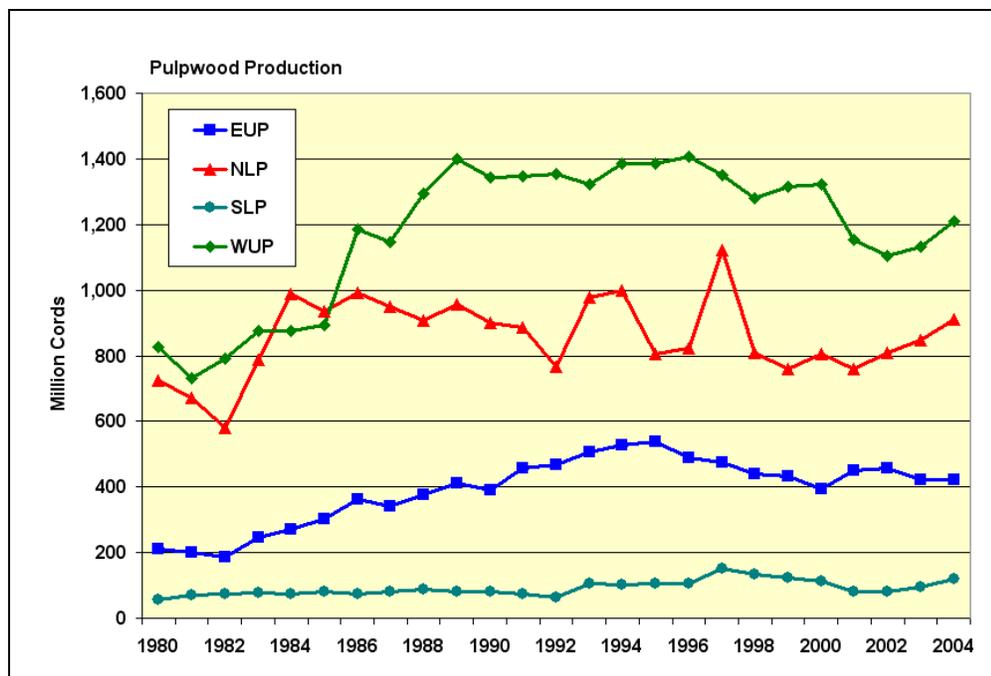
**Figure 5.14. Percent of timberland, volume, growth, and removals from State lands by forest type, 2004.**

Source: USDA Forest Service, 2004 FIA inventory.

### Timber production

Detailed production data for pulpwood and sawlogs are available from the USDA-Forest Services annual pulpwood production reports compiled in cooperation with the Michigan DNR and the periodic sawlog production reports (Piva, 1999-2006; Haugen and Pilon, 2002; and Haugen and Weatherspoon, 2003). These Timber Product Output data offer a long time-series of pulpwood and sawtimber removals by county and by species. These data do not, however, provide a method for identifying State-owned timberlands as the source of harvested wood.

Figure 5.15 provides a history of pulpwood production in the State. State pulpwood production has declined since 1997 and current levels are similar to those seen in the late 1980's. In terms of volume, the Western UP is the largest producer of pulpwood followed by the Northern LP and the Eastern UP. Pulpwood produced in the Western UP may be shipped to mills in the Upper Peninsula and it is within trucking distance to consuming mills in Wisconsin.

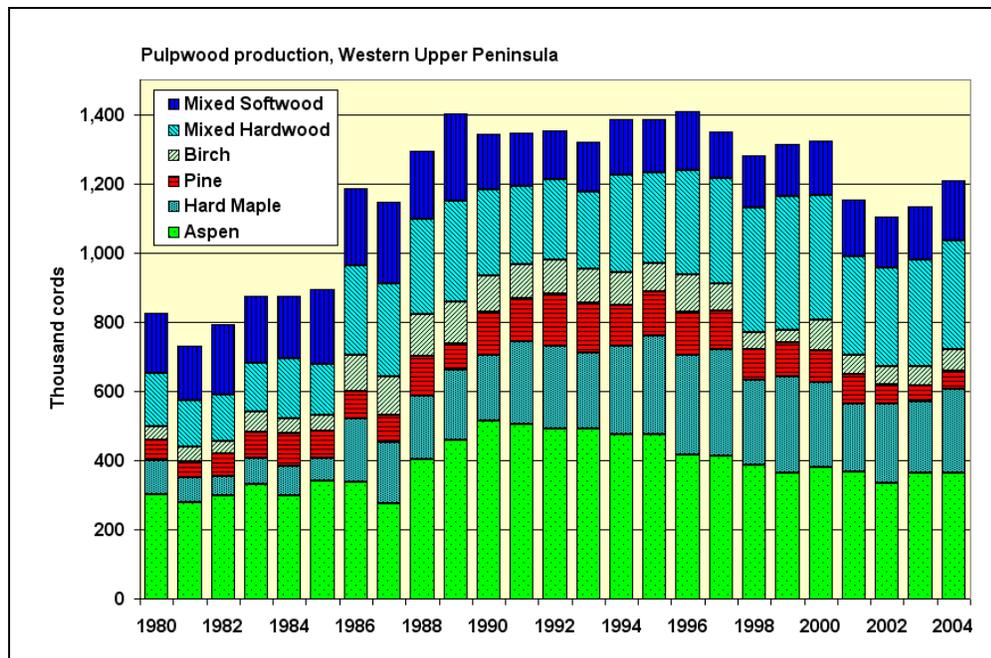


**Figure 5.15. Pulpwood production (thousand cords) from all lands by ecoregion, 1980 to 2004.**

Source: USDA-Forest Service, Pulpwood production and Timber Product Output reports.

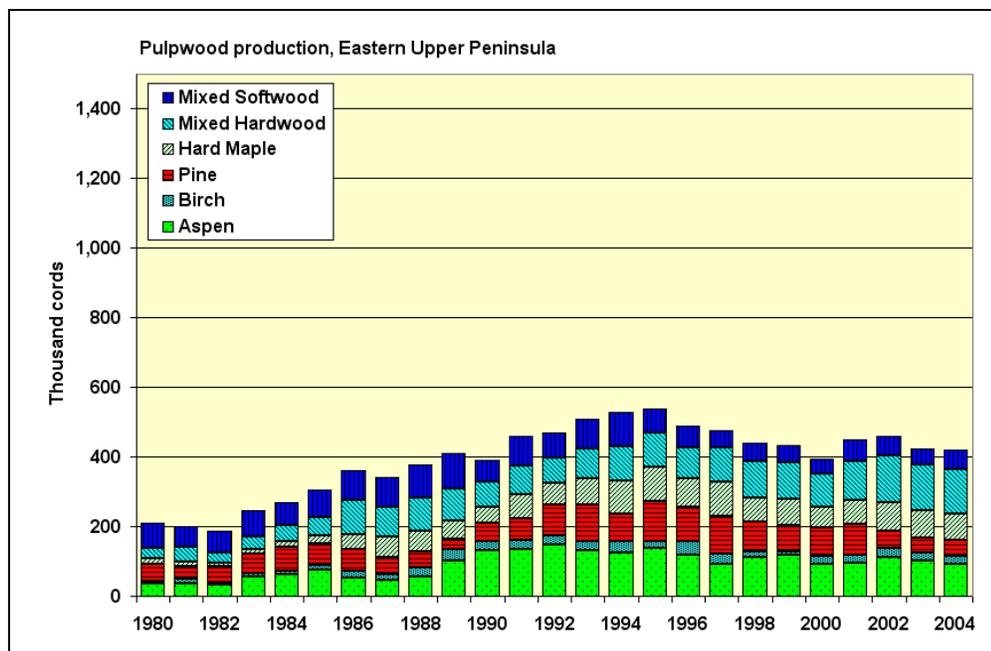
Total pulpwood production in Michigan was 2.66 million cords in 2004, the most recent year for which data are available. About one-quarter of this production came from state forests. Production in the WUP was 1.2 million cords; EUP was 420 thousand cords, and the NLP was 909 thousand cords from all lands. Pulpwood production for 2004 from DNR lands was about 4% of the state total in the EUP, 12% in the NLP, and 5% in the WUP.

Figures 5.16 to 5.18 show the distribution of pulpwood production for several broad species groups in each ecoregion. Overall pulpwood production has declined since a high period of 1993 to 1997. In terms of volume, the Western UP produces more pulpwood than any other region, followed by the Northern Lower Peninsula and the Eastern UP. Production in the Western UP (Figure 5.16) is dominated by hard maple, aspen, and other mixed hardwoods with relatively little pine or softwood production. Overall production in the Western UP declined from a high in 1996 with a fairly significant drop in 2001 and an increase from 2002 to 2004. Numeric data on pulpwood production from 1980 to 2004 by ecoregion is contained in appendix Table A5.12.



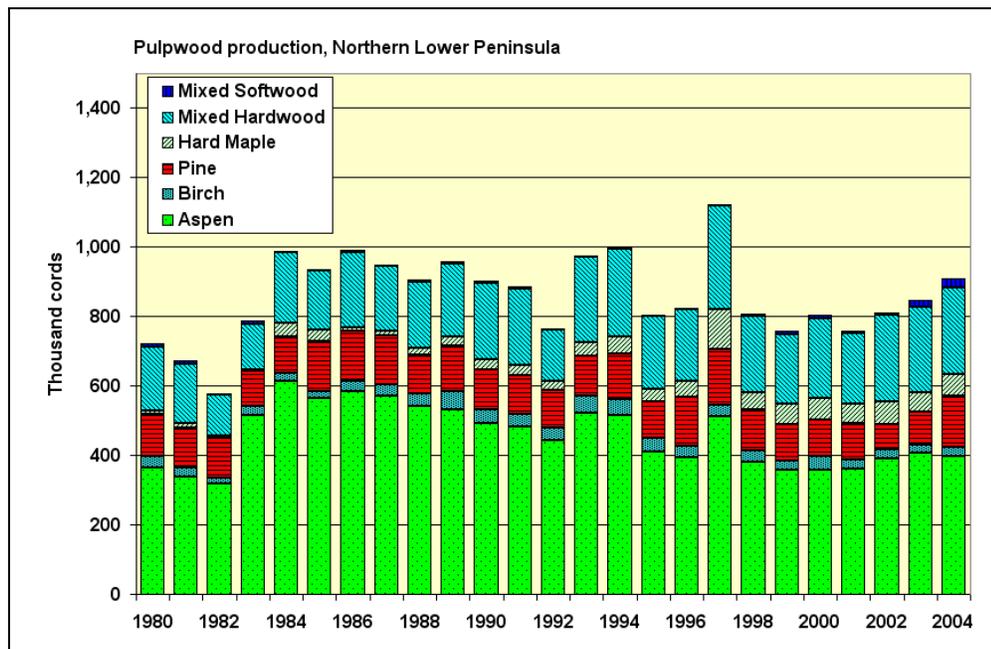
**Figure 5.16. Pulpwood production from all lands, by species group, Western Upper Peninsula, 1980 – 2004.**

Pulpwood production in the Eastern Upper Peninsula (Figure 5.17) has declined from a high in 1995. The 2003 production value was 78 percent of the 1995 production level, the record year for this ecoregion. Production in the Eastern UP was dominated by mixed hardwoods and hard maple followed by aspen and pine.



**Figure 5.17. Pulpwood production from all lands, by species group, Eastern Upper Peninsula, 1980 – 2004.**

Pulpwood production in the Northern Lower Peninsula (Figure 5.18) increased from 1998 to 2003. Production in the region is mostly mixed hardwoods and aspen. Aspen production in the ecoregion has declined, on average, over the past 20 years. Pine pulpwood production has also declined over time.



**Figure 5.18. Pulpwood production from all lands, by species group, Northern Lower Peninsula, 1980 – 2003.**

The distribution of statewide pulpwood production in 2004 by species and ecoregion is shown in Table 5.10. About two-thirds of the pulpwood production in the State, 64%, is composed of three species – soft maple, aspen, and hard maple. All other species comprise the remaining volume. The Western UP produced the majority of pulpwood for 17 identified species which individually account for 41% or more of the State total from the ecoregion. The Northern Lower Peninsula dominates in production of aspen, jack pine, and oak pulpwood production among the regions. Statewide pulpwood production by species and ecoregion for 2004 is shown in Figure 5.19.

**Table 5.10. Distribution of pulpwood production (thousand cords) by species and ecoregion, 2004.**

Species	State	Total Volume	WUP	EUP	NLP	SLP
	Percent	1,000 cords	Percent of species total			
Aspen	32%	846	40%	10%	45%	4%
Soft maple	17%	449	41%	18%	34%	7%
Hard maple	15%	388	62%	20%	17%	2%
Jack pine	7%	199	14%	15%	69%	2%
White birch	4%	110	54%	20%	24%	2%
Balsam fir	3%	79	66%	25%	9%	0%
Spruce	3%	74	72%	20%	8%	0%
Basswood	2%	63	51%	11%	36%	2%
Hemlock	2%	63	79%	20%	1%	0%

Species	State	Total Volume	WUP	EUP	NLP	SLP
	Percent	1,000 cords	Percent of species total			
Red oak	2%	60	19%	10%	47%	24%
Beech	2%	53	54%	24%	20%	2%
Red pine	2%	51	52%	29%	18%	1%
Balsam poplar	2%	48	55%	16%	26%	3%
Yellow birch	1%	37	70%	25%	4%	1%
Ash	1%	36	52%	17%	28%	3%
White oak	1%	29	0%	4%	41%	55%
Other hardwoods	1%	25	49%	19%	31%	1%
Tamarack	1%	19	59%	25%	16%	0%
White pine	0%	9	43%	24%	30%	3%
Other softwoods	0%	5	0%	0%	100%	0%
Elm	0%	5	54%	12%	29%	6%
Northern white-cedar	0%	4	69%	21%	10%	0%
Hickory	0%	3	4%	0%	79%	17%
All Species	100%	2,658	45%	16%	34%	5%

Source: USDA Forest Service, North Central Research Station. Data published in the Timber Product Output and Pulpwood Production report series.

Other species include: beech, spruce, white oak, ash, other hardwoods, white pine, tamarack, northern white cedar, elm, and hickory.

Timber Product Output data also provides information on sawlog production. Michigan produces more than one billion board feet of high-value sawlogs annually (based on 1998 FIA data). The most recent sawlog production data is for 1998. Five species – hard maple, red oak, red pine, soft maple, jack pine, and aspen - account for 80% of all sawlog production in the State. The Western UP dominates in production of jack pine, white pine, yellow birch, and white birch. The Northern Lower Peninsula dominates sawlog production for all other species except white oak which is primarily produced in the Southern Lower Peninsula. Sawlog production by ecoregion and species for 1998 is shown in Figure 5.20. According to DNR statistics, sawlog production on DNR lands is about 61 million board feet and dominated by red pine, oak, aspen, and maple.

**Table 5.11. Distribution of sawlog production (MBF) by species and ecoregion, 1998.**

Species	State Total	Total Volume	WUP	EUP	NLP	SLP
	Percent	MBF	Percent of species total			
Hard maple	21%	268,716	35%	9%	45%	10%
Red oak	16%	212,438	5%	1%	61%	34%
Red pine	16%	207,472	11%	10%	74%	5%
Soft maple	11%	141,606	19%	8%	45%	28%
Jack pine	8%	106,126	37%	27%	36%	0%
Aspen	8%	103,466	20%	3%	70%	7%
White oak	3%	38,528	0%	0%	36%	64%
Ash	2%	28,057	9%	15%	47%	29%

Species	State Total	Total Volume	WUP	EUP	NLP	SLP
	Percent	MBF	Percent of species total			
White pine	2%	25,248	34%	22%	33%	11%
Basswood	2%	23,995	33%	1%	52%	13%
Yellow birch	2%	23,204	80%	14%	5%	0%
White birch	2%	22,328	46%	23%	25%	6%
Other species	8%	99,487	42%	13%	21%	25%
All species	100%	1,300,671	23%	9%	50%	17%

Source: USDA Forest Service, North Central Research Station. Data published in the Timber Product Output report series.

Other species include: spruce, black cherry, balsam fir, cottonwood, beech, northern white cedar, hemlock, hickory, yellow poplar, elm, balsam poplar, walnut, sycamore, tamarack, sassafras, hackberry, butternut, red cedar, and other hardwoods

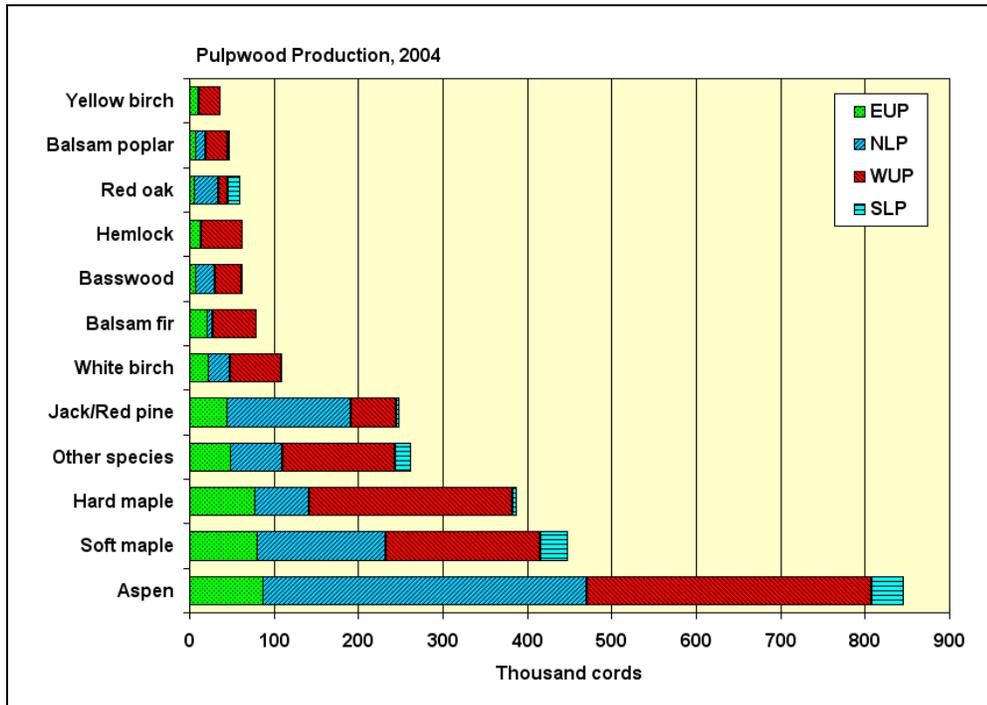


Figure 5.19. Pulpwood production (thousand cords) by species and ecoregion, 2003.

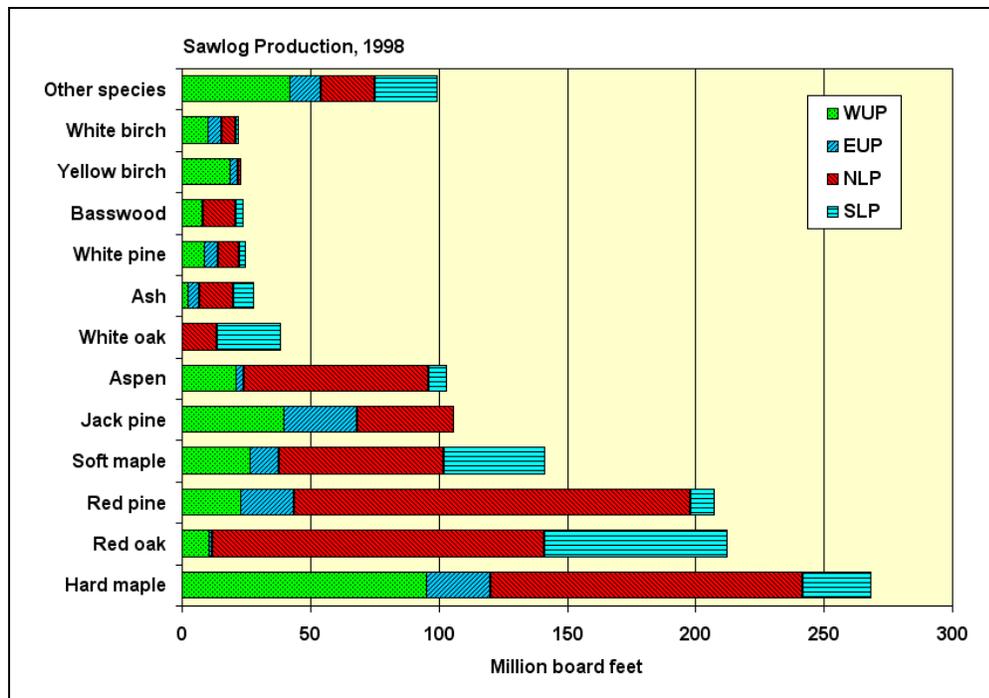
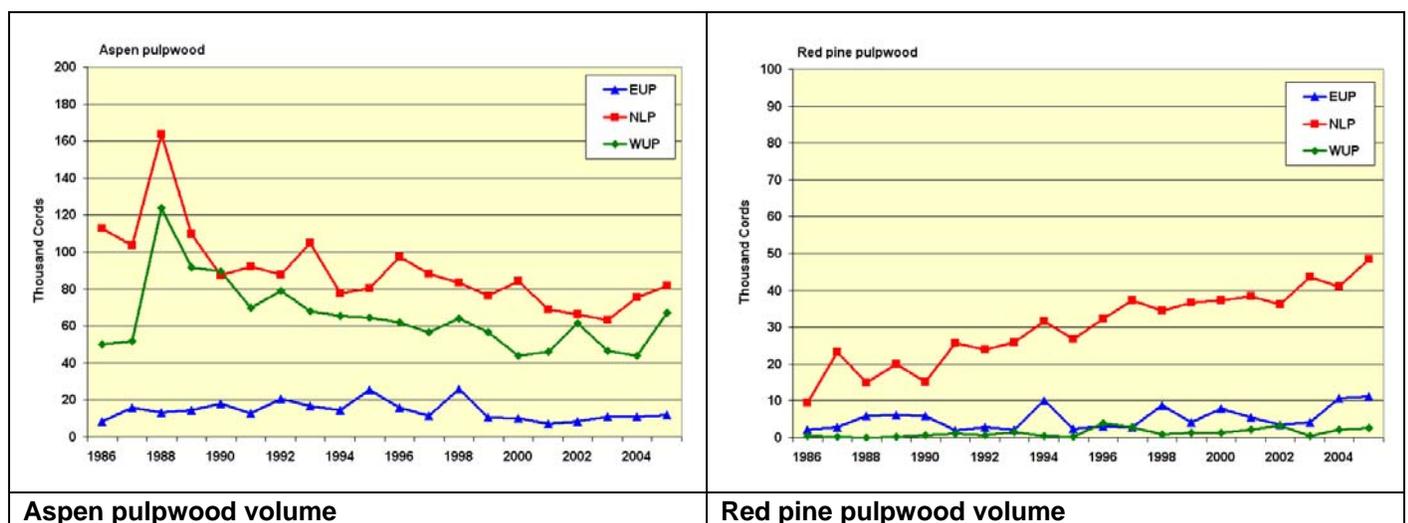
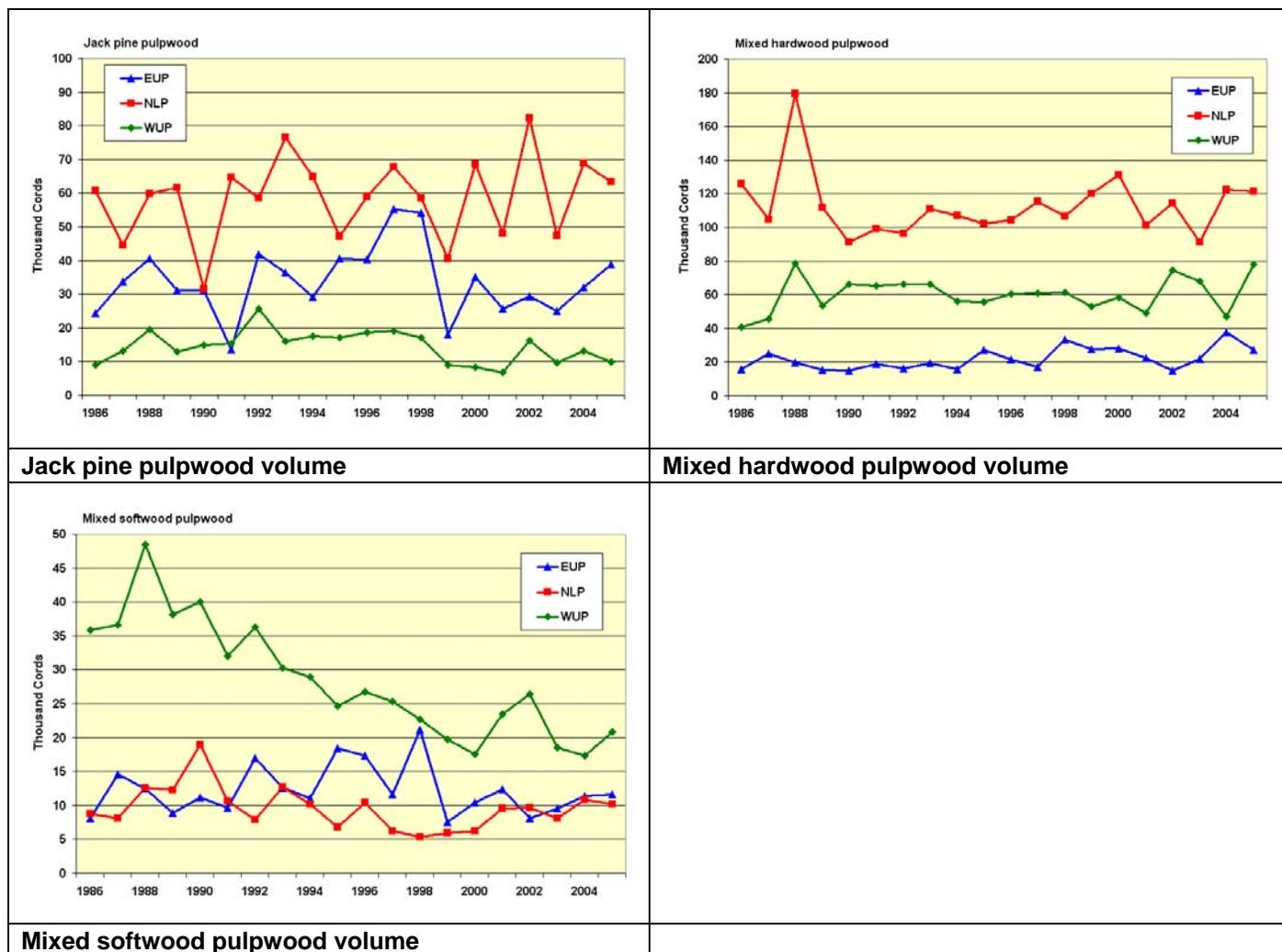


Figure 5.20. Sawlog production (MBF) by species and ecoregion, 1998.

### Michigan DNR timber volume and value

DNR timber production data provides a history of sale volumes by ecoregion and species. Figure 5.21 shows production data for selected pulpwood species from 1986 to 2005. Overall, year-to-year pulpwood production data are highly erratic for specific species, especially jack pine. Pulpwood production from DNR lands are highest for aspen, red pine, jack pine and mixed hardwoods in the Northern Lower Peninsula. The data also show recent declines for all selected species group in the Northern Lower Peninsula. These data show long-term declines in production of aspen and mixed softwood sawtimber. More detailed tabular data on volume and value of timber sold from state forests are available in appendix Tables A5.13 and A5.14. An excellent recent analysis of timber harvesting on DNR lands is available in Pedersen (2005).





**Figure 5.21. Volume of pulpwood for selected species groups sold from DNR lands by ecoregion, 1986 - 2005.**

Volume of sawlogs produced from DNR lands from 1986 to 2005 are shown in Figure 5.22 for selected species by ecoregion. Again, production data show erratic year-to-year patterns. The Northern Lower Peninsula dominates production of Aspen, Jack pine, and Red pine sawlogs with relatively little of these species produced from other ecoregions.

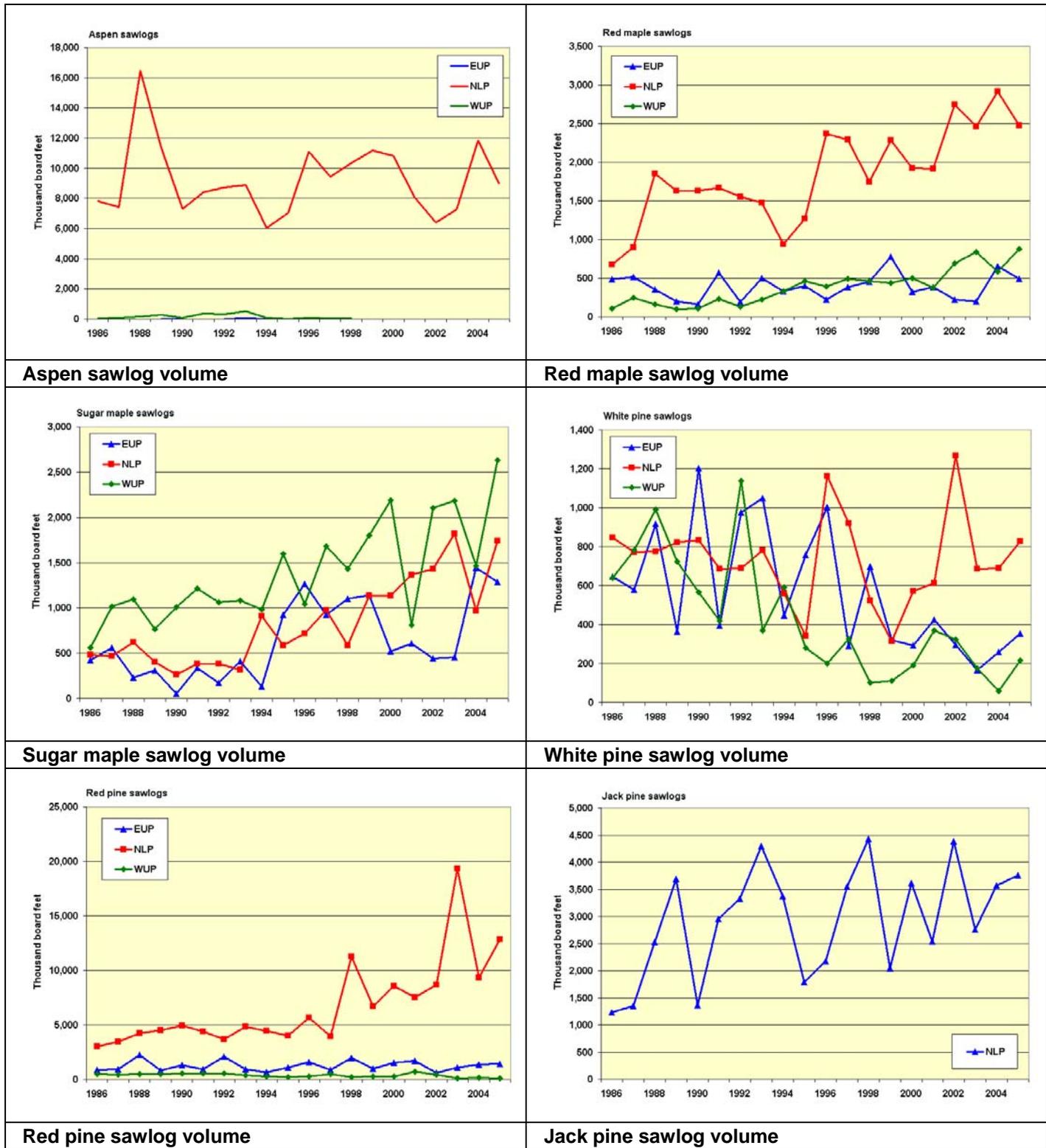


Figure 5.22. Volume of sawlogs sold from DNR lands for selected species by ecoregion, 1986 -2005.

Timber products sold from DNR lands in recent years are dominated by pulpwood (about 85% of the total volume sold) and by hardwoods (about 65% of total volume). Total volume sold from 2000 to 2004 varied from 630 to 808 thousand cords.

State forest timber sales in 2005 hit the highest volume sold since 1988. Because prices have increased considerably, it also hit an all-time record revenues of almost \$45 million. Potential softening of markets due to several recent mill closures will affect opportunities to achieve this record sale volume and revenue in the immediate future.

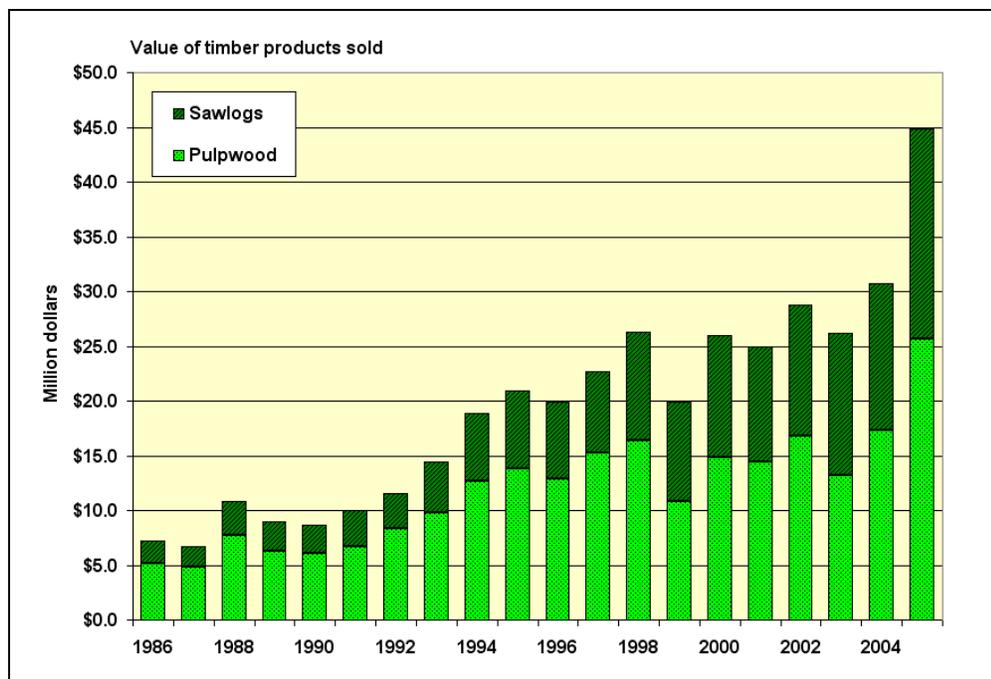
**Table 5.12. Volume of timber products (cords) sold from all DNR lands, by species group, 1986 to 2005.**

Fiscal Year	Hardwood				Softwood				All Products
	Pulpwood	Sawlogs	Bolts	Other	Pulpwood	Sawlogs	Bolts	Other	
1986	380,402	50,487	2,183	1,679	169,927	19,570	1,375	15,372	640,995
1987	387,761	49,456	3,443	2,035	199,522	23,028	1,503	4,158	670,905
1988	620,639	79,787	4,365	1,523	237,708	30,268	1,616	3,220	979,125
1989	430,184	55,233	4,454	1,037	214,162	29,289	1,331	4,460	740,151
1990	410,554	42,361	6,494	1,536	183,949	26,010	1,092	1,178	673,173
1991	386,895	49,495	2,795	595	201,943	27,947	889	494	671,053
1992	425,598	50,039	4,577	728	244,667	29,666	1,659	1,136	758,069
1993	440,268	56,937	2,611	791	235,914	29,857	820	5,852	773,048
1994	382,811	50,769	1,026	1,050	232,792	24,943	614	6,185	700,190
1995	394,514	52,891	333	237	217,851	25,044	357	405	691,632
1996	398,388	63,971	381	731	234,805	28,734	656	525	728,192
1997	407,339	69,011	994	628	258,258	25,742	177	248	762,397
1998	427,435	65,347	888	295	264,706	44,804	210	254	803,940
1999	386,808	75,429	527	481	159,682	26,168	1,227	335	650,656
2000	406,837	74,438	1,200	195	218,348	35,516	867	236	737,637
2001	340,941	59,556	1,100	844	194,755	31,378	933	812	630,320
2002	411,534	64,476	1,291		242,434	37,102	930	256	758,022
2003	337,010	63,586	722		181,718	53,995	150		637,181
2004	377,131	79,629	460		220,900	34,461	1,149		713,730
2,005	436,054	72,669	1,204		248,309	48,615	823		807,674

Source: Dr. Larry Pedersen, Michigan DNR.

All volumes and prices are shown in \$/cord. The conversion rate is 2.0 cords per thousand board feet (MBF) for sawlog products.

The value of timber products sold has climbed steadily, largely due to increases in bid prices. Except for 2005, DNR revenues from timber sales have averaged \$20 to \$30 million as shown in Figure 5.23. Although pulpwood comprises 80% or more of the timber volume, pulpwood sales account for only 50% to 58% of the revenue stream.



**Figure 5.23. Trend in total revenue for DNR timber sales from State Forests, 1986 – 2005.**

Table 5.13 provides a breakdown of statewide timber revenues by hardwood/softwood product classes. Sales of hardwood products provided 58% of the revenue from 2000 to 2005. Softwood accounted for 42% of timber sale revenue.

**Table 5.13. Value of timber products (thousand dollars) sold from all DNR lands, by species group, 1986 to 2005.**

Fiscal Year	Hardwood				Softwood				All Products
	Pulp-wood	Saw-logs	Bolt s	Other	Pulp-wood	Saw-logs	Bolts	Other	
1986	\$3,667	\$1,463	\$21	\$9	\$1,263	\$577	\$28	\$160	\$7,189
1987	\$3,234	\$1,203	\$33	\$17	\$1,390	\$677	\$15	\$107	\$6,674
1988	\$5,626	\$2,104	\$49	\$6	\$1,926	\$981	\$23	\$76	\$10,790
1989	\$4,046	\$1,585	\$41	\$2	\$2,035	\$1,055	\$19	\$152	\$8,934
1990	\$4,107	\$1,587	\$75	\$5	\$1,893	\$1,000	\$21	\$21	\$8,709
1991	\$4,316	\$2,029	\$35	\$4	\$2,317	\$1,232	\$14	\$4	\$9,951
1992	\$5,023	\$1,963	\$60	\$7	\$3,211	\$1,241	\$45	\$5	\$11,555
1993	\$6,233	\$3,231	\$39	\$2	\$3,490	\$1,392	\$26	\$13	\$14,426
1994	\$7,470	\$4,390	\$22	\$1	\$5,190	\$1,761	\$14	\$5	\$18,853
1995	\$7,999	\$4,989	\$8	\$0	\$5,743	\$2,178	\$7	\$29	\$20,954
1996	\$7,209	\$4,809	\$10	\$1	\$5,630	\$2,252	\$16	\$6	\$19,933
1997	\$7,625	\$5,570	\$29	\$0	\$7,601	\$1,874	\$13	\$1	\$22,713
1998	\$8,019	\$5,570	\$20	\$3	\$8,310	\$4,314	\$12	\$1	\$26,249
1999	\$6,271	\$6,611	\$13	\$4	\$4,518	\$2,397	\$51	\$8	\$19,873
2000	\$7,232	\$7,844	\$36	\$3	\$7,489	\$3,320	\$31	\$7	\$25,961

Fiscal Year	Hardwood				Softwood				All Products
	Pulp-wood	Saw-logs	Bolts	Other	Pulp-wood	Saw-logs	Bolts	Other	
2001	\$6,830	\$6,838	\$24	\$4	\$7,542	\$3,599	\$54	\$28	\$24,919
2002	\$7,696	\$8,186	\$27	\$0	\$9,011	\$3,820	\$60	\$13	\$28,813
2003	\$6,238	\$7,846	\$12	\$0	\$6,915	\$5,127	\$8	\$0	\$26,147
2004	\$7,950	\$10,290	\$12	\$0	\$9,277	\$3,162	\$54	\$0	\$30,745
2005	\$13,131	\$13,417	\$69	\$0	\$12,381	\$5,798	\$40	\$0	\$44,836

Source: Dr. Larry Pedersen, Michigan DNR.

Average bid prices have steadily increased for most timber products sold by the DNR as shown in Table 5.14. While some variation occurs from year to year, the overall trend in stumpage prices through 2005 is up for all product classes. Summaries of timber price trends by ecoregion are available in the appendix Tables A5.13 and A5.14.

Although prices for some products showed considerable variability over time, red and jack pine pulpwood, sugar and red maple and red pine sawlogs sawlogs showed very strong and sustained real price increases from 1986 to 2005.

**Table 5.14. Average bid (\$/cord) for timber products sold from all DNR lands, by species group, 1986 to 2005.**

Fiscal Year	Hardwood				Softwood				All Products
	Pulp-wood	Saw-logs	Bolts	Other	Pulp-wood	Saw-logs	Bolts	Other	
1986	\$9.64	\$28.98	\$9.61	\$5.22	\$7.43	\$29.49	\$20.67	\$10.40	\$11.21
1987	\$8.34	\$24.32	\$9.49	\$8.22	\$6.97	\$29.39	\$9.79	\$25.68	\$9.95
1988	\$9.06	\$26.36	\$11.22	\$4.10	\$8.10	\$32.42	\$14.19	\$23.56	\$11.02
1989	\$9.40	\$28.71	\$9.14	\$1.78	\$9.50	\$36.02	\$14.50	\$34.02	\$12.07
1990	\$10.00	\$37.47	\$11.55	\$3.04	\$10.29	\$38.45	\$18.86	\$17.87	\$12.94
1991	\$11.16	\$40.99	\$12.43	\$7.08	\$11.48	\$44.07	\$15.36	\$8.54	\$14.83
1992	\$11.80	\$39.23	\$13.10	\$9.54	\$13.13	\$41.82	\$27.17	\$4.46	\$15.24
1993	\$14.16	\$56.75	\$14.96	\$2.74	\$14.80	\$46.63	\$31.14	\$2.15	\$18.66
1994	\$19.51	\$86.46	\$21.79	\$0.73	\$22.30	\$70.58	\$23.39	\$0.74	\$26.93
1995	\$20.28	\$94.33	\$24.64	\$0.50	\$26.36	\$86.99	\$18.95	\$72.57	\$30.30
1996	\$18.09	\$75.17	\$25.91	\$1.73	\$23.98	\$78.39	\$24.79	\$11.86	\$27.37
1997	\$18.72	\$80.71	\$28.83	\$0.50	\$29.43	\$72.79	\$72.40	\$5.67	\$29.79
1998	\$18.76	\$85.23	\$22.22	\$10.95	\$31.39	\$96.28	\$58.63	\$5.58	\$32.65
1999	\$16.21	\$87.65	\$23.92	\$8.95	\$28.29	\$91.61	\$41.38	\$24.39	\$30.54
2000	\$17.78	\$105.38	\$29.65	\$17.83	\$34.30	\$93.48	\$35.20	\$28.18	\$35.19
2001	\$20.03	\$114.82	\$21.80	\$4.50	\$38.73	\$114.70	\$57.85	\$34.74	\$39.53
2002	\$18.70	\$126.96	\$21.21		\$37.17	\$102.97	\$64.44	\$50.00	\$38.01
2003	\$18.51	\$123.40	\$16.42		\$38.05	\$94.96	\$55.67		\$41.03
2004	\$21.08	\$129.23	\$27.01		\$41.99	\$91.76	\$46.70		\$43.08
2005	\$30.11	\$184.64	\$57.53		\$49.86	\$119.25	\$48.34		\$55.51

Source: Dr. Larry Pedersen, Michigan DNR.

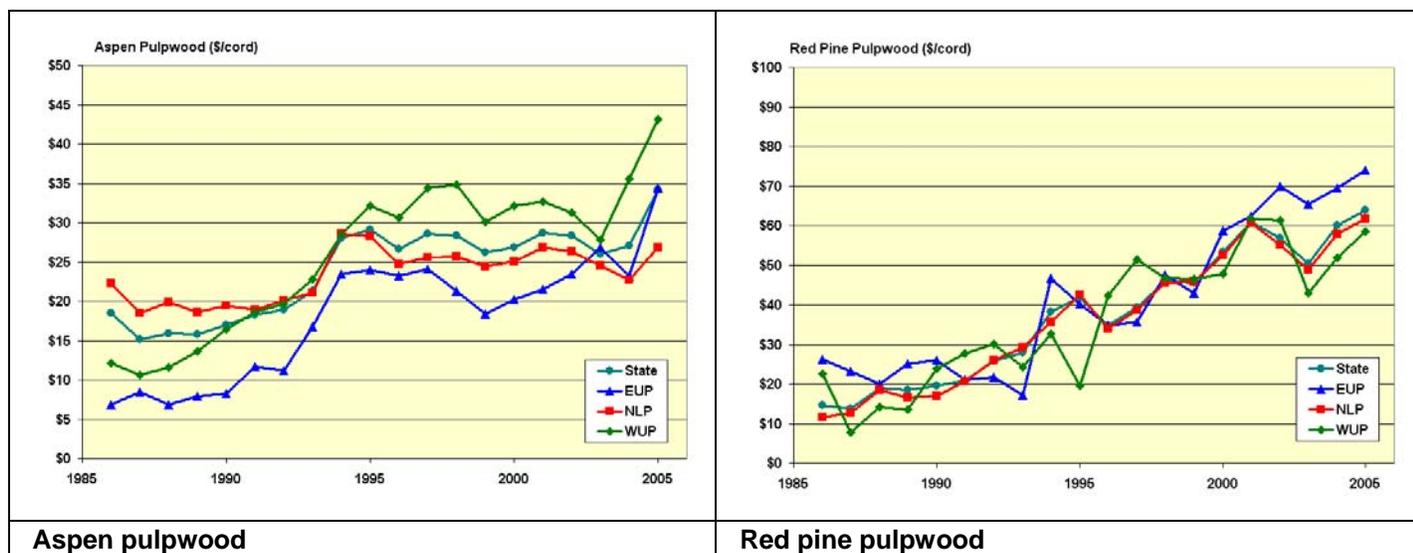
All volumes and prices are shown in cords and \$/cord. The conversion rate is 2.0 cords per thousand board feet (MBF) for sawlog products.

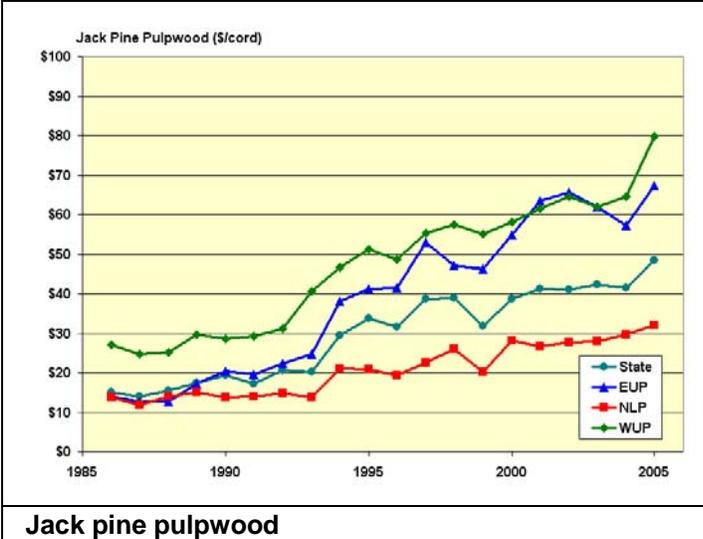
Timber sales from state forest lands in the three ecoregions generated \$30.7 million in 2004 and \$44.8 million in 2005. Sawlogs comprised about 15% of total timber volume sold in 2005, but generated 43% of total timber revenue.

Average timber prices for DNR sales have risen consistently and faster than inflation over time. Average prices for all timber products averaged \$43.08 per cord in 2004 and \$55.51 per cord in 2005. Prices varied greatly, depending on product and species. Pulpwood prices ranged from \$8 to \$55 per cord in 2005. Sawlog prices ranged from \$14 to \$852 per MBF. Jack and red pine generated the highest prices for pulpwood. Sugar maple and red pine generated the highest prices for sawlogs.

Analysis of these timber price series and adjustment for inflation shows that bid prices for most product classes have kept pace with or exceeded inflation. Figures 5.24 and 5.25 show trends in real prices for selected pulpwood and sawlog products by ecoregion. Nominal bid prices were adjusted by the Consumer Price Index for all commodities and are shown in constant 2005 dollars.

Figure 5.24 shows real price trends from 1986 to 2005 for selected pulp products – Aspen, Red pine, and Jack pine. Prices show a significant upward trend for all products and in all regions. Aspen prices show a short period, 1995 to 2003 of relatively constant real prices, but then showed an increase in 2004 and 2005. Annual fluctuations shown in prices are mostly due to local market or sale conditions. Continued price escalation depends on market factors associated with demand for wood as a raw material and aggregate supply. Factors such as mill closures could dampen market prices, especially in the short term.



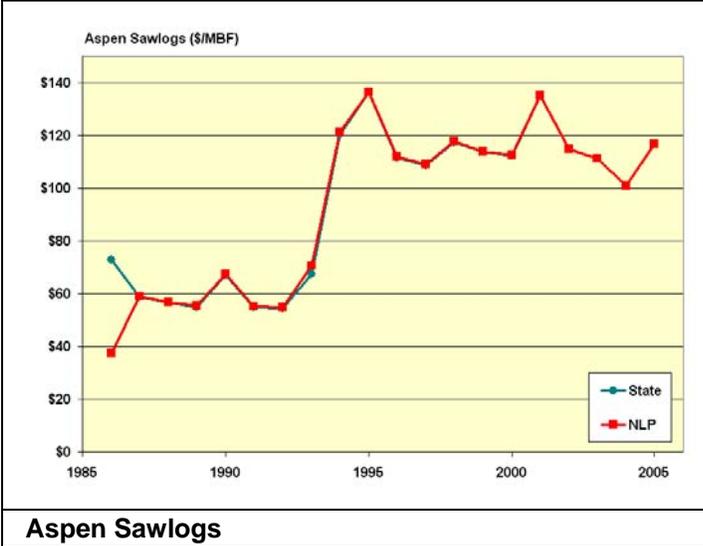


All stumpage prices are adjusted for inflation using the Consumer Price Index and shown in constant 2005 dollars.

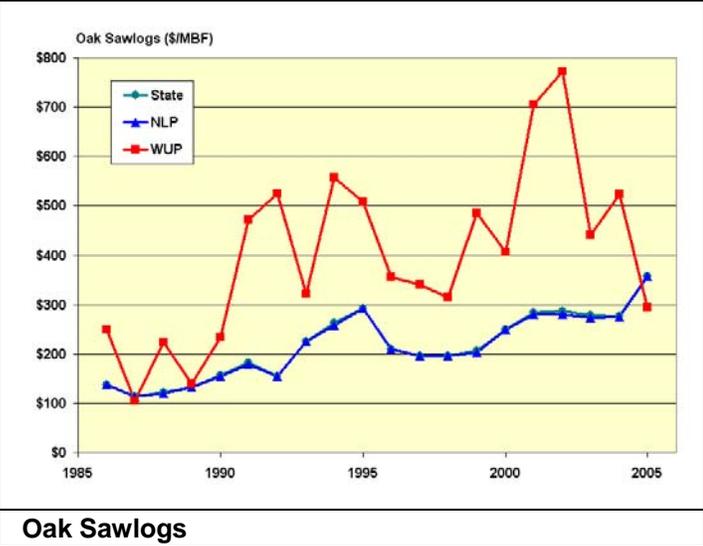
**Jack pine pulpwood**

**Figure 5.24. Real price trends (adjusted for inflation) for selected pulpwood timber products by region, 1986 to 2005.**

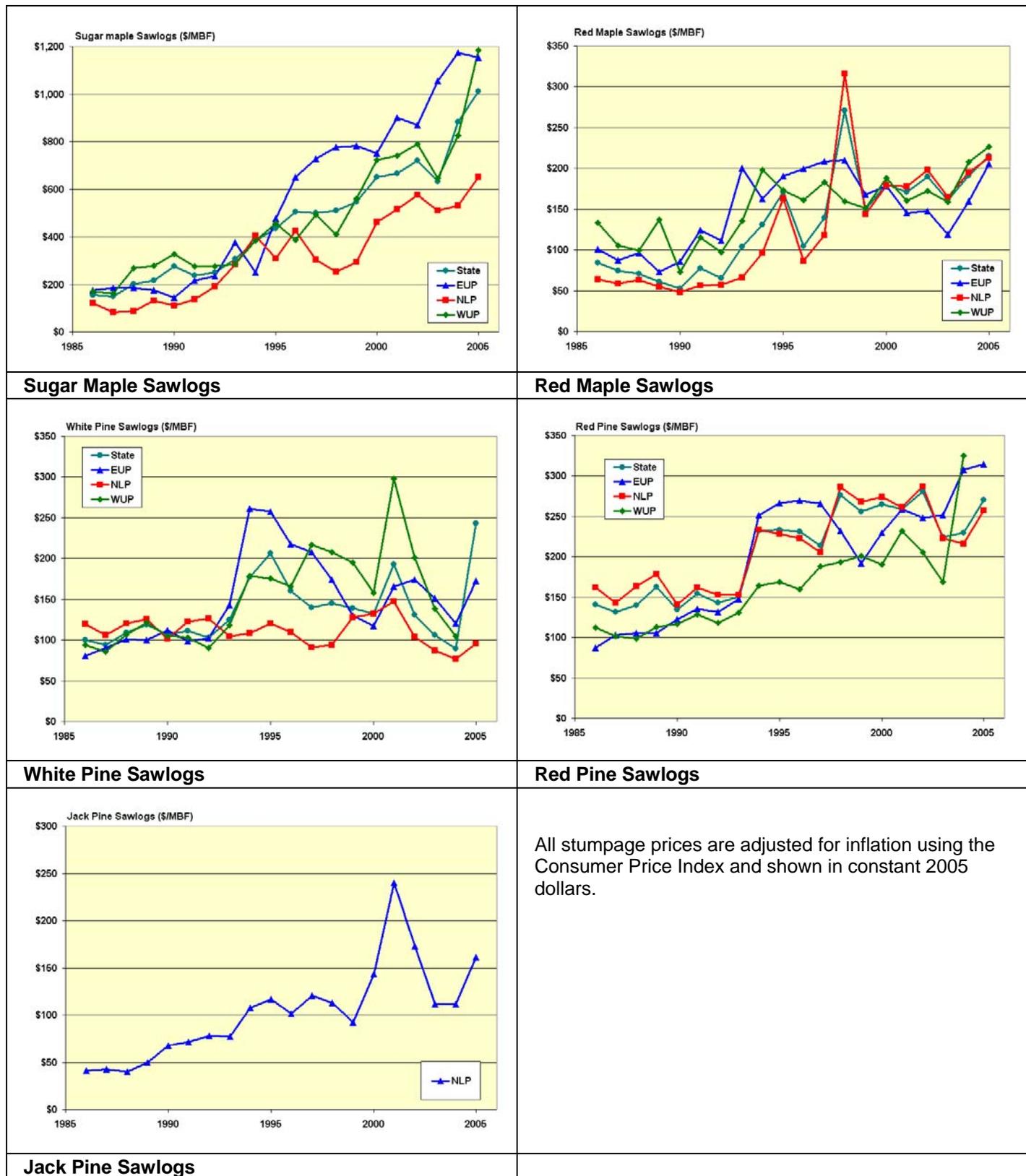
Figure 5.25 shows inflation-adjusted bid prices for sawlogs. These price series show much greater variability than pulpwood prices, but still demonstrate at least constant or upward trend in real prices over the longer term. Sawlog prices are more variable because of timber quality, sale conditions, and general market demand factors.



**Aspen Sawlogs**



**Oak Sawlogs**



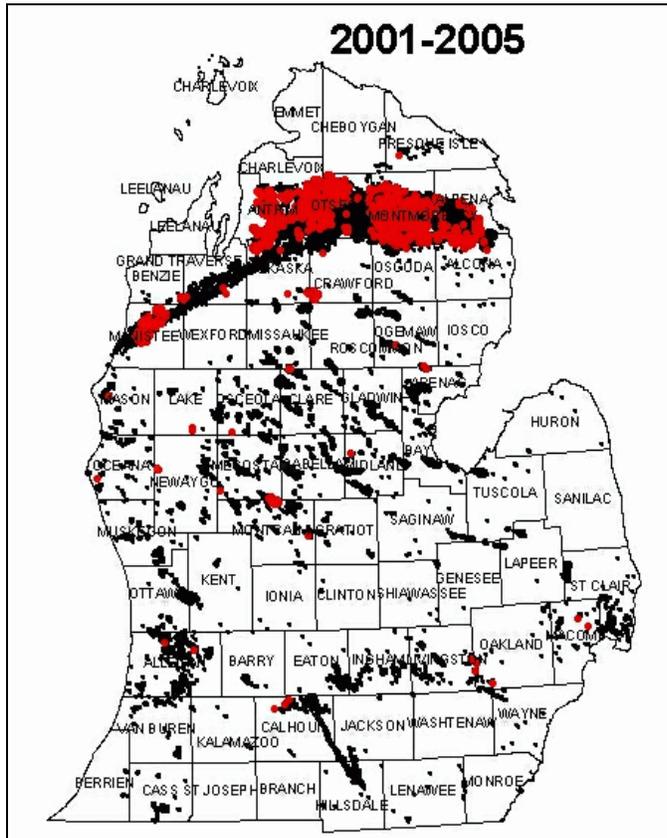
All stumpage prices are adjusted for inflation using the Consumer Price Index and shown in constant 2005 dollars.

Figure 5.25. Real price trends (adjusted for inflation) for selected sawlog timber products by region, 1986 to 2005.

## Mineral, oil and gas extraction

### Oil and Gas

Oil and gas production is a significant land use throughout the Lower Peninsula with most well operations in the Northern Lower Peninsula. There is no oil or gas production in the Upper Peninsula. Most wells are located in major sedimentary rock formations in the Northern Lower Peninsula as shown in Figure 5.26. Red locations on the map indicate new wells drilled in 2000 to 2005 mostly in a band stretching roughly from Manistee to Alpena counties. Black indicates older wells, some of which are no longer in production.



**Figure 5.26. Distribution of oil and gas wells in Michigan.**

The State owns mineral rights, including oil and gas, on over 6 million acres of land (Table 5.15), roughly one-sixth of the total land area of the State. About 25% of the 13,722 oil and gas wells in the State are located on state-owned land in the lower peninsula. About 31% of the oil and gas wells in the Northern Lower Peninsula are on state-owned lands. There is no oil and gas production in the upper peninsula.

Significant well development opportunities exist on these lands but also present potential conflicts with other land uses. A detailed analysis of oil and gas opportunities and issues is beyond the scope of this study. However, given recent escalation of energy prices on world markets, it is reasonable to expect that pressure for increased production from State-owned lands will develop.

**Table 5.15. Area (thousand acres) of State-owned land, by ownership rights and ecoregion**

EcoRegion	Surface only	Mineral and Surface	Minerals only	Mixed Ownership	Other Rights
EUP	97	996	435	25	70
NLP	146	1,860	940	70	19
SLP	63	347	68	29	4
WUP	158	780	804	27	37
State	465	3,983	2,247	150	130

The State produced about 6.9 million barrels of oil a year in 2005, down from 14.2 million barrels in 1990 as shown in Table 5.16. Eighty eight percent of the current oil production (including liquid condensates) is from wells located in the Northern Lower Peninsula ecoregion. For the production history covering the last 16 years, oil production peaked at 14.3 million barrels in 1990 and gas production peaked at 291 billion cubic feet in 1997. Except for a small increase in 1996 and 1997, oil production has generally declined over the past 15 years. Natural gas production (Table 5.17) was 191 billion cubic feet in 2005. Gas production increased from 1990 to 1997 and then steadily declined since then. Data on oil production from 1990 to 2005 in the Northern Lower Peninsula ecoregion by county is available in appendix Table A5.15. Similar data for gas production is available in appendix Table A5.16.

**Table 5.16. Michigan oil production (thousand barrels, including natural gas liquids and condensate) on all lands, by ecoregion, 1990 to 2005.**

Year	NLP	SLP	State
	<b>Thousand barrels</b>		
1990	11,328	2,964	14,292
1991	9,896	3,147	13,043
1992	10,294	2,423	12,718
1993	8,656	2,066	10,722
1994	7,461	1,775	9,236
1995	7,195	1,795	8,991
1996	6,697	1,935	8,631
1997	9,107	2,820	11,926
1998	8,024	2,312	10,336
1999	7,376	1,930	9,306
2000	7,321	1,928	9,249
2001	6,802	2,073	8,875
2002	6,217	2,083	8,300
2003	5,743	1,973	7,716
2004	5,397	1,692	7,089
2005	5,352	1,557	6,909

Source: Mi DEQ database, [http://www.michigan.gov/deq/0,1607,7-135-3311\\_4111\\_4231---,00.html](http://www.michigan.gov/deq/0,1607,7-135-3311_4111_4231---,00.html)

**Table 5.17. Michigan gas production (million cubic feet) on all lands, by ecoregion, 1990 to 2005.**

Year	NLP	SLP	State
	<b>Million Cubic Feet</b>		
1990	143,536	16,387	159,923
1991	159,192	21,952	181,144
1992	179,257	17,632	196,889
1993	183,199	12,721	195,920
1994	182,195	13,316	195,511
1995	203,491	12,428	215,919
1996	221,834	16,363	238,197
1997	272,300	18,762	291,062
1998	272,658	14,470	287,128
1999	262,354	10,819	273,173
2000	247,346	9,797	257,144
2001	234,269	10,550	244,819
2002	220,948	8,590	229,538
2003	202,938	8,676	211,614
2004	194,076	7,409	201,485
2005	184,714	5,953	190,667

Source: Mi DEQ database, [http://www.michigan.gov/deq/0,1607,7-135-3311\\_4111\\_4231---,00.html](http://www.michigan.gov/deq/0,1607,7-135-3311_4111_4231---,00.html)

Estimates of the distribution of wells on State lands (with mineral rights) are shown in Table 5.18. In the Northern Lower Peninsula, almost 31% of the wells (4,529) are estimated to be located on State lands. State-owned lands comprise about 20% of the land area of the NLP ecoregion. County-level data on the distribution of oil and gas wells in 2005 is available in appendix Table 5.17.

**Table 5.18. Distribution of Michigan lands and oil and gas wells by ecoregion, 2005.**

Ecoregion	Ecoregion Land Area	State-owned land area	State Forest Land Area	Wells on non-State Land	Wells on State land	State oil-gas wells	State land area
	Acres			Wells		Percent of Ecoregion Total	
WUP total	6,935,923	960,895	883,338	0	0	0.0%	13.9%
EUP Total	3,572,262	1,116,699	1,066,870	0	0	0.0%	31.3%
NLP Total	10,358,541	2,073,890	1,991,626	10,156	4,529	30.8%	20.0%
SLP Total	15,487,706	429,943	45,533	3,566	58	1.6%	2.8%
State	36,354,432	4,581,427	3,987,367	13,722	4,587	25.1%	12.1%

Source: Oil and gas well database maintained by the Michigan DEQ.

### **Minerals**

Mining is a very important land use in Michigan with mineral occurrences located throughout the state. There are 850 producing mineral occurrences in the State with more than 80% of these being sand and gravel operations.

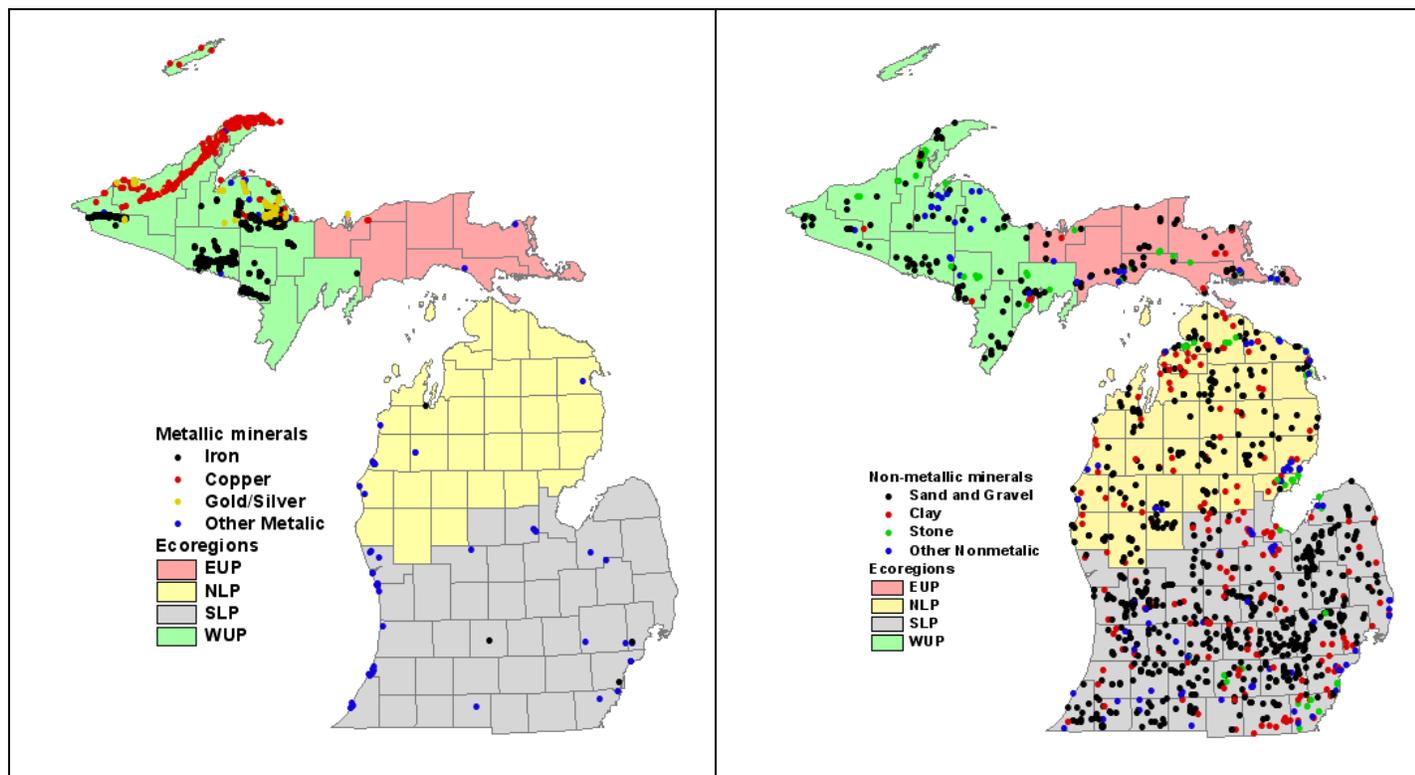
Mining operations for metallic ores, such as iron, copper and other metals are concentrated in the Western UP with numerous undeveloped mineral occurrences. There is current interest in expanding mining for metallic minerals in the Western Upper Peninsula. Many non-metallic operations, especially sand and gravel, are located in the Lower Peninsula. Table 5.19 provides a summary of the number of mineral occurrences by type in each ecoregion. These occurrences may be in any stage of development from a closed mine to a new prospect. Many current and old mines (indicated as Past Producer in Table 5.19 below) affect local environmental conditions or the suitability of nearby land uses. No information is available on specific mining operations located on State-owned lands. Campbell and Robert (2001) provide an overview of the implications of mining on land use in Michigan. Information on the distribution of mineral occurrences by ecoregion and county are shown in appendix Table A5.18. County-level State ownership rights (eg. surface and mineral rights) by ecoregion and county are shown in appendix Table A5.19.

Information on mining operations on DNR lands was limited.

**Table 5.19. Mineral occurrences by commodity group, development status, and ecoregion.**

Development Status	Clay	Stone	Sand And Gravel	Other Non-metallic	Iron	Copper	Gold/Silver	Other Metallic
<b>Eastern Upper Peninsula</b>								
Past Producer	6	6	2	1				
Producer		4	47	7				2
Prospect		2						
<b>Northern Lower Peninsula</b>								
Past Producer	38	14	23	7				2
Producer	1	9	156	14	1			8
Plant		1						1
Prospect	24	1		3				
Unknown			1					
<b>Southern Lower Peninsula</b>								
Past Producer	100	9	102	29		1		14
Producer	6	12	408	25	4			20
Plant			1					2
Prospect	17		2	1				
Unknown			4	1				
<b>Western Upper Peninsula</b>								
Past Producer	4	14	9	14	511	265	13	4
Producer		13	83	4	14	10	2	
Plant					8	2	1	
Occurrence					127	38	24	24
Prospect	1	1		3	662	74	42	3
Unknown			1		1			
<b>State</b>								
Past Producer	148	43	136	51	511	266	13	20
Producer	7	38	694	50	19	10	2	30
Plant		1	1		8	2	1	3
Occurrence					127	38	24	24
Prospect	42	4	2	7	662	74	42	3
Unknown			6	1	1			

Source: U.S. Geological Survey, 2005, Mineral Resources Data System: U.S. Geological Survey, Reston, Virginia. (<http://tin.er.usgs.gov/mrds/>)



**Figure 5.27. Distribution of metallic mineral occurrences in Michigan.**

**Figure 5.28. Distribution of nonmetallic mineral occurrences in Michigan.**

Source: U.S. Geological Survey, 2005, Mineral Resources Data System: U.S. Geological Survey, Reston, Virginia. (<http://tin.er.usgs.gov/mrds/>)

### Water Resources

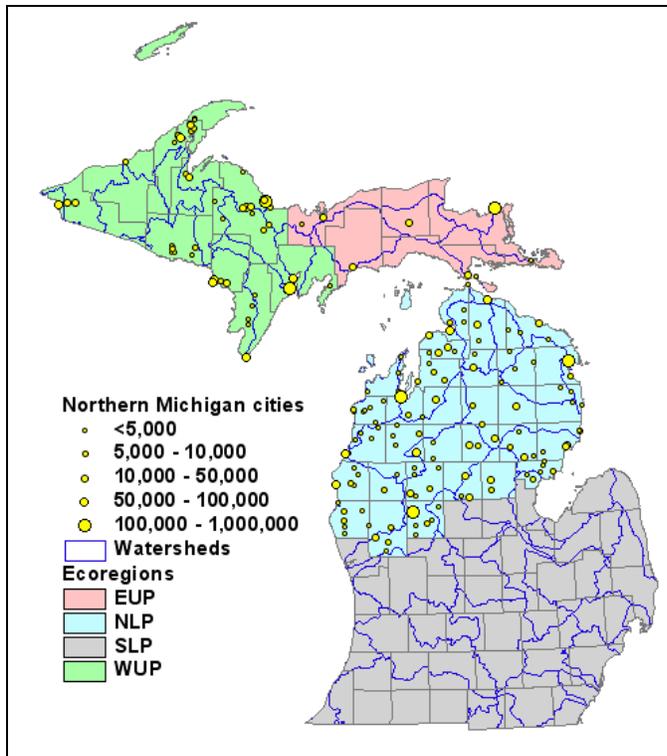
Water resources are an essential part of the Michigan experience with the Great Lakes, natural rivers, and many inland lakes. Water resources serve many needs in Michigan – domestic water supplies, recreation and transportation, and industry.

Each of the three ecoregions in this study contains many primary watersheds and they all touch on one or more of the Great Lakes. Table 5.20 lists watersheds and the proportion of land area drained within each ecoregion. The Western Upper Peninsula has parts or all of 19 watersheds and the five largest watersheds drain almost 49% of the ecoregion. Five out of eight watersheds in the Eastern UP drain 78% of the land area of the ecoregion. The Northern Lower Peninsula has 17 watersheds and the top five watersheds drain 59% of the ecoregion. (Figure 5.29)

**Table 5.20. Distribution of major watersheds and percent land area coverage by ecoregion, 2000.**

Hydrologic Unit Code	Watershed	Percent of Ecoregion	Hydrologic Unit Code	Watershed	Percent of Ecoregion
<b>Western Upper Peninsula</b>			<b>Northern Lower Peninsula</b>		
4020102	Ontonagan	12.10%	4060102	Muskegon	14.20%
4020103	Keweenaw Peninsula	9.80%	4070007	Au Sable	12.00%
4030109	Cedar-Ford	9.00%	4060103	Manistee	11.60%
4030108	Menominee	8.90%	4060101	Pere Marquette-White	11.10%
4020101	Black-Presque Isle	8.70%	4060105	Boardman-Charlevoix	9.80%
4030110	Escanaba	8.40%	4070006	Thunder Bay	7.50%
4020105	Dead-Kelsey	8.30%	4080101	Au Gres-Rifle	6.10%
4030106	Brule	7.90%	4070004	Cheboygan	5.60%
4030107	Michigamme	6.60%	4080201	Tittabawassee	5.40%
4020104	Sturgeon	6.40%	4060104	Betsie-Platte	5.00%
4030111	Tacoosh-Whitefish	4.50%	4070003	Lone Lake-Ocqueoc	4.60%
4030112	Fishdam-Sturgeon	3.90%	4070005	Black	3.70%
4020300	Lake Superior	2.00%	4080202	Pine	1.20%
4020201	Betsy-Chocolay	1.60%	4060200	Lake Michigan	0.90%
4010302	Bad-Montreal	0.90%	4080102	Kawkawlin-Pine	0.80%
7070001	Upper Wisconsin	0.50%	4050006	Lower Grand	0.50%
4060106	Manistique	0.30%	4080300	Lake Huron	<0.1%
7050002	Flambeau	<0.1%			
4060200	Lake Michigan	<0.1%			
<b>Eastern Upper Peninsula</b>					
4060106	Manistique	24.80%			
4020201	Betsy-Chocolay	17.50%			
4020202	Tahquamenon	14.60%			
4070002	Carp-Pine	11.30%			
4060107	Brevoort-Millecoquins	10.00%			
4070001	St. Marys	7.20%			
4020203	Waiska	5.50%			
4080300	Lake Huron	4.30%			
4030112	Fishdam-Sturgeon	2.30%			
4030111	Tacoosh-Whitefish	2.30%			
4020300	Lake Superior	<0.1%			
4060200	Lake Michigan.	<0.1%			

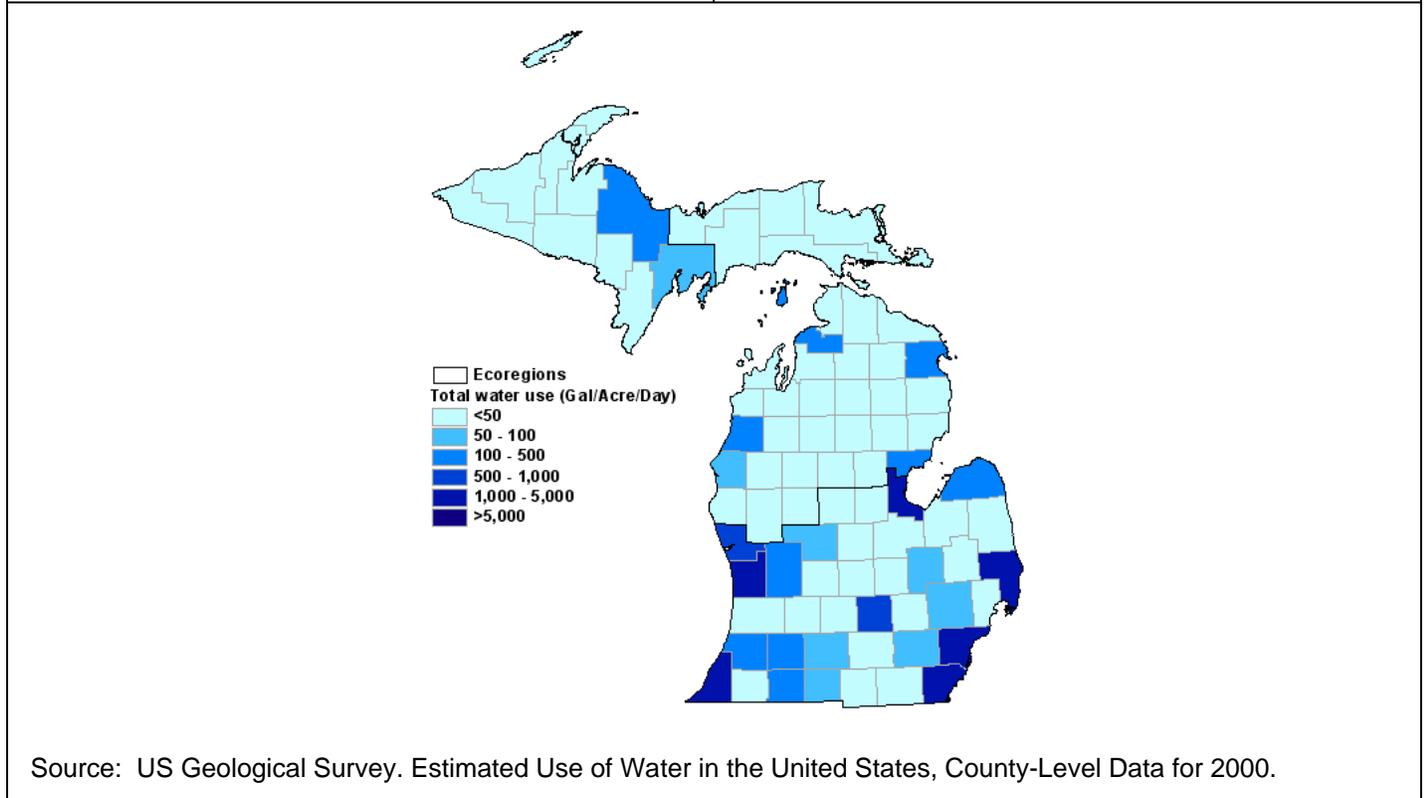
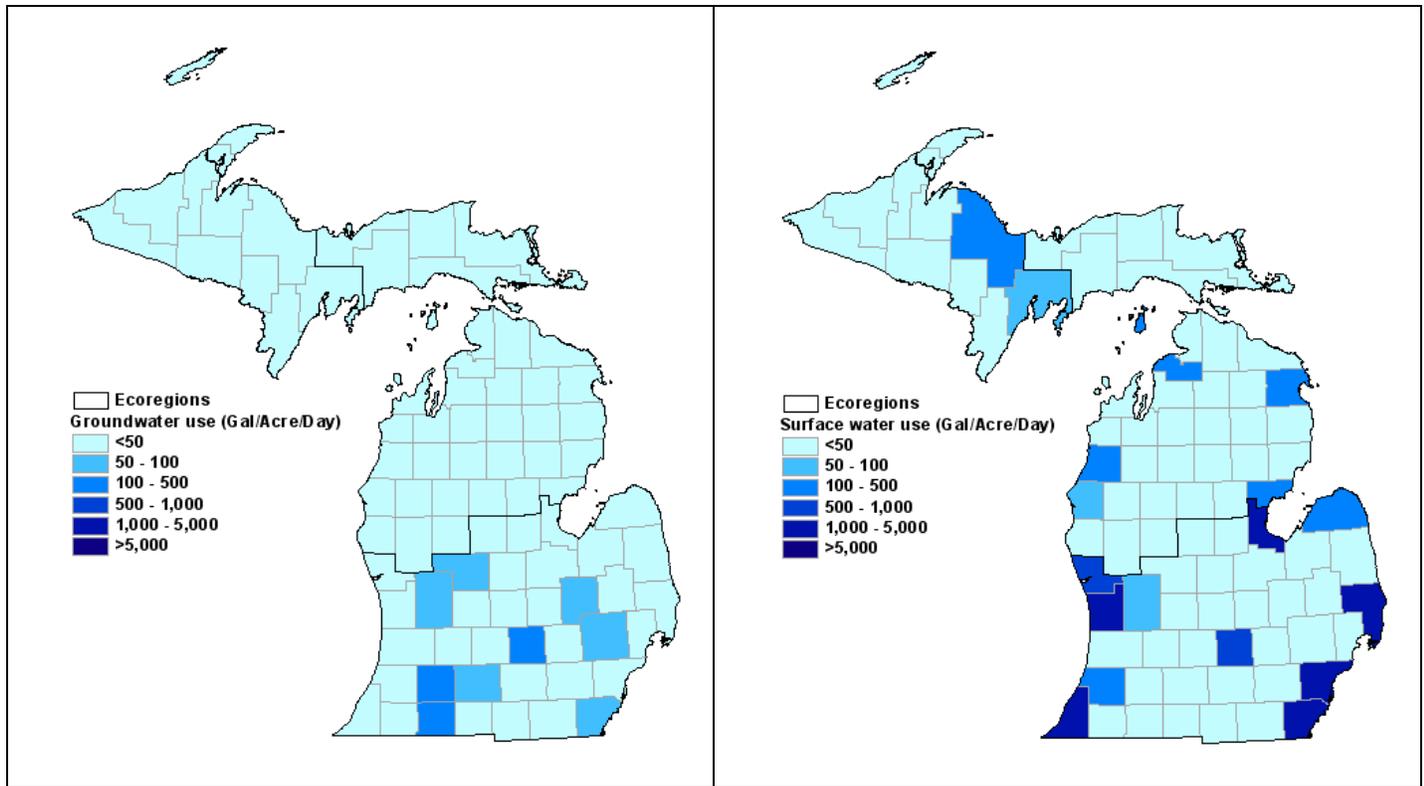
Source: Hydrologic boundaries were intersected with county and ecoregion boundaries to derive watershed coverage. GIS layers are available from the National Atlas (<http://nationalatlas.gov>).



**Figure 5.29. Hydrologic unit (watershed) boundaries in Michigan by ecoregion.**

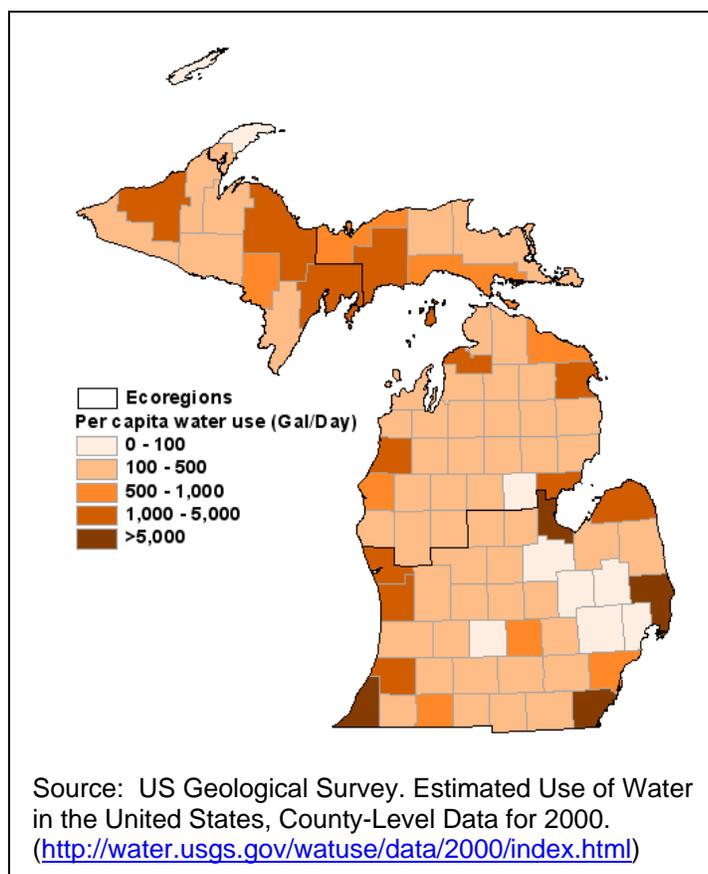
Water use in Michigan is about 1 billion gallons per day. About 93% of the water supply comes from surface waters (particularly the Great Lakes) and about 7% from ground water sources. Water use varies greatly throughout Michigan for both domestic and industrial use according to data maintained by the US Geological Survey. Figure 5.20 displays water consumption at the county level from surface and ground water sources. Per capita water use in the State is 1,006 gallons per day. While this may seem high, it averages all water consumption (domestic, agricultural, and industrial) per resident. Consumption values are much higher in counties with large industrial water users. Consumption rates at the low end, primarily for domestic water use range from about 100 to 150 gallons per person per day. Detailed county-level estimates of water use are available in appendix Table A5.20.

Counties adjacent to Great Lakes tend to have much higher consumption rates for surface waters, mostly to supply water-using industries or thermoelectric power generation. Per capita water consumption (Figure 5.21) is particularly high in locations with relatively low population, but high industrial water use.



Source: US Geological Survey. Estimated Use of Water in the United States, County-Level Data for 2000.

**Figure 5.30. Groundwater, surface water, and total water use by county, 2000.**



**Figure 5.31. Per capita water use in Michigan, by county, 2000.**

Average Michigan withdrawals was 1,006 gallons per day in 2000. This rate includes all water uses divided by the resident population and varies considerably across the state, depending on industrial uses. Per capita consumption is much higher in some counties bordering the Great Lakes, especially those with high water-use industries such as thermoelectric power generation. Water use by ecoregion is shown in Tables 5.21 and 5.22.

Average US per-capita withdrawals for all purposes was 1,432 gallons per day in 2000. Approximately 48% of total withdrawals was for thermoelectric power and 34% was for irrigation. Public water supplies accounted for only 11% of total withdrawals nationally.

Public water supplies are especially important to communities. Seventy two percent of the State's population is served by a public water utility but public water supplies reach a lower proportion of the residents in the three study ecoregions. . In the Western UP, 68% of the population are served by public water supplies. Fifty one percent of the people in the EUP have access to public water supplies and only 33% have public water in the Northern Lower Peninsula where the dispersed population relies primarily on groundwater from domestic wells.

Public land management activities can significantly affect water quality. Road construction and maintenance, silvicultural operations, mining operations, drilling and well operations, and even wildlife management strategies can affect both surface and groundwater resources. Adherence to best management practices and effective operational planning is essential to prevent or mitigate degradation.

**Table 5.21. Public water supply by ecoregion from ground and surface water, 2000.**

Ecoregion	Public Supply With-drawals	Population served by public supply		Public Supply from groundwater		Public Supply from Surface water	
	Million Gal/Day	Thousand persons	Percent	Million Gal/Day	Percent	Million Gal/Day	Percent
WUP	22.3	163	67.5%	15.0	5.6%	7.3	94.4%
EUP	6.4	39	50.8%	2.3	18.1%	4.0	81.9%
NLP	77.9	244	32.5%	29.1	29.2%	48.8	70.8%
SLP	1,036.8	6,720	75.8%	200.6	6.5%	836.1	93.5%
State	1,143.3	7,165	72.1%	247.0	7.3%	896.3	92.7%

Source: US Geological Survey. Estimated Use of Water in the United States, County-Level Data for 2000. (<http://water.usgs.gov/watuse/data/2000/index.html>)

**Table 5.22. Per-capita water use and per-acre withdrawals from ground and surface water, by ecoregion, 2000.**

Ecoregion	Total pop-ulation	Per-capita use	Land area	Total water use	Ground-water with-drawals	Ground-water with-drawals	Surface water with-drawals	Total with-drawals
	Thousand persons	Gal/Day	Thousand Acres	Gal/Acre /Day	Gal/Acre/ Day	Million Gal/Day	Million Gal/Day	Million Gal/Day
WUP	241	1,731	6,936	60.2	3.4	23.5	394.4	417.8
EUP	76	461	3,572	9.8	1.8	6.4	28.8	35.1
NLP	750	513	10,359	37.1	10.8	112.2	272.5	384.7
SLP	8,871	1,033	15,488	591.5	38.2	592.2	8,568.8	9,161.0
State	9,938	1,006	36,354	275.0	20.2	734.3	9,264.3	9,998.6

Source: US Geological Survey. Estimated Use of Water in the United States, County-Level Data for 2000. (<http://water.usgs.gov/watuse/data/2000/index.html>)

### Special forest products

Information on the actual production of special forest products from state forests is limited. We could find no compilations indicating the production or harvesting of products that are typically not marketed. Gathering activities are particularly important and generate recreational activity and tourism spending for some products such as mushrooms found in state forests. Work by Emery (1998, 2001) and Davidson-Hunt, et al.(2001) provides a basis for further investigation of special products.

One related area of special interest is the captive production of deer and related species (cervids) on farms and ranches. These facilities are described below.

#### Captive Cervids

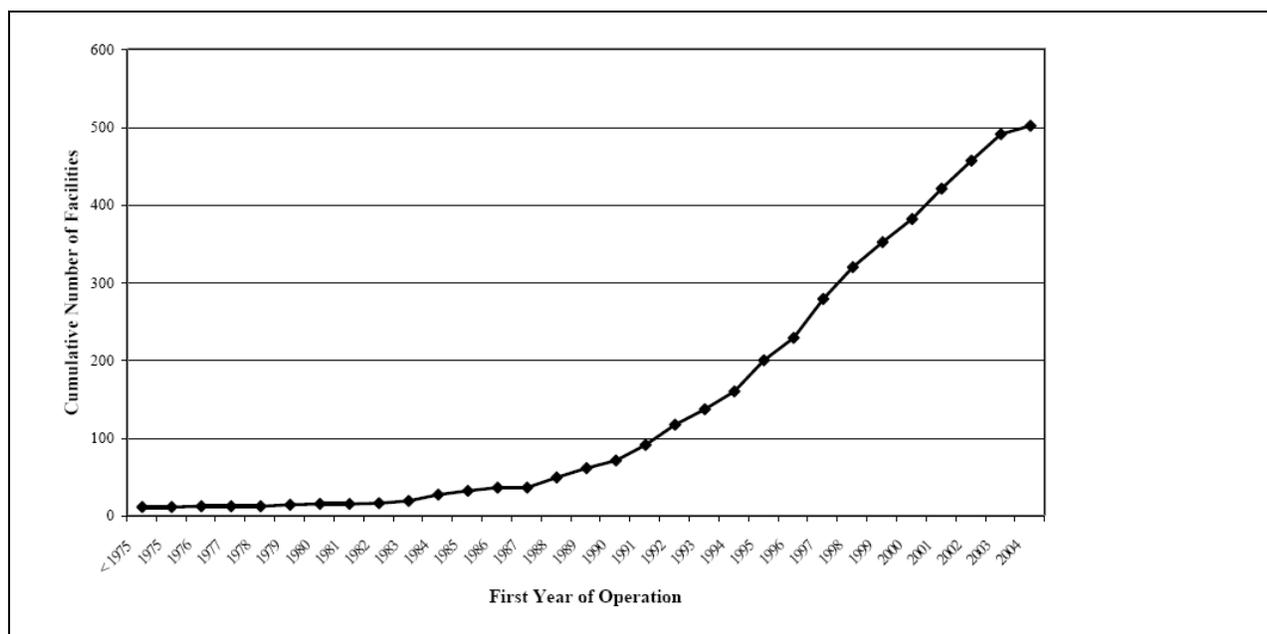
The number of privately-owned captive cervid facilities has increased dramatically from the late 1980's to the present (Figure 5.22). In 2004 there were 740 facilities that raise deer and elk in captivity. According to O'Brien et al. (2005), there were 740 facilities in Michigan (Table 5.23). These facilities, while on private lands, can

significantly affect the healthy of wildlife resources on nearby public lands. Captive cervid facilities are actively inspected by the Michigan Department of Agriculture to assure animal safety and protect wildlife in surrounding areas. There are a range of classes of these facilities, but more than half (399) are full registration operations. Overall, from 83 to 89% of the facilities were active in 2004 (Table 5.23).

**Table 5.23. Number of captive privately-owned cervid facilities in Michigan by type of registration, 2004.**

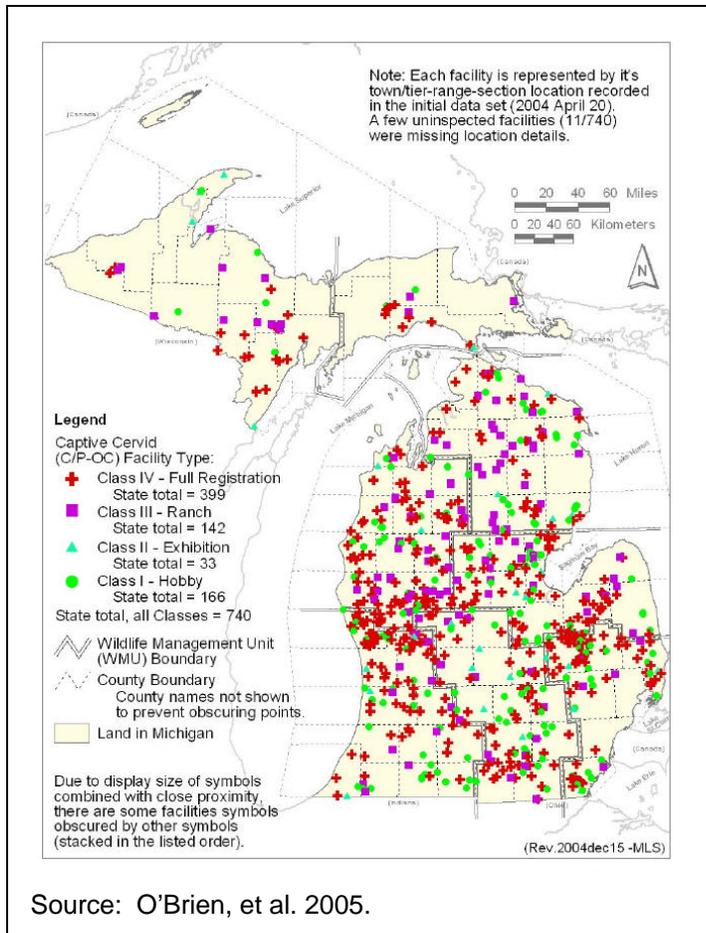
Facility Class	MDA Registration	Percent Inspected	Percent Active
Class I (Hobby)	166	21%	83%
Class II (Exhibition)	33	27%	89%
Class III (Ranch)	142	100%	88%
Full Registration	399	100%	86%
Total	740	79%	87%

Source: O'Brien et al., 2005, p 101)



**Figure 5.32. Number of active captive privately-owned cervid facilities inspected in 2004. (from O'Brien et al., 2005, p 94)**

Most cervid facilities are located in the Lower Peninsula (Figure 5.33) and almost half (361) are located in the Northern Lower Peninsula (Northeastern, Northwestern, and Saginaw Bay Wildlife Management Units). The Upper Peninsula has 52 facilities. A specific breakdown of facility locations in relation to State-owned lands could not be done without further data. Current summaries and mapping show these facilities by administrative Wildlife Management Units (Table 2.24) which do not match ecoregion boundaries considered in this report.



**Figure 5.33 Distribution of captive privately-owned cervid facilities by Michigan DNR Wildlife Management Unit, 2004.**

**Table 5.24. Number of captive privately-owned cervid facilities in Michigan by Wildlife Management Unit, 2004.**

Wildlife Management Unit	MDA Registration	Percent Inspected	Percent Active
Western UP	38	82%	94%
Eastern UP	14	93%	85%
Northeastern	97	78%	87%
Northwestern	145	86%	86%
Saginaw Bay	119	76%	81%
South Central	109	77%	92%
Southeastern	98	76%	91%
Southwestern	120	77%	83%
Total	740	79%	87%

Source: O'Brien, et al. 2005.

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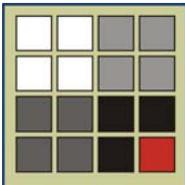
# **Social and Economic Assessment for Michigan's State Forests**

## **APPENDIX**

**Prepared for: Michigan Department of Natural Resources  
Forest, Mineral, and Fire Management Division**

**Lansing, Michigan**

**September 5, 2006**



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## Chapter 5. Natural Resources Production

Table A5.1. Land cover percent by ecoregion and county, 1980 and 2000.

Western Upper Peninsula								
County	Year	Urban or Built-up	Agriculture	Forest	Nonforest wetlands	Open water	Barren	Forest Change
Baraga	1980	0.1%	2.7%	96.2%	0.2%	0.7%	0.0%	
	2000	0.3%	3.7%	94.8%	0.2%	0.7%	0.3%	-1.5%
Delta	1980	1.3%	11.5%	86.6%	0.4%	0.2%	0.0%	
	2000	1.4%	9.3%	88.7%	0.4%	0.2%	0.0%	2.0%
Dickinson	1980	1.3%	3.9%	93.5%	0.2%	0.5%	0.5%	
	2000	1.4%	10.8%	86.5%	0.2%	0.5%	0.5%	-6.9%
Gogebic	1980	0.4%	0.9%	95.9%	0.3%	2.3%	0.1%	
	2000	0.4%	0.8%	96.0%	0.3%	2.3%	0.1%	0.1%
Houghton	1980	0.6%	9.7%	88.3%	0.4%	0.9%	0.1%	
	2000	0.9%	3.4%	94.2%	0.4%	0.9%	0.2%	5.9%
Iron	1980	0.2%	2.3%	95.1%	0.3%	2.0%	0.1%	
	2000	0.3%	3.4%	93.4%	0.8%	2.0%	0.2%	-1.7%
Keweenaw	1980	5.3%	0.0%	92.0%	0.0%	2.7%	0.1%	
	2000	5.5%	1.9%	89.5%	0.0%	2.7%	0.4%	-2.5%
Marquette	1980	1.1%	1.5%	94.7%	0.6%	1.4%	0.7%	
	2000	1.6%	1.0%	94.5%	0.6%	1.4%	0.9%	-0.2%
Menominee	1980	0.6%	16.6%	82.0%	0.5%	0.3%	0.0%	
	2000	0.9%	14.7%	83.6%	0.5%	0.3%	0.0%	1.5%
Ontonagon	1980	1.1%	5.6%	92.2%	0.1%	1.0%	0.0%	
	2000	1.1%	7.0%	90.7%	0.1%	1.0%	0.1%	-1.5%
WUP Total	1980	1.0%	5.5%	91.8%	0.3%	1.2%	0.2%	
	2000	1.2%	5.3%	91.6%	0.4%	1.2%	0.3%	-0.2%
Eastern Upper Peninsula								
County	Year	Urban or Built-up	Agriculture	Forest	Nonforest wetlands	Open water	Barren	Forest Change
Alger	1980	0.0%	6.7%	91.9%	0.3%	0.7%	0.4%	
	2000	0.0%	2.3%	96.2%	0.3%	0.7%	0.4%	4.3%
Chippewa	1980	1.0%	14.0%	81.2%	3.0%	0.7%	0.1%	
	2000	1.2%	16.1%	78.8%	3.0%	0.7%	0.3%	-2.4%
Luce	1980	0.3%	2.3%	87.1%	8.8%	1.6%	0.0%	
	2000	0.4%	0.3%	89.0%	8.8%	1.6%	0.1%	1.8%
Mackinac	1980	0.2%	4.8%	89.9%	1.4%	3.2%	0.6%	
	2000	0.3%	4.5%	90.0%	1.3%	3.2%	0.6%	0.2%
Schoolcraft	1980	0.2%	4.4%	81.2%	11.9%	2.1%	0.2%	
	2000	0.2%	0.8%	85.2%	11.5%	2.1%	0.2%	4.0%
EUP Total	1980	0.4%	7.2%	85.5%	5.1%	1.6%	0.2%	
	2000	0.5%	5.8%	86.8%	5.0%	1.6%	0.3%	1.2%
Northern Lower Peninsula								
County	Year	Urban or Built-up	Agriculture	Forest	Nonforest wetlands	Open water	Barren	Forest Change

Alcona	1980	0.3%	15.8%	79.7%	0.2%	2.4%	1.6%	
	2000	0.5%	16.7%	78.5%	0.2%	2.4%	1.7%	-1.2%
Alpena	1980	2.0%	28.8%	65.6%	0.7%	2.6%	0.3%	
	2000	3.0%	14.8%	78.3%	0.7%	2.6%	0.6%	12.7%
Antrim	1980	1.2%	29.2%	60.1%	0.0%	8.0%	1.4%	
	2000	2.3%	9.0%	79.3%	0.0%	8.0%	1.5%	19.1%
Arenac	1980	0.5%	50.4%	46.3%	2.0%	0.0%	0.8%	
	2000	1.5%	34.1%	60.7%	2.0%	0.0%	1.8%	14.3%
Benzie	1980	0.6%	15.3%	77.2%	0.1%	6.4%	0.4%	
	2000	0.6%	15.1%	77.4%	0.1%	6.4%	0.4%	0.2%
Charlevoix	1980	1.3%	33.2%	58.2%	0.0%	7.0%	0.3%	
	2000	2.2%	11.6%	78.8%	0.0%	7.0%	0.4%	20.6%
Cheboygan	1980	0.7%	16.1%	73.3%	0.3%	9.3%	0.2%	
	2000	2.2%	14.0%	73.3%	0.4%	9.3%	0.7%	0.0%
Clare	1980	1.7%	24.3%	71.1%	1.2%	0.2%	1.5%	
	2000	1.7%	28.6%	66.7%	1.2%	0.2%	1.6%	-4.3%
Crawford	1980	1.6%	3.0%	93.6%	0.7%	0.5%	0.5%	
	2000	1.6%	0.8%	95.2%	1.2%	0.5%	0.7%	1.6%
Emmet	1980	2.0%	27.8%	66.4%	0.0%	3.3%	0.5%	
	2000	3.1%	19.8%	72.8%	0.5%	3.3%	0.5%	6.4%
Gladwin	1980	1.0%	31.6%	64.9%	1.0%	0.6%	0.9%	
	2000	1.0%	29.1%	67.0%	1.3%	0.6%	0.9%	2.1%
Grand Traverse	1980	3.6%	28.5%	63.5%	0.1%	4.1%	0.2%	
	2000	3.7%	23.0%	68.9%	0.1%	4.1%	0.2%	5.4%
Iosco	1980	2.3%	18.7%	75.2%	0.8%	1.9%	1.1%	
	2000	2.7%	22.8%	70.7%	0.8%	1.9%	1.1%	-4.5%
Kalkaska	1980	0.5%	13.7%	84.6%	0.4%	0.8%	0.0%	
	2000	0.5%	6.0%	92.1%	0.5%	0.8%	0.1%	7.5%
Lake	1980	0.3%	9.4%	89.2%	0.0%	0.3%	0.8%	
	2000	0.3%	24.7%	73.9%	0.0%	0.3%	0.8%	-15.3%
Leelanau	1980	1.5%	28.4%	62.2%	0.3%	6.5%	1.2%	
	2000	2.4%	17.9%	71.7%	0.4%	6.5%	1.2%	9.5%
Manistee	1980	1.2%	21.3%	75.8%	0.3%	1.3%	0.0%	
	2000	1.2%	23.9%	73.3%	0.3%	1.3%	0.0%	-2.6%
Mason	1980	1.4%	35.3%	60.1%	0.2%	1.8%	1.1%	
	2000	1.4%	35.4%	60.0%	0.2%	1.8%	1.1%	-0.1%
Mecosta	1980	0.9%	61.0%	35.9%	0.3%	0.9%	0.9%	
	2000	1.9%	43.2%	52.5%	0.3%	0.9%	1.1%	16.6%
Missaukee	1980	0.3%	30.7%	65.1%	2.9%	0.9%	0.0%	
	2000	0.6%	9.8%	85.4%	3.3%	0.9%	0.0%	20.2%
Montmorency	1980	0.7%	8.1%	88.2%	0.0%	1.8%	1.2%	
	2000	0.8%	1.3%	94.1%	0.2%	1.8%	1.9%	5.9%
Newaygo	1980	0.6%	36.8%	61.1%	0.0%	1.3%	0.2%	
	2000	0.8%	31.4%	66.3%	0.0%	1.3%	0.2%	5.2%
Oceana	1980	1.0%	43.3%	54.2%	0.2%	0.6%	0.6%	
	2000	1.0%	48.8%	48.8%	0.2%	0.6%	0.6%	-5.4%

Ogemaw	1980	1.3%	27.6%	69.5%	0.5%	0.9%	0.2%	
	2000	1.3%	23.2%	73.9%	0.5%	0.9%	0.3%	4.4%
Osceola	1980	0.8%	49.3%	48.2%	0.1%	0.2%	1.4%	
	2000	0.7%	48.4%	49.1%	0.1%	0.2%	1.4%	0.9%
Oscoda	1980	0.5%	5.9%	90.2%	0.3%	0.2%	2.8%	
	2000	0.5%	5.9%	89.4%	0.3%	0.2%	3.7%	-0.9%
Otsego	1980	1.4%	14.4%	81.3%	0.1%	0.8%	2.0%	
	2000	1.4%	11.8%	82.6%	0.4%	0.8%	3.0%	1.3%
Presque Isle Isle	1980	0.8%	25.5%	67.2%	1.8%	3.1%	1.7%	
	2000	2.8%	9.2%	80.8%	1.8%	3.1%	2.4%	13.6%
Roscommon	1980	2.1%	2.6%	78.8%	6.4%	9.4%	0.7%	
	2000	2.3%	5.9%	75.2%	6.5%	9.4%	0.7%	-3.6%
Wexford	1980	1.3%	18.1%	78.7%	0.1%	1.7%	0.1%	
	2000	1.4%	15.6%	81.0%	0.1%	1.7%	0.1%	2.3%
NLP Total	1980	1.2%	24.8%	69.9%	0.7%	2.6%	0.8%	
	2000	1.6%	20.0%	74.1%	0.8%	2.6%	1.0%	4.1%
<b>State</b>								
<b>County</b>	<b>Year</b>	<b>Urban or Built-up</b>	<b>Agri- culture</b>	<b>Forest</b>	<b>Nonforest wetlands</b>	<b>Open water</b>	<b>Barren</b>	<b>Forest Change</b>
State Total	1980	3.5%	42.2%	51.5%	1.0%	1.4%	0.4%	
	2000	4.6%	38.9%	53.7%	1.0%	1.4%	0.5%	2.1%

**Table A5.2. Forest area (thousand acres) by land class for all owner groups, by ecoregion and county, 1980, 1993, and 2004.**

County	Year	Total Land	Timber-land	Reserved Timber-land	Other Forest Land	Non-forest Land	Total Forest	Percent Forest
<b>Western Upper Peninsula</b>								
Baraga	1980	606	513	29	5	58	548	90.4%
	1993	579	487	19	2	70	508	87.8%
	2004	592	520	10	5	56	535	90.5%
Delta	1980	715	575	0	10	131	584	81.7%
	1993	749	596	2	5	147	602	80.4%
	2004	746	592	0	8	146	600	80.4%
Dickinson	1980	455	375	2	2	77	378	83.1%
	1993	491	398	0	0	92	398	81.2%
	2004	473	407	0	0	66	407	86.0%
Gogebic	1980	712	620	36	0	56	656	92.1%
	1993	705	608	27	0	70	635	90.1%
	2004	720	616	34	6	64	656	91.1%
Houghton	1980	634	514	10	7	104	530	83.7%
	1993	648	529	10	2	107	540	83.5%
	2004	655	516	17	0	123	533	81.3%
Iron	1980	741	656	0	5	80	661	89.2%
	1993	747	658	0	4	84	662	88.7%
	2004	752	659	0	9	85	667	88.7%
Keweenaw	1980	353	207	126	0	19	333	94.5%
	1993	346	199	112	1	34	312	90.1%
	2004	350	199	110	16	25	324	92.8%
Marquette	1980	1,140	977	20	24	120	1,020	89.5%
	1993	1,166	1,005	14	8	138	1,027	88.1%
	2004	1,154	993	15	19	127	1,027	89.0%
Menominee	1980	637	495	1	2	139	498	78.1%
	1993	668	523	1	0	143	525	78.5%
	2004	639	514	0	2	123	516	80.8%
Ontonagon	1980	813	675	47	0	91	722	88.8%
	1993	839	706	47	0	87	753	89.6%
	2004	837	670	55	16	96	741	88.5%
Western Upper Peninsula Total	1980	6,806	5,606	271	54	875	5,930	87.1%
	1993	6,937	5,708	232	23	973	5,963	86.0%
	2004	6,917	5,686	240	80	911	6,006	86.8%
<b>County</b>	<b>Year</b>	<b>Total Land</b>	<b>Timber-land</b>	<b>Reserved Timber-land</b>	<b>Other Forest Land</b>	<b>Non-forest Land</b>	<b>Total Forest</b>	<b>Percent Forest</b>
<b>Eastern Upper Peninsula</b>								
Alger	1980	589	492	41	3	53	536	91.0%
	1993	588	471	54	7	56	532	90.5%

County	Year	Total Land	Timber-land	Reserved Timber-land	Other Forest Land	Non-forest Land	Total Forest	Percent Forest
<b>Western Upper Peninsula</b>								
	2004	593	524	7	7	56	537	90.5%
Chippewa	1980	965	706	30	18	212	753	78.1%
	1993	999	708	27	14	250	749	75.0%
	2004	1,035	784	2	20	229	806	77.9%
Luce	1980	586	468	11	17	90	496	84.7%
	1993	578	463	3	6	105	473	81.8%
	2004	559	477	5	12	65	494	88.4%
Mackinac	1980	647	524	22	8	92	555	85.8%
	1993	654	522	26	7	98	555	84.9%
	2004	676	560	9	14	93	583	86.2%
Schoolcraft	1980	739	543	39	11	146	593	80.3%
	1993	754	525	8	7	214	541	71.7%
	2004	751	559	6	12	174	577	76.8%
Eastern Upper Peninsula Total	1980	3,526	2,734	144	57	592	2,935	83.2%
	1993	3,572	2,690	118	41	723	2,849	79.8%
	2004	3,613	2,903	29	65	617	2,996	82.9%
<b>County</b>	<b>Year</b>	<b>Total Land</b>	<b>Timber-land</b>	<b>Reserved Timber-land</b>	<b>Other Forest Land</b>	<b>Non-forest Land</b>	<b>Total Forest</b>	<b>Percent Forest</b>
<b>Northern Lower Peninsula</b>								
Alcona	1980	425	306	2	10	107	319	74.9%
	1993	432	322	9	2	99	333	77.1%
	2004	405	317	0	3	84	320	79.2%
Alcona	1980	352	218	2	3	130	223	63.2%
	1993	368	233	3	0	131	236	64.3%
	2004	388	261	0	4	123	265	68.3%
Antrim	1980	309	157	3	0	149	160	51.8%
	1993	305	190	0	0	116	190	62.2%
	2004	310	183	0	0	127	183	59.1%
Arenac	1980	227	93	0	2	133	94	41.6%
	1993	235	121	0	0	114	121	51.6%
	2004	230	103	0	2	124	105	45.9%
Benzie	1980	200	119	12	0	70	131	65.1%
	1993	206	137	10	0	59	147	71.3%
	2004	206	133	6	0	68	139	67.2%
Charlevoix	1980	265	139	1	0	126	139	52.6%
	1993	267	170	2	0	95	172	64.5%
	2004	273	174	0	0	100	174	63.6%
Cheboygan	1980	495	367	1	15	112	383	77.4%
	1993	458	340	10	1	108	350	76.5%
	2004	473	363	0	6	105	369	77.9%
Clare	1980	359	216	0	4	139	220	61.2%

County	Year	Total Land	Timberland	Reserved Timberland	Other Forest Land	Non-forest Land	Total Forest	Percent Forest
<b>Western Upper Peninsula</b>								
	1993	363	246	0	0	117	246	67.7%
	2004	333	191	0	0	142	191	57.4%
Crawford	1980	355	273	32	0	51	304	85.7%
	1993	357	290	18	0	49	308	86.3%
	2004	356	291	0	11	54	302	84.9%
Emmet	1980	314	195	7	0	112	202	64.4%
	1993	300	198	8	2	91	208	69.5%
	2004	315	216	2	0	97	218	69.1%
Gladwin	1980	322	193	0	0	129	193	59.9%
	1993	324	187	0	0	138	187	57.6%
	2004	309	192	2	0	114	194	63.0%
Grand Traverse	1980	308	154	4	0	150	159	51.5%
	1993	298	171	3	2	122	176	59.1%
	2004	312	167	1	6	138	175	55.9%
Iosco	1980	349	225	0	3	121	228	65.4%
	1993	352	243	0	2	107	244	69.5%
	2004	353	251	0	6	96	257	72.7%
Kalkaska	1980	359	253	27	2	76	282	78.7%
	1993	359	267	4	0	88	271	75.5%
	2004	371	287	0	8	77	295	79.4%
Lake	1980	365	300	0	0	65	300	82.2%
	1993	363	315	0	0	48	315	86.8%
	2004	377	306	0	0	72	306	81.0%
Leelanau	1980	187	76	18	0	93	94	50.3%
	1993	223	88	39	0	96	127	56.9%
	2004	245	114	25	0	105	140	57.2%
Manistee	1980	335	225	0	0	109	226	67.4%
	1993	348	249	4	0	95	253	72.8%
	2004	349	242	0	2	105	244	69.8%
Mason	1980	301	148	8	0	146	156	51.7%
	1993	317	157	13	3	144	173	54.5%
	2004	331	173	4	2	153	178	53.9%
Mecosta	1980	350	120	0	2	227	123	35.1%
	1993	356	163	0	0	192	163	45.9%
	2004	315	128	0	2	185	130	41.2%
Missaukee	1980	375	204	10	2	158	217	57.9%
	1993	363	229	7	2	125	238	65.6%
	2004	372	226	0	3	143	229	61.5%
Montmorency	1980	364	302	0	0	62	302	83.0%
	1993	351	294	0	0	57	294	83.8%
	2004	361	290	0	8	63	298	82.6%

County	Year	Total Land	Timberland	Reserved Timberland	Other Forest Land	Non-forest Land	Total Forest	Percent Forest
<b>Western Upper Peninsula</b>								
Newaygo	1980	535	310	4	3	219	316	59.1%
	1993	539	330	1	0	208	332	61.5%
	2004	534	317	0	0	217	317	59.3%
Oceana	1980	329	148	12	4	165	164	49.9%
	1993	346	182	5	0	159	187	54.0%
	2004	354	175	0	4	174	179	50.6%
Ogemaw	1980	373	220	6	9	137	235	63.1%
	1993	361	229	1	0	132	229	63.4%
	2004	367	222	2	0	143	224	61.0%
Osceola	1980	370	157	3	0	210	160	43.3%
	1993	362	186	0	0	177	186	51.2%
	2004	346	163	0	0	183	163	47.1%
Oscoda	1980	367	307	0	2	57	310	84.4%
	1993	362	308	9	0	44	317	87.7%
	2004	369	296	2	18	54	315	85.4%
Otsego	1980	343	261	2	0	80	263	76.8%
	1993	329	240	0	0	90	240	72.8%
	2004	330	250	0	2	79	251	76.0%
Presque Isle	1980	412	267	3	8	135	278	67.3%
	1993	422	299	2	11	111	311	73.7%
	2004	426	314	0	5	108	318	74.7%
Roscommon	1980	336	247	0	6	83	253	75.3%
	1993	334	255	2	2	76	258	77.3%
	2004	334	266	0	6	63	272	81.3%
Wexford	1980	380	250	22	0	108	272	71.6%
	1993	362	259	22	0	80	282	77.8%
	2004	356	260	0	2	95	261	73.3%
Northern Lower Peninsula Total	1980	10,361	6,449	180	77	3,656	6,706	64.7%
	1993	10,360	6,896	170	27	3,267	7,093	68.5%
	2004	10,402	6,870	44	98	3,390	7,012	67.4%

County	Year	Total Land	Timberland	Reserved Timberland	Other Forest Land	Non-forest Land	Total Forest	Percent Forest
<b>State</b>								
State	1980	36,126	17,493	682	194	17,757	18,369	50.8%
	1993	36,358	18,616	575	90	17,077	19,281	53.0%
	2004	36,408	18,746	321	245	17,096	19,312	53.0%

Data Source: 1980 and 1993 data are derived from the Eastwide Forest Inventory datasets. 2004 data are derived from the 2004 FIA Snapshot dataset (<http://www.ncrs2.fs.fed.us/FIADatamart/fiadatamart.aspx>) which includes plots taken in 2000 to 2004.

**Table A5.3. Merchantable timber volume and growth on timberland, all owners, by ecoregion and county, 2004.**

Ecoregion/ County	State Timberland	Merch. volume, growing stock trees	Merch. volume, all live trees	Net annual growth, growing stock trees	Volume per acre, growing stock trees
	Thousand Acres	Million cubic feet			Cubic feet
<b>Western Upper Peninsula</b>					
Baraga	69.3	104.7	110.4	2.7	1,510
Delta	63.4	66.8	70.3	3.4	1,053
Dickinson	193.9	254.2	261.9	12.3	1,311
Houghton	46.4	105.3	107.1	0.5	2,272
Iron	83.0	105.2	108.9	6.7	1,266
Keweenaw	2.0	2.2	2.2	0.0	1,118
Marquette	249.5	350.2	367.1	9.5	1,404
Menominee	93.9	137.3	142.1	4.9	1,462
Ontonagon	21.6	42.3	44.4	0.0	1,956
WUP Total	823.1	1,168.2	1,214.4	40.0	1,419
<b>Eastern Upper Peninsula</b>					
Alger	109.1	174.3	183.8	4.6	1,599
Chippewa	218.8	292.8	312.9	4.1	1,338
Luce	246.8	338.3	358.1	13.2	1,371
Mackinac	198.5	254.1	270.4	10.4	1,280
Schoolcraft	204.3	190.7	204.7	3.3	933
EUP total	977.5	1,250.2	1,329.8	35.6	1,279
<b>Northern Lower Peninsula</b>					
Alcona	3.0	5.2	6.8	0.1	1,745
Alpena	42.9	47.2	57.4	0.3	1,100
Antrim	39.8	64.2	72.6	1.7	1,615
Arenac	22.7	23.5	24.3	0.8	1,033
Benzie	65.2	85.1	90.7	1.4	1,304
Charlevoix	52.9	94.8	101.8	3.2	1,792
Cheboygan	162.0	199.1	213.8	10.7	1,229
Clare	45.4	52.2	53.6	4.3	1,152
Crawford	161.5	139.5	151.4	4.1	864
Emmet	72.6	126.8	134.2	0.3	1,747
Gladwin	79.2	50.7	54.9	2.4	640
Grand Traverse	60.7	72.9	78.8	3.7	1,201
Iosco	20.1	23.3	25.8	0.3	1,162
Kalkaska	159.0	194.3	205.5	6.1	1,222
Lake	56.5	66.7	67.6	1.4	1,180
Leelanau	9.9	16.4	17.0	0.0	1,658
Manistee	19.8	41.6	44.0	1.6	2,106
Mason	8.3	14.9	16.2	0.0	1,793

Mecosta	13.2	26.8	27.3	0.3	2,038
Missaukee	99.0	125.9	133.7	3.8	1,273
Montmorency	131.0	175.5	186.1	4.5	1,340
Newaygo	6.1	9.9	10.0	1.1	1,629
Oceana	6.1	5.5	6.6	0.0	898
Ogemaw	72.8	46.6	50.2	4.7	640
Osceola	21.7	33.4	34.3	1.5	1,541
Oscoda	54.4	44.0	46.4	1.5	809
Otsego	84.1	101.7	108.9	3.0	1,210
Presque Isle	87.8	93.9	101.1	-0.5	1,069
Roscommon	176.0	153.1	171.3	-3.5	870
Wexford	53.5	75.5	81.1	2.5	1,413
NLP Total	1,886.7	2,210.1	2,373.1	61.2	1,171
SLP Total	339.4	512.0	560.1	26.7	1,508
State	4,026.7	5,140.5	5,477.5	163.5	1,277

Data Source: FIA Snapshot inventory, 2000-2004

**Table A5.4. Forest area (thousand acres) by land class for State ownership, by ecoregion and county, 1980, 1993, and 2004.**

County	Year	Timberland	Reserved Timberland	Other Forest Land	Total Forest Land
<b>Western Upper Peninsula</b>					
Baraga	1980	66	7	1	74
	1993	58	8	1	67
	2004	69	0	0	69
Delta	1980	63	0	2	66
	1993	62	2	1	65
	2004	63	0	2	66
Dickinson	1980	183	2	0	185
	1993	196	0	0	196
	2004	194	0	0	194
Gogebic	1980	0	10	0	10
	1993	3	11	0	14
	2004	0	17	0	17
Houghton	1980	44	0	0	44
	1993	40	0	0	40
	2004	46	0	0	46
Iron	1980	90	0	0	90
	1993	74	0	2	76
	2004	83	0	0	83
Keweenaw	1980	3	0	0	3
	1993	1	0	0	1
	2004	2	0	0	2
Marquette	1980	218	3	9	230
	1993	225	1	4	230
	2004	249	0	2	252
Menominee	1980	79	0	0	80
	1993	73	0	0	73
	2004	94	0	0	94
Ontonagon	1980	16	47	0	64
	1993	20	47	0	67
	2004	22	53	0	75
Western Upper Peninsula Total	1980	763	69	12	844
	1993	751	69	8	828
	2004	823	70	5	898

Data Source: 1980 and 1993 data are derived from the Eastwide Forest Inventory datasets. 2004 data are derived from the 2004 FIA Snapshot dataset (<http://www.ncrs2.fs.fed.us/FIADatamart/fiadatamart.aspx>) which includes plots taken in 2000 to 2004.

County	Year	Timberland	Reserved Timberland	Other Forest Land	Total Forest Land
<b>Eastern Upper Peninsula</b>					
Alger	1980	91	1	2	93
	1993	81	2	0	84
	2004	109	0	0	109
Chippewa	1980	169	24	8	201
	1993	156	16	7	179
	2004	219	0	1	220
Luce	1980	209	11	17	238
	1993	215	3	4	222
	2004	247	3	4	254
Mackinac	1980	167	21	5	193
	1993	165	7	4	175
	2004	199	0	9	208
Schoolcraft	1980	198	0	2	199
	1993	185	0	5	190
	2004	204	0	3	207
Eastern Upper Peninsula Total	1980	834	56	34	924
	1993	803	28	19	849
	2004	978	3	17	998

County	Year	Timberland	Reserved Timberland	Other Forest Land	Total Forest Land
<b>Northern Lower Peninsula</b>					
Alcona	1980	2	0	0	2
	1993	2	0	0	2
	2004	3	0	1	4
Alcona Peninsulaena	1980	27	0	0	27
	1993	37	3	0	40
	2004	43	0	0	43
Antrim	1980	40	0	0	40
	1993	51	0	0	51
	2004	40	0	0	40
Arenac	1980	25	0	2	27
	1993	34	0	0	34
	2004	23	0	2	25
Benzie	1980	57	0	0	57
	1993	67	0	0	67
	2004	65	0	0	65
Charlevoix	1980	48	0	0	48
	1993	62	2	0	64
	2004	53	0	0	53
Cheboygan	1980	186	0	4	191
	1993	168	2	0	171
	2004	162	0	6	168
Clare	1980	53	0	0	53
	1993	53	0	0	53
	2004	45	0	0	45
Crawford	1980	127	0	0	127
	1993	152	16	0	168
	2004	161	0	5	167
Emmet	1980	78	0	0	78
	1993	75	8	2	86
	2004	73	2	0	75
Gladwin	1980	73	0	0	73
	1993	75	0	0	75
	2004	79	2	0	81
Grand Traverse	1980	69	0	0	69
	1993	71	0	2	73
	2004	61	0	2	63
Iosco	1980	16	0	0	16
	1993	15	0	0	15
	2004	20	0	2	22
Kalkaska	1980	144	0	2	147

County	Year	Timberland	Reserved Timberland	Other Forest Land	Total Forest Land
<b>Northern Lower Peninsula</b>					
	1993	144	0	0	144
	2004	159	0	6	165
Lake	1980	57	0	0	57
	1993	64	0	0	64
	2004	57	0	0	57
Leelanau	1980	5	3	0	7
	1993	6	2	0	8
	2004	10	0	0	10
Manistee	1980	15	0	0	15
	1993	15	0	0	15
	2004	20	0	0	20
Mason	1980	5	0	0	5
	1993	7	1	0	8
	2004	8	2	0	10
Mecosta	1980	22	0	0	22
	1993	21	0	0	21
	2004	13	0	2	15
Missaukee	1980	89	0	0	89
	1993	107	0	2	108
	2004	99	0	3	101
Montmorency	1980	151	0	0	151
	1993	148	0	0	148
	2004	131	0	2	133
Newaygo	1980	3	0	0	3
	1993	4	0	0	4
	2004	6	0	0	6
Oceana	1980	0	0	0	0
	1993	2	0	0	2
	2004	6	0	0	6
Ogemaw	1980	61	0	2	64
	1993	66	1	0	67
	2004	73	0	0	73
Osceola	1980	24	0	0	24
	1993	21	0	0	21
	2004	22	0	0	22
Oscoda	1980	44	0	0	44
	1993	42	0	0	42
	2004	54	0	2	56
Otsego	1980	96	0	0	96
	1993	82	0	0	82
	2004	84	0	1	85

County	Year	Timberland	Reserved Timberland	Other Forest Land	Total Forest Land
<b>Northern Lower Peninsula</b>					
Presque Isle	1980	65	2	0	67
	1993	66	1	2	69
	2004	88	0	2	90
Roscommon	1980	161	0	1	162
	1993	168	2	0	170
	2004	176	0	6	182
Wexford	1980	45	0	0	45
	1993	61	0	0	61
	2004	53	0	2	55
Northern Lower Peninsula Total	1980	1,788	5	12	1,805
	1993	1,886	38	8	1,932
	2004	1,887	6	42	1,934

County	Year	Timberland	Reserved Timberland	Other Forest Land	Total Forest Land
<b>State</b>					
State	1980	3,571	141	61	3,773
	1993	3,728	182	35	3,946
	2004	4,027	82	64	4,172

Data Source: 1980 and 1993 data are derived from the Eastwide Forest Inventory datasets. 2004 data are derived from the 2004 FIA Snapshot dataset (<http://www.ncrs2.fs.fed.us/FIADatamart/fiadatamart.aspx>) which includes plots taken in 2000 to 2004.

**Table A5.5. Area (thousand acres) of softwood forest types for all owners, 1980, 1993, and 2004.**

Year	Balsam fir	Black spruce	Jack pine	Northern white-cedar	Red pine	Tamarack	White Pine	White spruce	Other Softwoods
<b>Western Upper Peninsula</b>									
1980	378	258	113	525	81	60	53	82	2
1993	355	263	103	542	130	70	57	72	1
2004	186	243	100	527	115	95	67	72	110
<b>Eastern Upper Peninsula</b>									
1980	142	163	209	387	85	25	62	44	1
1993	146	177	176	382	127	33	58	42	3
2004	114	183	185	423	123	59	70	33	60
<b>Northern Lower Peninsula</b>									
1980	57	29	525	365	386	32	67	13	67
1993	63	25	439	417	589	38	95	25	78
2004	76	26	361	350	557	38	115	29	116
<b>Southern Lower Peninsula</b>									
1980	0	0	12	17	37	4	17	3	36
1993	0	0	14	8	52	8	25	9	34
2004	0	0	8	7	54	5	25	6	57
<b>State</b>									
1980	578	450	859	1,294	589	122	199	140	105
1993	563	465	731	1,349	897	149	234	147	115
2004	376	453	654	1,306	850	197	278	139	343

Data Source: 1980 and 1993 data are derived from the Eastwide Forest Inventory datasets. 2004 data are derived from the 2004 FIA Snapshot dataset (<http://www.ncrs2.fs.fed.us/FIADatamart/fiadatamart.aspx>) which includes plots taken in 2000 to 2004.

**Table A5.6. Area (thousand acres) of softwood forest types for State ownership, 1980, 1993, and 2004.**

Year	Balsam fir	Black spruce	Jack pine	Northern white-cedar	Red pine	Tamarack	White Pine	White spruce	Other Soft-woods
<b>Western Upper Peninsula</b>									
1980	68	60	27	88	9	17	13	8	0
1993	54	53	26	105	16	17	8	11	1
2004	32	58	25	136	15	29	12	10	5
<b>Eastern Upper Peninsula</b>									
1980	44	78	105	140	36	19	32	8	0
1993	37	80	93	127	43	12	24	10	0
2004	28	82	93	143	51	33	34	13	21
<b>Northern Lower Peninsula</b>									
1980	11	13	230	105	104	12	24	0	0
1993	22	10	207	131	166	12	31	4	0
2004	22	7	161	127	165	14	26	7	5
<b>Southern Lower Peninsula</b>									
1980	0	0	3	0	11	0	0	0	0
1993	0	0	4	0	14	0	0	0	3
2004	0	0	0	0	4	0	1	0	3
<b>State</b>									
1980	122	151	365	333	160	48	70	16	0
1993	113	143	329	363	240	41	63	26	4
2004	82	147	278	406	235	76	74	30	32

Data Source: 1980 and 1993 data are derived from the Eastwide Forest Inventory datasets. 2004 data are derived from the 2004 FIA Snapshot dataset (<http://www.ncrs2.fs.fed.us/FIADatamart/fiadatamart.aspx>) which includes plots taken in 2000 to 2004.

**Table A5.7. Area (thousand acres) of hardwood forest types for all owners, 1980, 1993, and 2004.**

Year	Aspen	Balsam poplar	Elm-Ash-Cottonwood	Maple-Beech-Birch	Oak Hickory	Paper birch	Other Hardwoods	Oak Pine	Non-stocked
<b>Western Upper Peninsula</b>									
1980	852	62	282	2,637	41	166	NA	NA	15
1993	835	75	287	2,743	43	127	NA	NA	8
2004	817	104	224	2,750	63	125	0	60	28
<b>Eastern Upper Peninsula</b>									
1980	372	66	129	943	9	72	NA	NA	26
1993	302	53	123	987	24	51	NA	NA	7
2004	302	68	101	978	12	110	4	48	28
<b>Northern Lower Peninsula</b>									
1980	1,576	60	423	1,683	1,022	118	NA	NA	27
1993	1,312	54	474	2,048	1,126	99	NA	NA	17
2004	1,233	81	435	1,798	1,179	67	11	342	56
<b>Southern Lower Peninsula</b>									
1980	281	7	588	980	690	13	NA	NA	19
1993	227	7	744	1,384	790	15	NA	NA	7
2004	174	0	686	777	1,316	16	49	66	39
<b>State</b>									
1980	3,081	194	1,421	6,243	1,762	369	NA	NA	87
1993	2,676	190	1,627	7,161	1,982	292	NA	NA	39
2004	2,527	254	1,447	6,304	2,571	317	64	517	151

Data Source: 1980 and 1993 data are derived from the Eastwide Forest Inventory datasets. 2004 data are derived from the 2004 FIA Snapshot dataset (<http://www.ncrs2.fs.fed.us/FIADatamart/fiadatamart.aspx>) which includes plots taken in 2000 to 2004.

**Table A5.8. Area (thousand acres) of hardwood forest types for State ownership, 1980, 1993, and 2004.**

Year	Aspen	Balsam poplar	Elm-Ash-Cottonwood	Maple-Beech-Birch	Oak Hickory	Paper birch	Other Hardwoods	Oak Pine	Non-stocked
<b>Western Upper Peninsula</b>									
1980	144	9	49	235	8	27	NA	NA	2
1993	146	13	36	232	7	24	NA	NA	2
2004	168	10	28	252	13	15	0	12	5
<b>Eastern Upper Peninsula</b>									
1980	112	11	24	184	2	27	NA	NA	14
1993	89	7	36	210	3	28	NA	NA	6
2004	119	11	43	228	5	38	2	22	13
<b>Northern Lower Peninsula</b>									
1980	501	7	76	398	272	25	NA	NA	11
1993	391	8	103	473	302	18	NA	NA	8
2004	416	5	92	380	314	18	3	108	18
<b>Southern Lower Peninsula</b>									
1980	30	0	36	48	55	2	NA	NA	2
1993	45	0	51	54	110	6	NA	NA	0
2004	22	0	71	56	165	1	7	8	1
<b>State</b>									
1980	786	26	184	865	336	81	NA	NA	29
1993	671	28	226	969	422	75	NA	NA	16
2004	725	26	234	915	497	72	13	149	36

Data Source: 1980 and 1993 data are derived from the Eastwide Forest Inventory datasets. 2004 data are derived from the 2004 FIA Snapshot dataset (<http://www.ncrs2.fs.fed.us/FIADatamart/fiadatamart.aspx>) which includes plots taken in 2000 to 2004.

Table Notes: The 1980 and 1993 inventories did not use type classifications of Oak Pine and Other Hardwoods.

**Table A5.9. Volume of all live trees (million cubic feet) on timberland, all ownerships, by forest type group and ecoregion, 2004.**

<b>Forest type group</b>	<b>EUP</b>	<b>NLP</b>	<b>SLP</b>	<b>WUP</b>	<b>State</b>
Aspen	335	1,462	212	832	2,841
Balsam fir	97	60		176	332
Balsam poplar	78	73		64	215
Black spruce	155	22	0	212	389
Elm-Ash-Cottonwood	99	539	1,151	282	2,071
Jack pine	170	289	7	94	560
Maple-Beech-Birch	1,747	3,164	1,309	5,308	11,529
Nonstocked	2	3	3	3	10
Northern white-cedar	824	650	9	1,032	2,515
Oak Hickory	15	1,672	2,395	93	4,174
Oak Pine	39	462	82	76	658
Other Hardwoods	10	14	87		111
Other Softwoods	147	139	96	250	632
Paper birch	144	104	7	168	424
Red pine	209	1,272	131	242	1,853
Tamarack	44	28	1	89	162
White Pine	143	240	65	179	627
White spruce	48	28	14	91	181
<b>Total</b>	<b>4,303</b>	<b>10,221</b>	<b>5,568</b>	<b>9,191</b>	<b>29,283</b>

**Table A5.10. Volume of all live trees (million cubic feet) on timberland, State ownership, by forest type group and ecoregion, 2004.**

<b>Forest type group</b>	<b>EUP</b>	<b>NLP</b>	<b>SLP</b>	<b>WUP</b>	<b>State</b>
Aspen	128	346	20	135	629
Balsam fir	23	21		19	63
Balsam poplar	11	4		6	21
Black spruce	61	3		51	114
Elm-Ash-Cottonwood	48	106	114	38	306
Jack pine	87	122	0	22	230
Maple-Beech-Birch	427	628	89	490	1,634
Nonstocked	1	1		1	3
Northern white-cedar	231	235	0	255	721
Oak Hickory	5	326	285	24	641
Oak Pine	13	98	9	7	127
Other Hardwoods	5	3	17		25
Other Softwoods	47	3	2	12	64
Paper birch	50	26		24	100
Red pine	86	386	17	41	530
Tamarack	31	9		36	76
White Pine	59	44	5	38	146
White spruce	18	11		17	46
<b>Total</b>	<b>1,330</b>	<b>2,373</b>	<b>560</b>	<b>1,214</b>	<b>5,477</b>

**Table A5.11. Timberland, growing stock volume, growth and removals from State-owned land as a percent of all ownerships, 2004.**

<b>Forest Type</b>	<b>Timberland</b>	<b>Volume</b>	<b>Growth</b>	<b>Removals</b>
Jack pine	43%	41%	52%	74%
Tamarack	39%	47%	39%	0%
Black spruce	32%	29%	28%	18%
Northern white-cedar	31%	29%	14%	0%
Oak Pine	29%	19%	15%	70%
Aspen	29%	22%	32%	31%
Red pine	28%	29%	22%	24%
White Pine	27%	23%	19%	42%
Nonstocked	24%	33%	71%	78%
Paper birch	23%	24%	6%	0%
Balsam fir	22%	19%	7%	81%
White spruce	22%	26%	32%	0%
All Types	21%	19%	18%	20%
Oak Hickory	19%	15%	12%	26%
Elm-Ash-Cottonwood	16%	15%	8%	7%
Maple-Beech-Birch	15%	14%	15%	15%
Balsam poplar	10%	10%	23%	0%

Data source: USDA Forest Service 2004 FIA inventory.

**Table A5.12. Pulpwood production (thousand cords) by species group and ecoregion, 1980 to 2004.**

<b>Western Upper Peninsula</b>							
<b>Year</b>	<b>Aspen</b>	<b>Birch</b>	<b>Pine</b>	<b>Hard Maple</b>	<b>Mixed Hardwood</b>	<b>Mixed Softwood</b>	<b>Total Volume</b>
1980	302	38	59	98	155	173	826
1981	279	41	47	70	134	158	730
1982	298	37	63	57	133	203	791
1983	330	59	75	77	140	193	874
1984	298	43	94	87	173	181	875
1985	340	45	78	67	148	216	895
1986	338	103	81	182	260	222	1,185
1987	274	112	79	178	266	236	1,145
1988	402	122	113	185	274	197	1,293
1989	459	121	76	201	293	251	1,400
1990	513	107	124	191	247	163	1,344
1991	503	100	123	242	226	154	1,347
1992	490	98	152	239	234	141	1,353
1993	491	99	142	221	223	145	1,321
1994	476	94	117	255	281	162	1,386
1995	474	81	129	285	262	156	1,386
1996	415	109	125	289	302	168	1,407
1997	413	80	112	306	302	136	1,349
1998	387	50	90	244	358	151	1,281
1999	364	38	99	276	385	152	1,315
2000	380	87	92	246	362	156	1,323
2001	368	57	84	197	285	164	1,154
2002	336	52	57	227	283	149	1,104
2003	364	56	46	206	307	153	1,132
2004	364	60	55	240	316	173	1,208
<b>Eastern Upper Peninsula</b>							
<b>Year</b>	<b>Aspen</b>	<b>Birch</b>	<b>Pine</b>	<b>Hard Maple</b>	<b>Mixed Hardwood</b>	<b>Mixed Softwood</b>	<b>Total Volume</b>
1980	36	6	48	18	28	73	210
1981	36	13	34	16	42	59	201
1982	33	6	47	10	30	62	188
1983	55	11	56	13	37	73	245
1984	62	12	67	18	45	66	270
1985	77	11	62	23	54	76	304
1986	53	20	63	41	98	87	362
1987	45	17	50	61	85	85	342
1988	55	26	48	58	96	93	376
1989	103	31	32	50	93	103	412
1990	132	25	52	46	73	64	392
1991	135	24	62	70	82	84	458
1992	149	26	88	61	73	72	469

1993	132	25	106	74	86	84	507
1994	126	30	80	97	98	97	527
1995	136	22	113	100	97	68	537
1996	118	38	101	82	88	63	490
1997	91	29	108	99	100	49	476
1998	111	17	86	68	104	54	440
1999	118	10	78	73	105	50	433
2000	92	24	81	59	95	42	393
2001	96	23	87	70	112	62	451
2002	112	24	51	81	135	54	458
2003	100	24	43	78	132	46	424
2004	94	22	44	77	128	55	420

**Northern Lower Peninsula**

Year	Aspen	Birch	Pine	Hard Maple	Mixed Hardwood	Mixed Softwood	Total Volume
1980	364	34	122	7	187	9	723
1981	339	24	117	13	171	7	671
1982	317	19	115	4	118	5	579
1983	516	25	101	5	132	8	787
1984	614	24	104	38	205	4	989
1985	563	19	146	33	171	2	934
1986	585	29	142	10	219	7	992
1987	572	33	139	15	186	4	950
1988	541	36	111	22	189	7	906
1989	533	51	130	28	210	6	958
1990	492	41	113	29	221	6	901
1991	481	39	110	30	218	7	885
1992	444	34	109	26	147	5	765
1993	521	50	115	39	246	5	976
1994	514	47	131	49	253	5	999
1995	410	39	107	35	209	4	805
1996	394	33	139	47	206	5	824
1997	512	34	161	113	298	5	1,123
1998	382	31	118	51	220	5	808
1999	357	28	105	58	202	10	760
2000	358	40	105	62	230	9	804
2001	360	28	104	56	203	8	759
2002	392	26	72	63	250	6	810
2003	406	23	97	56	246	17	846
2004	396	26	147	64	250	25	909

**State**

Year	Aspen	Birch	Pine	Hard Maple	Mixed Hardwood	Mixed Softwood	Total Volume
1980	724	79	250	124	383	256	1,815
1981	683	80	217	99	369	224	1,672
1982	664	63	243	72	318	269	1,630

1983	929	96	240	95	350	274	1,984
1984	999	79	267	145	465	251	2,208
1985	1,010	76	287	124	421	294	2,213
1986	1,010	152	287	234	617	316	2,614
1987	926	163	268	255	580	326	2,518
1988	1,043	185	272	265	602	296	2,663
1989	1,136	204	238	280	636	360	2,853
1990	1,176	173	290	266	580	233	2,717
1991	1,158	163	296	343	559	244	2,763
1992	1,109	159	349	327	488	217	2,649
1993	1,184	177	363	342	609	234	2,909
1994	1,153	175	329	402	690	264	3,013
1995	1,057	145	349	424	630	228	2,834
1996	971	182	366	424	650	236	2,828
1997	1,082	146	384	530	769	189	3,099
1998	930	99	298	368	757	211	2,662
1999	889	78	284	417	753	212	2,632
2000	868	152	279	378	748	209	2,633
2001	855	109	278	327	643	234	2,446
2002	866	104	183	374	714	210	2,451
2003	906	104	187	344	738	217	2,497
2004	894	110	250	388	762	254	2,658

**Table A5.13. Pulpwood volume sold from DNR lands and average bid price, by species group and region, 1986 to 2005.**

<b>Aspen</b>								
<b>Fiscal Year</b>	<b>Pulpwood volume sold, Cords</b>				<b>Average bid price, \$/cord</b>			
	<b>State</b>	<b>EUP</b>	<b>NLP</b>	<b>WUP</b>	<b>State</b>	<b>EUP</b>	<b>NLP</b>	<b>WUP</b>
1986	170,887	8,383	112,582	49,921	\$10.40	\$3.83	\$12.48	\$6.81
1987	171,215	15,603	103,650	51,962	\$8.83	\$4.94	\$10.75	\$6.18
1988	300,764	13,325	163,633	123,806	\$9.63	\$4.16	\$12.06	\$7.01
1989	215,908	14,627	109,592	91,688	\$10.02	\$5.07	\$11.85	\$8.64
1990	194,690	17,952	87,114	89,625	\$11.38	\$5.54	\$12.99	\$10.98
1991	174,529	12,700	92,256	69,573	\$12.74	\$8.14	\$13.18	\$13.00
1992	187,443	20,643	87,806	78,994	\$13.59	\$8.07	\$14.43	\$14.11
1993	189,662	16,747	104,826	68,089	\$15.76	\$12.45	\$15.59	\$16.83
1994	157,348	14,525	77,634	65,188	\$21.32	\$17.83	\$21.74	\$21.59
1995	169,831	25,347	80,118	64,366	\$22.73	\$18.69	\$22.11	\$25.11
1996	175,027	15,640	97,422	61,964	\$21.46	\$18.70	\$19.88	\$24.66
1997	156,060	11,588	87,981	56,491	\$23.53	\$19.80	\$21.00	\$28.25
1998	173,219	26,057	83,195	63,967	\$23.69	\$17.75	\$21.43	\$29.04
1999	143,142	10,318	76,385	56,440	\$22.37	\$15.70	\$20.84	\$25.67
2000	138,179	10,076	84,294	43,809	\$23.73	\$17.82	\$22.05	\$28.32
2001	121,881	7,090	68,868	45,923	\$26.04	\$19.52	\$24.34	\$29.59
2002	135,863	8,129	66,203	61,531	\$26.16	\$21.56	\$24.28	\$28.78
2003	120,577	11,176	62,942	46,460	\$24.52	\$25.38	\$23.13	\$26.19
2004	130,410	10,923	75,433	44,055	\$26.21	\$22.44	\$21.97	\$34.40
2005	160,585	11,897	81,546	67,143	\$34.23	\$34.42	\$26.86	\$43.16

<b>Red Pine</b>								
<b>Fiscal Year</b>	<b>Pulpwood volume sold, Cords</b>				<b>Average bid price, \$/cord</b>			
	<b>State</b>	<b>EUP</b>	<b>NLP</b>	<b>WUP</b>	<b>State</b>	<b>EUP</b>	<b>NLP</b>	<b>WUP</b>
1986	12,121	2,104	9,507	510	\$8.21	\$14.78	\$6.51	\$12.72
1987	26,273	2,748	23,334	191	\$8.03	\$13.53	\$7.41	\$4.50
1988	20,872	5,907	14,952	14	\$11.44	\$12.14	\$11.16	\$8.59
1989	26,374	6,214	19,856	304	\$11.77	\$15.97	\$10.50	\$8.65
1990	21,537	5,815	15,105	617	\$13.12	\$17.38	\$11.36	\$15.93
1991	28,614	2,003	25,591	1,020	\$14.61	\$14.63	\$14.41	\$19.40
1992	27,475	2,864	23,874	737	\$18.51	\$15.56	\$18.76	\$21.69
1993	29,539	2,300	25,795	1,443	\$20.70	\$12.69	\$21.57	\$18.00
1994	42,073	10,002	31,623	449	\$29.05	\$35.42	\$27.09	\$24.83
1995	29,576	2,521	26,745	310	\$32.81	\$31.37	\$33.15	\$15.22
1996	39,281	3,175	32,221	3,885	\$28.02	\$28.02	\$27.29	\$34.10
1997	43,143	2,958	37,297	2,888	\$32.40	\$29.42	\$31.87	\$42.30
1998	44,074	8,674	34,527	873	\$38.41	\$39.64	\$38.09	\$38.98
1999	42,376	4,265	36,717	1,394	\$38.82	\$36.71	\$39.03	\$39.65
2000	46,480	7,942	37,253	1,285	\$47.06	\$51.86	\$46.21	\$42.07
2001	46,091	5,459	38,371	2,261	\$55.15	\$56.51	\$54.91	\$55.88

2002	43,156	3,485	36,291	3,380	\$52.32	\$64.29	\$50.79	\$56.42
2003	48,108	4,088	43,615	405	\$47.33	\$61.63	\$46.06	\$40.49
2004	53,894	10,713	41,035	2,145	\$57.99	\$67.09	\$56.02	\$50.22
2005	62,266	11,169	48,527	2,571	\$63.84	\$73.95	\$61.80	\$58.41

<b>Jack Pine</b>								
<b>Fiscal Year</b>	<b>Pulpwood volume sold, Cords</b>				<b>Average bid price, \$/cord</b>			
	<b>State</b>	<b>EUP</b>	<b>NLP</b>	<b>WUP</b>	<b>State</b>	<b>EUP</b>	<b>NLP</b>	<b>WUP</b>
1986	94,044	24,357	60,746	8,941	\$8.44	\$7.82	\$7.69	\$15.23
1987	91,445	33,875	44,478	13,092	\$8.13	\$7.40	\$6.82	\$14.43
1988	119,929	40,557	59,828	19,544	\$9.34	\$7.71	\$8.52	\$15.25
1989	105,761	31,106	61,722	12,932	\$11.07	\$10.86	\$9.54	\$18.85
1990	77,557	31,172	31,570	14,815	\$12.93	\$13.68	\$9.25	\$19.17
1991	93,898	13,681	64,767	15,450	\$12.02	\$13.58	\$9.70	\$20.34
1992	126,099	41,927	58,586	25,586	\$14.80	\$16.01	\$10.59	\$22.47
1993	128,949	36,350	76,623	15,975	\$14.93	\$18.31	\$10.16	\$30.12
1994	111,724	29,208	64,931	17,585	\$22.42	\$28.96	\$15.95	\$35.46
1995	104,820	40,478	47,233	17,109	\$26.37	\$32.30	\$16.34	\$40.02
1996	117,869	40,299	59,023	18,546	\$25.31	\$33.37	\$15.48	\$39.11
1997	142,018	55,347	67,690	18,982	\$31.83	\$43.48	\$18.49	\$45.39
1998	129,906	54,249	58,567	17,090	\$32.50	\$39.31	\$21.67	\$47.99
1999	67,580	18,013	40,513	9,054	\$27.20	\$39.50	\$17.32	\$46.99
2000	112,084	35,099	68,740	8,245	\$34.16	\$48.34	\$24.87	\$51.28
2001	80,390	25,562	48,030	6,799	\$37.45	\$57.55	\$24.15	\$55.85
2002	127,881	29,388	82,231	16,262	\$37.89	\$60.49	\$25.58	\$59.34
2003	82,105	25,082	47,454	9,569	\$39.93	\$58.38	\$26.44	\$58.45
2004	114,217	32,071	68,959	13,187	\$40.07	\$55.24	\$28.76	\$62.31
2005	112,201	38,854	63,447	9,901	\$48.43	\$67.25	\$32.01	\$79.72

<b>Mixed Hardwood</b>								
<b>Fiscal Year</b>	<b>Pulpwood volume sold, Cords</b>				<b>Average bid price, \$/cord</b>			
	<b>State</b>	<b>EUP</b>	<b>NLP</b>	<b>WUP</b>	<b>State</b>	<b>EUP</b>	<b>NLP</b>	<b>WUP</b>
1986	181,933	15,579	125,700	40,653	\$9.80	\$3.36	\$12.24	\$4.71
1987	175,195	24,855	104,838	45,502	\$8.58	\$4.83	\$11.05	\$4.93
1988	277,659	19,793	179,304	78,562	\$9.14	\$5.46	\$11.05	\$5.72
1989	180,660	15,415	111,677	53,568	\$9.61	\$4.73	\$11.44	\$7.21
1990	172,214	14,852	91,334	66,028	\$9.75	\$5.40	\$10.76	\$9.34
1991	183,165	18,747	98,973	65,444	\$10.50	\$6.45	\$11.13	\$10.70
1992	179,034	16,279	96,443	66,311	\$12.16	\$7.95	\$13.23	\$11.64
1993	196,853	19,310	111,154	66,389	\$13.71	\$10.17	\$14.70	\$13.09
1994	179,092	16,000	106,815	56,277	\$19.19	\$16.50	\$18.05	\$22.12
1995	185,035	27,047	102,144	55,844	\$18.65	\$17.87	\$16.81	\$22.40
1996	186,369	21,312	104,564	60,493	\$15.91	\$15.29	\$14.20	\$19.09
1997	193,639	17,300	115,490	60,849	\$16.04	\$15.42	\$13.48	\$21.07
1998	201,020	33,336	106,442	61,243	\$15.84	\$14.65	\$13.64	\$20.33

1999	200,981	27,687	120,064	53,230	\$13.03	\$10.97	\$11.66	\$17.20
2000	217,804	28,147	131,346	58,311	\$15.65	\$11.91	\$15.86	\$16.98
2001	172,800	22,349	101,469	48,982	\$17.19	\$13.02	\$16.48	\$20.58
2002	203,861	15,128	114,306	74,427	\$15.12	\$10.48	\$14.59	\$16.89
2003	180,871	21,837	91,196	67,838	\$15.43	\$14.36	\$14.07	\$17.60
2004	206,866	37,696	122,382	46,788	\$17.98	\$18.46	\$15.96	\$22.86
2005	226,380	27,023	121,310	78,046	\$27.17	\$30.95	\$24.63	\$29.80

<b>Mixed Softwood</b>								
<b>Fiscal Year</b>	<b>Pulpwood volume sold, Cords</b>				<b>Average bid price, \$/cord</b>			
	<b>State</b>	<b>EUP</b>	<b>NLP</b>	<b>WUP</b>	<b>State</b>	<b>EUP</b>	<b>NLP</b>	<b>WUP</b>
1986	52,639	8,095	8,730	35,814	\$6.14	\$4.65	\$4.66	\$6.83
1987	59,349	14,631	8,111	36,608	\$5.64	\$5.26	\$3.93	\$6.17
1988	73,515	12,484	12,616	48,415	\$5.99	\$5.41	\$4.77	\$6.45
1989	59,348	8,863	12,284	38,201	\$6.94	\$5.21	\$6.58	\$7.46
1990	70,245	11,210	18,983	40,053	\$7.37	\$6.85	\$4.16	\$9.03
1991	52,342	9,678	10,609	32,054	\$9.39	\$7.79	\$7.40	\$10.53
1992	61,211	17,041	7,845	36,325	\$9.97	\$10.32	\$6.65	\$10.52
1993	55,599	12,562	12,770	30,267	\$11.93	\$12.02	\$6.84	\$14.05
1994	50,181	11,089	10,186	28,906	\$16.86	\$18.62	\$13.37	\$17.41
1995	49,934	18,458	6,821	24,654	\$20.44	\$21.05	\$10.94	\$22.62
1996	54,534	17,332	10,414	26,788	\$18.98	\$17.78	\$17.32	\$20.40
1997	43,202	11,646	6,261	25,296	\$20.39	\$25.49	\$7.72	\$21.17
1998	49,281	21,160	5,384	22,737	\$21.37	\$22.14	\$8.94	\$23.59
1999	33,276	7,534	5,961	19,781	\$17.54	\$15.66	\$9.58	\$20.65
2000	34,171	10,407	6,239	17,525	\$19.96	\$15.27	\$15.20	\$24.44
2001	45,398	12,336	9,581	23,481	\$25.25	\$26.94	\$12.87	\$29.40
2002	44,224	8,095	9,669	26,460	\$23.07	\$24.83	\$15.39	\$25.33
2003	36,066	9,498	8,087	18,481	\$23.82	\$31.14	\$10.97	\$25.69
2004	39,512	11,383	10,830	17,300	\$26.73	\$29.84	\$13.02	\$33.26
2005	42,579	11,569	10,157	20,853	\$37.84	\$38.50	\$12.51	\$49.82

Pulpwood species are grouped as follows for this report: aspen (quaking aspen, bigtooth aspen, mixed aspen, and balsam poplar), mixed hardwoods (red maple, butternut, white oak, basswood, sugar maple, paper birch, mixed oak, mixed hardwood, red oak, white ash, willow, black cherry, red elm, yellow birch, black ash, beech, american elm, ironwood, and cottonwood), mixed softwoods (white pine, european larch, norway spruce, austrian pine, mixed softwood, mixed pine, balsam fir, black spruce, northern white cedar, white spruce, hemlock, tamarack, and scotch pine). Red pine and jack pine are reported separately.

**Table A5.14. Sawlog volume sold from DNR lands and average bid price, by species group and region, 1986 to 2005.**

<b>Aspen</b>								
<b>Fiscal Year</b>	<b>Sawlog volume sold, MBF</b>				<b>Average bid price, \$/MBF</b>			
	<b>State</b>	<b>EUP</b>	<b>NLP</b>	<b>WUP</b>	<b>State</b>	<b>EUP</b>	<b>NLP</b>	<b>WUP</b>
1986	7,861	7	7,800	54	\$40.93	\$12.00	\$41.17	\$8.95
1987	7,487		7,415	72	\$34.19		\$34.42	\$10.38
1988	16,639		16,473	166	\$34.33		\$34.45	\$21.71
1989	11,651	2	11,367	282	\$34.82	\$9.00	\$35.13	\$22.65
1990	7,382	1	7,313	68	\$44.94	\$15.00	\$45.18	\$19.65
1991	8,759		8,405	355	\$38.14		\$38.54	\$28.62
1992	9,048	17	8,735	297	\$39.20	\$23.76	\$39.38	\$34.54
1993	9,410	27	8,884	499	\$49.96	\$31.56	\$52.22	\$10.83
1994	6,112	13	6,031	69	\$91.33	\$24.00	\$92.03	\$43.00
1995	7,017	6	7,008	3	\$106.46	\$23.46	\$106.57	\$35.74
1996	11,202	0	11,106	95	\$89.63	\$17.00	\$90.03	\$43.09
1997	9,470	4	9,440	26	\$89.39	\$33.00	\$89.50	\$60.95
1998	10,378		10,330	47	\$98.00		\$98.26	\$40.63
1999	11,183		11,183		\$97.14		\$97.14	
2000	10,833		10,806	27	\$99.05		\$99.19	\$40.00
2001	8,076		8,076		\$122.44		\$122.44	
2002	6,389		6,389		\$105.72		\$105.72	
2003	7,254		7,254		\$104.80		\$104.80	
2004	11,825		11,825		\$97.77		\$97.77	
2005	9,013		9,013		\$116.89		\$116.89	

<b>Basswood</b>								
<b>Fiscal Year</b>	<b>Sawlog volume sold, MBF</b>				<b>Average bid price, \$/MBF</b>			
	<b>State</b>	<b>EUP</b>	<b>NLP</b>	<b>WUP</b>	<b>State</b>	<b>EUP</b>	<b>NLP</b>	<b>WUP</b>
1986	580	1	499	80	\$96.20	\$26.29	\$99.23	\$78.43
1987	650	5	517	129	\$76.44	\$34.92	\$77.74	\$72.81
1988	532	1	336	196	\$88.93	\$27.00	\$86.07	\$94.02
1989	880	2	726	152	\$92.75	\$31.57	\$88.98	\$111.66
1990	750	1	686	64	\$113.18	\$16.00	\$112.36	\$123.56
1991	1,177	8	651	519	\$127.62	\$56.29	\$119.21	\$139.28
1992	966	17	604	346	\$131.25	\$52.40	\$112.75	\$167.38
1993	867	41	589	238	\$160.40	\$126.14	\$157.67	\$173.06
1994	1,390	19	959	412	\$229.98	\$177.01	\$215.01	\$267.28
1995	1,139	28	741	371	\$206.19	\$178.39	\$186.82	\$247.03
1996	1,409	66	1,020	324	\$155.83	\$180.85	\$133.98	\$219.57
1997	2,194	9	1,595	590	\$161.39	\$147.36	\$147.70	\$198.59
1998	1,938	110	1,108	721	\$162.92	\$155.32	\$131.89	\$211.80
1999	2,217	62	1,583	573	\$143.96	\$193.47	\$132.73	\$169.64
2000	2,358	37	1,989	332	\$170.04	\$105.01	\$166.17	\$200.44

2001	1,815	58	1,483	274	\$158.55	\$92.99	\$152.64	\$204.43
2002	2,938	6	2,027	905	\$157.67	\$86.51	\$143.15	\$190.64
2003	2,465	50	1,766	649	\$138.79	\$118.28	\$129.53	\$165.54
2004	2,162	360	1,201	601	\$130.08	\$128.51	\$113.87	\$163.43
2005	2,955	17	1,789	1,150	\$149.99	\$114.58	\$134.94	\$173.92

<b>Black Cherry</b>								
Fiscal Year	Sawlog volume sold, MBF				Average bid price, \$/MBF			
	State	EUP	NLP	WUP	State	EUP	NLP	WUP
1986	101	68	19	14	\$41.61	\$40.85	\$43.70	\$42.41
1987	36	24	12		\$73.55	\$63.06	\$94.58	
1988	54	23	30	1	\$63.78	\$82.10	\$50.12	\$35.42
1989	50	35	12	3	\$103.28	\$57.91	\$255.68	\$32.24
1990	27	4	15	8	\$44.53	\$53.16	\$45.55	\$38.76
1991	123	53	30	40	\$65.51	\$65.98	\$43.52	\$81.46
1992	33	17	7	9	\$85.09	\$62.94	\$152.54	\$70.84
1993	76	54	6	17	\$111.75	\$122.07	\$167.88	\$56.75
1994	148	24	100	23	\$158.31	\$123.64	\$181.77	\$92.61
1995	171	87	48	36	\$178.65	\$181.15	\$202.90	\$140.77
1996	302	44	233	25	\$438.51	\$174.99	\$519.04	\$151.82
1997	406	72	256	78	\$333.51	\$410.56	\$296.06	\$385.46
1998	277	141	63	74	\$228.63	\$230.61	\$202.08	\$247.64
1999	133	61	35	37	\$261.96	\$212.34	\$346.88	\$264.74
2000	200	45	116	39	\$269.10	\$240.77	\$278.21	\$275.01
2001	141	54	72	14	\$352.00	\$394.80	\$315.00	\$375.95
2002	114	11	56	47	\$382.58	\$188.67	\$548.64	\$231.05
2003	281	17	174	89	\$275.05	\$153.51	\$270.58	\$307.16
2004	239	148	62	28	\$551.73	\$577.34	\$660.59	\$175.14
2005	320	51	200	69	\$382.20	\$419.65	\$328.98	\$507.85

<b>Oaks</b>								
Fiscal Year	Sawlog volume sold, MBF				Average bid price, \$/MBF			
	State	EUP	NLP	WUP	State	EUP	NLP	WUP
1986	8,770		8,766	4	\$77.13		\$77.09	\$140.00
1987	6,352		6,345	6	\$65.99		\$66.00	\$61.00
1988	11,623		11,558	65	\$73.61		\$73.26	\$135.46
1989	7,235		7,226	9	\$84.62		\$84.61	\$88.91
1990	5,579		5,432	147	\$105.06		\$103.67	\$156.30
1991	6,189		6,142	47	\$126.76		\$125.23	\$328.60
1992	7,229		7,217	12	\$111.14		\$110.70	\$376.95
1993	8,145	0	8,092	53	\$166.99	\$16.00	\$166.53	\$237.76
1994	8,346		8,231	115	\$199.19		\$196.07	\$423.23
1995	8,113		8,108	5	\$228.07		\$227.96	\$396.67
1996	7,077		7,047	30	\$169.06		\$168.56	\$286.61

1997	9,421		9,401	20	\$160.92		\$160.66	\$280.20
1998	10,062	25	9,993	43	\$164.21	\$130.51	\$163.87	\$263.01
1999	10,867		10,731	135	\$176.42		\$173.42	\$414.39
2000	12,454		12,410	44	\$220.64		\$220.16	\$358.05
2001	9,195	24	9,096	76	\$257.44	\$300.12	\$254.16	\$638.87
2002	9,161		9,037	124	\$265.03		\$258.90	\$711.18
2003	8,605		8,338	267	\$262.23		\$257.35	\$414.93
2004	12,858		12,742	117	\$267.95		\$265.78	\$505.50
2005	10,546		10,481	66	\$357.27		\$357.66	\$294.44

<b>Paper Birch</b>								
Fiscal Year	Sawlog volume sold, MBF				Average bid price, \$/MBF			
	State	EUP	NLP	WUP	State	EUP	NLP	WUP
1986	244	37	181	26	\$21.42	\$43.28	\$15.30	\$33.41
1987	299	153	90	57	\$43.65	\$50.32	\$42.10	\$28.15
1988	353	23	306	24	\$20.49	\$48.29	\$17.73	\$28.81
1989	418	57	235	126	\$27.72	\$44.45	\$19.26	\$35.92
1990	427	81	217	128	\$38.93	\$50.17	\$19.58	\$64.63
1991	346	42	182	122	\$50.56	\$47.87	\$46.96	\$56.87
1992	456	48	113	295	\$63.10	\$43.24	\$26.19	\$80.42
1993	438	43	70	325	\$93.95	\$94.42	\$26.59	\$108.44
1994	560	80	194	287	\$130.03	\$167.14	\$84.00	\$150.80
1995	564	169	102	293	\$150.87	\$207.86	\$50.33	\$152.98
1996	806	138	159	508	\$119.69	\$121.84	\$61.66	\$137.30
1997	468	59	42	368	\$122.14	\$128.55	\$32.48	\$131.28
1998	286	65	42	180	\$107.89	\$102.16	\$44.80	\$124.52
1999	562	14	225	323	\$87.03	\$90.48	\$44.42	\$116.55
2000	259	33	49	177	\$238.46	\$55.41	\$716.59	\$141.73
2001	375	63	72	239	\$127.22	\$64.72	\$97.52	\$152.63
2002	699	17	141	541	\$147.24	\$88.90	\$46.41	\$175.41
2003	663	154	37	472	\$141.24	\$79.24	\$35.88	\$169.70
2004	235	27	59	149	\$193.25	\$86.41	\$46.03	\$270.21
2005	379	53	40	286	\$635.77	\$175.27	\$61.24	\$802.34

<b>Red Maple</b>								
Fiscal Year	Sawlog volume sold, MBF				Average bid price, \$/MBF			
	State	EUP	NLP	WUP	State	EUP	NLP	WUP
1986	1,273	485	678	109	\$47.21	\$56.69	\$36.00	\$74.66
1987	1,654	513	897	244	\$43.22	\$50.62	\$34.06	\$61.28
1988	2,366	351	1,852	164	\$42.84	\$58.24	\$38.40	\$60.00
1989	1,926	198	1,630	98	\$38.54	\$46.30	\$34.67	\$87.18
1990	1,899	160	1,633	106	\$35.42	\$57.55	\$32.39	\$48.92
1991	2,462	566	1,666	230	\$54.27	\$86.85	\$39.62	\$80.16
1992	1,877	196	1,552	129	\$47.13	\$80.11	\$41.10	\$69.53

1993	2,195	499	1,476	221	\$76.78	\$148.01	\$49.20	\$100.32
1994	1,600	334	935	331	\$99.62	\$123.56	\$73.05	\$150.41
1995	2,134	397	1,272	465	\$133.16	\$148.65	\$127.60	\$135.14
1996	2,983	220	2,369	394	\$84.34	\$160.21	\$69.78	\$129.49
1997	3,162	381	2,289	493	\$114.43	\$171.19	\$97.26	\$150.30
1998	2,659	457	1,743	459	\$226.26	\$175.38	\$264.12	\$133.24
1999	3,506	778	2,285	442	\$128.08	\$143.38	\$122.70	\$128.94
2000	2,741	322	1,920	500	\$159.11	\$157.62	\$157.62	\$165.80
2001	2,685	388	1,917	379	\$154.62	\$131.88	\$161.07	\$145.32
2002	3,665	224	2,750	692	\$174.97	\$136.22	\$182.28	\$158.43
2003	3,501	199	2,464	838	\$151.63	\$112.28	\$155.58	\$149.37
2004	4,159	653	2,918	588	\$184.79	\$154.66	\$188.26	\$201.04
2005	3,844	492	2,475	877	\$215.24	\$205.28	\$213.33	\$226.23

<b>Sugar Maple</b>								
Fiscal Year	Sawlog volume sold, MBF				Average bid price, \$/MBF			
	State	EUP	NLP	WUP	State	EUP	NLP	WUP
1986	1,466	422	484	561	\$87.33	\$98.42	\$67.68	\$95.94
1987	2,045	563	468	1,013	\$87.41	\$107.56	\$48.57	\$94.15
1988	1,946	228	623	1,095	\$121.74	\$112.79	\$53.31	\$162.57
1989	1,479	307	405	767	\$137.63	\$111.88	\$83.16	\$176.70
1990	1,324	50	267	1,007	\$184.89	\$96.53	\$74.20	\$218.64
1991	1,928	333	384	1,211	\$165.46	\$151.20	\$94.84	\$191.75
1992	1,616	173	380	1,063	\$180.29	\$169.47	\$136.50	\$197.69
1993	1,805	408	314	1,084	\$227.19	\$279.06	\$209.54	\$212.79
1994	2,021	133	908	980	\$291.97	\$189.03	\$307.15	\$291.91
1995	3,105	920	589	1,596	\$339.63	\$372.96	\$242.56	\$356.21
1996	3,020	1,264	716	1,040	\$407.16	\$523.14	\$342.68	\$310.61
1997	3,582	921	978	1,683	\$412.35	\$597.64	\$249.68	\$405.56
1998	3,118	1,099	588	1,430	\$426.22	\$648.84	\$212.11	\$343.17
1999	4,075	1,142	1,134	1,800	\$467.48	\$666.32	\$250.05	\$478.30
2000	3,842	521	1,133	2,188	\$573.50	\$663.23	\$407.66	\$637.97
2001	2,788	609	1,368	811	\$603.55	\$817.03	\$468.02	\$671.76
2002	3,979	442	1,433	2,104	\$664.04	\$800.80	\$528.97	\$727.35
2003	4,459	457	1,821	2,181	\$595.05	\$993.73	\$480.56	\$607.11
2004	3,880	1,445	969	1,466	\$853.22	\$1,134.59	\$515.33	\$799.27
2005	5,658	1,283	1,744	2,631	\$1,012.43	\$1,153.29	\$650.51	\$1,183.65

<b>Yellow Birch</b>								
Fiscal Year	Sawlog volume sold, MBF				Average bid price, \$/MBF			
	State	EUP	NLP	WUP	State	EUP	NLP	WUP
1986	286	112	21	154	\$105.83	\$116.78	\$10.05	\$111.02
1987	527	157	105	265	\$80.54	\$94.19	\$27.24	\$93.52
1988	323	46	128	148	\$95.47	\$98.35	\$26.09	\$154.55

1989	204	58	48	98	\$90.05	\$76.10	\$33.35	\$125.79
1990	162	36	29	97	\$100.72	\$100.14	\$26.90	\$123.20
1991	311	60		251	\$147.29	\$134.14		\$150.42
1992	134	43	5	85	\$92.55	\$123.96	\$24.02	\$80.70
1993	357	102	2	254	\$201.06	\$193.49	\$21.67	\$205.16
1994	193	20	15	159	\$234.66	\$156.75	\$104.56	\$256.27
1995	424	89	0	335	\$236.72	\$270.90	\$27.00	\$227.83
1996	356	49	6	301	\$209.65	\$176.69	\$42.52	\$218.25
1997	392	137		255	\$299.64	\$431.87		\$228.72
1998	285	93	4	187	\$239.37	\$357.98	\$100.00	\$183.23
1999	280	99		181	\$210.35	\$235.15		\$196.85
2000	335	63	1	271	\$206.66	\$206.13	\$55.00	\$207.34
2001	233	68		165	\$177.46	\$163.14		\$183.34
2002	219	17		202	\$508.06	\$149.02		\$538.53
2003	237	14	1	221	\$362.89	\$114.92	\$145.00	\$380.41
2004	260	99	3	158	\$347.07	\$225.35	\$97.20	\$427.66
2005	248	42		206	\$333.75	\$234.16		\$354.05

<b>Ash</b>								
<b>Fiscal Year</b>	<b>Sawlog volume sold, MBF</b>				<b>Average bid price, \$/MBF</b>			
	<b>State</b>	<b>EUP</b>	<b>NLP</b>	<b>WUP</b>	<b>State</b>	<b>EUP</b>	<b>NLP</b>	<b>WUP</b>
1986	322		321	1	\$96.82		\$96.91	\$60.00
1987	103	2	101		\$70.16	\$35.61	\$70.95	
1988	217		215	1	\$43.12		\$42.82	\$90.00
1989	363	1	361	1	\$57.67	\$20.74	\$57.59	\$110.00
1990	336	0	312	24	\$74.93	\$25.00	\$78.90	\$25.04
1991	404	5	378	21	\$120.18	\$72.21	\$122.05	\$97.36
1992	327	2	258	66	\$166.59	\$79.79	\$160.86	\$191.85
1993	156		143	13	\$162.14		\$167.81	\$101.29
1994	507	12	467	28	\$350.40	\$266.00	\$358.44	\$250.52
1995	361	5	293	64	\$286.42	\$258.70	\$299.56	\$228.31
1996	569	25	515	29	\$196.17	\$201.70	\$195.81	\$198.03
1997	436	20	372	44	\$177.91	\$200.00	\$177.22	\$173.54
1998	337	18	279	40	\$158.41	\$178.22	\$155.82	\$167.64
1999	447	21	361	65	\$151.07	\$156.38	\$154.43	\$130.77
2000	367	4	336	27	\$163.50	\$155.62	\$170.07	\$82.64
2001	532	26	466	40	\$151.54	\$121.60	\$157.90	\$96.87
2002	364	3	220	142	\$129.89	\$135.52	\$127.29	\$133.83
2003	560	23	334	204	\$121.21	\$86.00	\$119.78	\$127.47
2004	391	54	261	77	\$377.70	\$106.35	\$472.38	\$246.78
2005	336	3	278	55	\$82.48	\$96.93	\$81.37	\$87.36

<b>White Pine</b>		
<b>Fiscal</b>	<b>Sawlog volume sold, MBF</b>	<b>Average bid price, \$/MBF</b>

Year	State	EUP	NLP	WUP	State	EUP	NLP	WUP
1986	2,132	646	847	639	\$56.11	\$45.03	\$67.07	\$52.77
1987	2,134	580	773	781	\$54.93	\$52.66	\$61.55	\$50.06
1988	2,684	918	776	990	\$65.91	\$61.28	\$73.04	\$64.61
1989	1,909	364	822	723	\$75.68	\$63.51	\$80.04	\$76.83
1990	2,601	1,203	833	565	\$71.73	\$74.91	\$67.97	\$70.50
1991	1,497	393	687	418	\$77.45	\$68.81	\$85.74	\$71.94
1992	2,800	975	688	1,138	\$74.28	\$73.65	\$90.83	\$64.82
1993	2,200	1,048	782	370	\$92.59	\$105.90	\$77.30	\$87.24
1994	1,595	447	559	590	\$134.30	\$198.15	\$82.13	\$135.37
1995	1,379	756	343	280	\$161.20	\$200.72	\$93.76	\$136.98
1996	2,368	1,004	1,163	201	\$128.57	\$174.52	\$88.11	\$133.09
1997	1,537	290	920	327	\$114.99	\$171.01	\$74.94	\$177.98
1998	1,327	700	523	103	\$121.24	\$145.38	\$78.64	\$173.52
1999	745	319	315	111	\$118.51	\$111.14	\$109.22	\$166.03
2000	1,055	292	572	190	\$117.07	\$103.21	\$116.76	\$139.24
2001	1,402	424	611	368	\$174.76	\$150.35	\$134.04	\$270.55
2002	1,884	294	1,267	322	\$120.93	\$160.18	\$95.49	\$185.10
2003	1,025	165	685	175	\$99.95	\$142.37	\$81.96	\$130.38
2004	1,006	259	688	58	\$86.48	\$116.34	\$73.99	\$101.12
2005	1,395	354	827	214	\$243.25	\$172.67	\$95.71	\$929.99

Red Pine								
Fiscal Year	Sawlog volume sold, MBF				Average bid price, \$/MBF			
	State	EUP	NLP	WUP	State	EUP	NLP	WUP
1986	4,443	896	3,033	514	\$79.01	\$48.95	\$90.65	\$62.80
1987	4,817	920	3,466	430	\$76.55	\$59.79	\$83.18	\$59.00
1988	6,972	2,266	4,208	497	\$84.70	\$64.04	\$98.75	\$59.92
1989	5,811	842	4,479	490	\$103.16	\$66.78	\$113.44	\$71.68
1990	6,801	1,300	4,926	575	\$90.41	\$82.15	\$94.04	\$78.00
1991	5,869	928	4,382	560	\$107.64	\$94.44	\$112.74	\$89.56
1992	6,303	2,101	3,671	531	\$102.52	\$94.70	\$109.54	\$84.89
1993	6,146	936	4,836	374	\$111.54	\$109.31	\$113.11	\$96.81
1994	5,400	669	4,445	286	\$175.76	\$190.79	\$176.81	\$124.23
1995	5,369	1,119	4,036	214	\$182.18	\$208.08	\$177.68	\$131.63
1996	7,519	1,595	5,676	248	\$185.40	\$216.35	\$179.20	\$128.47
1997	5,341	893	3,978	470	\$175.94	\$218.23	\$168.96	\$154.70
1998	13,449	1,976	11,254	219	\$230.58	\$193.33	\$238.47	\$161.15
1999	7,954	974	6,686	294	\$218.46	\$164.02	\$228.46	\$171.54
2000	10,410	1,521	8,592	298	\$233.78	\$202.52	\$241.60	\$167.91
2001	9,952	1,702	7,539	711	\$234.78	\$234.71	\$237.09	\$210.41
2002	9,737	607	8,682	449	\$258.51	\$229.11	\$264.14	\$189.11
2003	20,554	1,093	19,332	129	\$211.14	\$236.61	\$210.05	\$158.64
2004	10,905	1,384	9,336	185	\$221.83	\$297.89	\$208.71	\$314.75
2005	14,391	1,409	12,856	126	\$270.39	\$314.83	\$257.06	\$1,130.89

Jack Pine								
Fiscal Year	Sawlog volume sold, MBF				Average bid price, \$/MBF			
	State	EUP	NLP	WUP	State	EUP	NLP	WUP
1986	1,238		1,232	6	\$23.30		\$23.19	\$45.00
1987	1,350		1,350		\$24.92		\$24.92	
1988	2,524		2,524		\$24.42		\$24.42	
1989	3,692		3,692		\$31.65		\$31.65	
1990	1,367		1,367		\$45.31		\$45.31	
1991	2,953		2,953		\$50.06		\$50.06	
1992	3,338	3	3,335		\$55.96	\$50.00	\$55.97	
1993	4,299		4,299		\$57.27		\$57.27	
1994	3,377		3,377		\$81.80		\$81.80	
1995	1,791		1,791		\$90.92		\$90.92	
1996	2,174		2,174		\$81.58		\$81.58	
1997	3,554		3,554		\$99.15		\$99.15	
1998	4,430		4,430		\$94.22		\$94.22	
1999	2,047		2,047		\$78.58		\$78.58	
2000	3,610		3,610		\$126.01		\$126.01	
2001	2,536		2,536		\$217.63		\$217.63	
2002	4,389		4,389		\$159.00		\$159.00	
2003	2,754		2,754		\$104.99		\$104.99	
2004	3,571		3,571		\$108.21		\$108.21	
2005	3,755		3,755		\$161.50		\$161.50	

Northern white cedar								
Fiscal Year	Sawlog volume sold, MBF				Average bid price, \$/MBF			
	State	EUP	NLP	WUP	State	EUP	NLP	WUP
1986	45	2	40	3	\$20.53	\$20.00	\$20.40	\$23.00
1987	130	9	58	63	\$21.34	\$21.61	\$24.50	\$18.44
1988	183		179	3	\$32.84		\$33.12	\$16.50
1989	211		199	11	\$28.46		\$28.56	\$26.70
1990	129		93	37	\$30.89		\$35.17	\$20.13
1991	222		151	70	\$31.90		\$36.23	\$22.60
1992	113	7	107		\$44.77	\$16.62	\$46.51	
1993	122		93	29	\$35.63		\$38.41	\$26.69
1994	87	6	62	19	\$131.83	\$8.40	\$56.33	\$415.72
1995	98		98	0	\$27.39		\$27.42	\$18.00
1996	242	12	229	0	\$21.42	\$30.96	\$20.92	\$11.00
1997	107		101	6	\$22.07		\$21.88	\$25.20
1998	11	4	5	2	\$47.10	\$57.00	\$41.28	\$40.00
1999	1			1	\$12.00			\$12.00
2000	0			0	\$16.00			\$16.00
2001	96		9	87	\$78.31		\$35.00	\$82.78
2002	0			0	\$25.00			\$25.00

2003	2	2			\$73.00	\$73.00		
2004	4		4		\$18.00		\$18.00	
2005	10		6	4	\$113.70		\$63.80	\$200.00

<b>Mixed Hardwood</b>								
Fiscal Year	Sawlog volume sold, MBF				Average bid price, \$/MBF			
	State	EUP	NLP	WUP	State	EUP	NLP	WUP
1986	2,188	310	1,623	254	\$39.38	\$38.55	\$38.68	\$44.85
1987	1,915	198	1,419	298	\$35.85	\$39.97	\$33.96	\$42.09
1988	3,670	179	3,187	304	\$43.87	\$43.22	\$42.61	\$57.43
1989	1,761	84	1,302	375	\$51.95	\$30.82	\$32.94	\$122.69
1990	1,746	63	1,034	648	\$70.83	\$40.39	\$58.01	\$94.25
1991	1,969	134	1,278	558	\$53.14	\$51.10	\$40.44	\$82.74
1992	2,323	67	1,696	561	\$57.38	\$46.16	\$45.38	\$95.02
1993	2,355	160	1,609	586	\$83.36	\$148.59	\$74.17	\$90.78
1994	2,067	68	1,417	582	\$187.27	\$104.39	\$209.17	\$143.70
1995	1,592	167	1,115	310	\$102.54	\$126.91	\$93.94	\$120.35
1996	2,478	105	1,637	736	\$90.50	\$108.33	\$67.37	\$139.36
1997	2,402	189	1,729	484	\$93.99	\$118.78	\$74.78	\$152.95
1998	1,808	173	1,213	423	\$89.94	\$92.92	\$84.20	\$105.22
1999	2,105	115	1,586	404	\$90.16	\$89.30	\$83.82	\$115.31
2000	1,497	52	896	550	\$92.30	\$70.10	\$81.07	\$112.69
2001	1,408	96	855	457	\$119.81	\$64.98	\$92.52	\$182.46
2002	1,724	170	936	618	\$134.65	\$65.21	\$83.27	\$231.67
2003	1,294	67	797	430	\$111.90	\$63.06	\$94.16	\$152.40
2004	1,415	197	985	233	\$116.09	\$77.54	\$119.83	\$132.89
2005	1,179	185	535	460	\$167.84	\$99.85	\$78.54	\$299.02

<b>Mixed Softwood</b>								
Fiscal Year	Sawlog volume sold, MBF				Average bid price, \$/MBF			
	State	EUP	NLP	WUP	State	EUP	NLP	WUP
1986	741	188	312	240	\$46.04	\$26.55	\$66.41	\$34.82
1987	679	201	172	307	\$30.07	\$22.54	\$27.26	\$36.58
1988	1,190	42	977	171	\$56.58	\$34.31	\$61.62	\$33.26
1989	870	164	495	211	\$62.80	\$21.17	\$89.13	\$33.40
1990	1,121	39	903	179	\$71.73	\$48.05	\$82.68	\$21.68
1991	750	17	645	87	\$72.98	\$26.01	\$79.19	\$36.26
1992	693	31	428	233	\$52.34	\$22.83	\$54.64	\$52.09
1993	640	49	425	166	\$79.14	\$34.75	\$99.72	\$39.63
1994	372	6	247	119	\$73.00	\$27.31	\$76.77	\$67.44
1995	1,035	56	834	146	\$100.45	\$66.43	\$110.36	\$56.78
1996	672	78	360	234	\$64.22	\$55.65	\$68.82	\$60.00
1997	490	10	325	154	\$66.11	\$51.41	\$70.18	\$58.45
1998	397	33	227	138	\$64.19	\$42.31	\$72.56	\$55.66

1999	473	60	235	177	\$105.53	\$46.12	\$160.00	\$53.30
2000	841	58	134	650	\$67.54	\$46.39	\$76.69	\$67.53
2001	451	52	69	330	\$48.94	\$36.77	\$117.94	\$36.36
2002	722	37	296	389	\$52.35	\$39.34	\$68.20	\$41.49
2003	454	113	207	134	\$59.79	\$50.90	\$76.44	\$41.57
2004	180	20	137	24	\$56.38	\$24.00	\$65.64	\$29.78
2005	403		155	248	\$69.70		\$76.09	\$65.73

Sawlog species are grouped as follows for this report: aspen (quaking aspen, bigtooth aspen, mixed aspen, and balsam poplar), mixed hardwoods (mixed hardwood, willow, red elm, american elm, ironwood, butternut, cottonwood, and beech), mixed softwoods (white spruce, mixed pine, balsam fir, austrian pine, mixed softwood, norway spruce, tamarack, european larch, scotch pine, hemlock, and black spruce) oaks (red oak, white oak, mixed oak), ash (white and black ash), the following species are reported separately: basswood, black cherry, paper birch, red maple, sugar maple, yellow birch, white pine, red pine, jack pine, and northern white cedar.

**Table A5.15. Michigan oil production (thousand barrels, including natural gas liquids and condensate) on all lands, by ecoregion and county, 1990 to 2005.**

Ecoregion/ county	1990	1991	1992	1993	1994	1995	1996	1997
	Thousand Barrels							
<b>Northern Lower Peninsula</b>								
Alcona	0	0	0	0	0	0	0	0
Alpena	63	58	79	57	44	62	21	18
Antrim	72	49	47	43	39	26	20	26
Arenac	69	196	714	513	405	418	283	359
Benzie	383	367	367	324	302	362	472	310
Charlevoix	0	0	0	0	0	0	0	0
Cheboygan	174	128	123	98	80	71	69	63
Clare	39	33	26	23	19	17	22	249
Crawford	528	403	309	174	160	230	282	676
Gladwin	11	11	11	9	22	20	10	260
Grand Traverse	1,788	1,625	1,466	1,119	889	709	722	771
Iosco	11	5	170	230	214	187	154	167
Kalkaska	1,275	1,098	995	859	749	710	705	1,033
Lake	0	0	0	0	0	0	0	17
Manistee	2,889	2,570	2,257	1,976	1,699	1,687	1,610	1,538
Mason	174	136	175	181	127	59	41	42
Mecosta	92	107	64	43	37	37	32	38
Missaukee	76	52	24	12	8	8	33	517
Montmorency	176	153	151	93	63	95	60	55
Newaygo	154	132	103	84	64	35	25	34
Oceana	126	66	45	32	26	24	22	71
Ogemaw	0	73	552	427	397	391	263	527
Osceola	34	42	284	277	235	196	154	246
Oscoda	53	64	68	52	42	142	113	102
Otsego	2,308	1,857	1,603	1,512	1,428	1,301	1,248	1,205
Presque Isle	795	640	640	503	398	398	326	295
Roscommon	0	0	0	0	0	0	0	477
Wexford	37	31	22	16	12	11	12	11
NLP Total	11,327	9,896	10,295	8,657	7,459	7,196	6,699	9,107
<b>State</b>	14,292	13,043	12,718	10,722	9,236	8,991	8,631	11,926

Ecoregion/ county	1998	1999	2000	2001	2002	2003	2004	2005
	Thousand Barrels							
<b>Northern Lower Peninsula</b>								
Alcona	0	0	1	1	5	5	1	0
Alpena	17	17	15	11	10	9	9	7
Antrim	24	17	13	9	13	15	11	7
Arenac	278	249	245	265	221	184	168	130
Benzie	211	175	117	79	60	50	50	46

Charlevoix	0	0	0	0	0	0	0	0
Cheboygan	65	54	84	92	91	74	57	65
Clare	224	164	195	180	179	178	169	159
Crawford	472	532	459	428	391	388	404	419
Gladwin	233	100	130	128	129	117	110	97
Grand Traverse	818	625	601	558	538	490	444	495
Iosco	162	198	181	179	113	95	72	46
Kalkaska	895	864	784	708	626	584	558	581
Lake	26	20	23	11	12	16	19	32
Manistee	1,494	1,239	1,266	1,228	1,132	956	942	967
Mason	34	30	40	26	34	71	46	37
Mecosta	41	37	43	40	27	24	25	27
Missaukee	392	495	540	501	486	443	434	398
Montmorency	43	59	73	80	74	68	62	97
Newaygo	18	21	27	32	33	35	38	42
Oceana	66	113	107	116	126	260	227	136
Ogemaw	506	383	364	336	310	266	250	247
Osceola	198	175	165	144	129	116	123	107
Oscoda	88	72	79	76	67	59	51	47
Otsego	1,152	982	923	802	669	618	551	632
Presque Isle	269	327	363	303	247	193	166	156
Roscommon	290	421	468	443	437	394	381	348
Wexford	9	9	15	27	59	35	29	25
<b>NLP Total</b>	<b>8,025</b>	<b>7,378</b>	<b>7,321</b>	<b>6,803</b>	<b>6,218</b>	<b>5,743</b>	<b>5,397</b>	<b>5,350</b>
<b>State</b>	<b>10,336</b>	<b>9,306</b>	<b>9,249</b>	<b>8,875</b>	<b>8,300</b>	<b>7,716</b>	<b>7,089</b>	<b>6,909</b>

Data Source: Mi DEQ database, [http://www.michigan.gov/deq/0,1607,7-135-3311\\_4111\\_4231---,00.html](http://www.michigan.gov/deq/0,1607,7-135-3311_4111_4231---,00.html)

**Table A5.16. Michigan gas production (million cubic feet) on all lands, by ecoregion and county, 1990 to 2005.**

Ecoregion/ county	1990	1991	1992	1993	1994	1995	1996	1997
	Million Cubic Feet							
<b>Northern Lower Peninsula</b>								
Alcona	0	0	0	0	0	0	1,250	3,735
Alpena	1,518	1,180	1,748	1,330	902	933	7,798	20,034
Antrim	775	521	1,323	3,010	4,053	3,253	8,954	17,891
Arenac	2,932	2,704	5,098	4,621	3,578	3,698	2,829	1,930
Benzie	271	207	234	270	312	331	629	595
Charlevoix	0	0	0	141	145	9	5	382
Cheboygan	186	187	185	160	118	84	47	52
Clare	3,448	2,474	1,768	1,641	1,263	1,123	1,155	1,293
Crawford	2,342	10,216	8,142	7,562	6,321	5,299	4,637	5,842
Gladwin	630	787	995	875	1,470	1,616	1,138	696
Grand Traverse	12,573	10,421	11,211	8,555	6,907	5,406	4,994	5,104
Iosco	342		245	374	432	593	698	854
Kalkaska	10,397	15,796	16,803	15,154	17,130	14,804	13,288	10,366
Lake	0	0	0	0	0	0	0	0
Manistee	23,174	21,888	22,142	18,579	15,534	15,989	16,444	15,809
Mason	2,187	1,493	1,871	2,449	1,558	1,236	980	980
Mecosta	5,407	5,802	3,764	2,762	2,322	1,807	1,165	847
Missaukee	1,583	1,445	1,046	702	462	525	430	968
Montmorency	6,215	5,161	8,402	10,977	24,705	53,542	62,858	82,294
Newaygo	11,434	9,768	6,704	5,182	3,780	2,419	1,657	1,318
Oceana	9	0	0	0	0	0	0	1,684
Ogemaw	7,715	7,535	8,527	6,852	6,005	5,638	4,705	4,606
Osceola	6,733	3,908	4,084	4,008	3,987	3,583	3,244	2,665
Oscoda	5,158	6,632	6,413	5,596	6,281	8,177	8,200	8,359
Otsego	35,469	48,059	65,589	79,898	73,625	72,191	72,131	81,464
Presque Isle	2,211	2,396	2,600	2,337	1,159	1,110	2,494	1,779
Roscommon	192	181	146	0	0	0	0	666
Wexford	634	431	218	165	145	123	104	88
NLP Total	143,536	159,192	179,257	183,199	182,195	203,491	221,834	272,300
SLP Total	16,387	21,952	17,632	12,721	13,316	12,428	16,363	18,762
State	159,923	181,144	196,889	195,920	195,511	215,919	238,197	291,062

Ecoregion/ county	1998	1999	2000	2001	2002	2003	2004	2005
	Million Cubic Feet							
<b>Northern Lower Peninsula</b>								
Alcona	5,684	7,955	9,050	8,794	8,141	7,466	7,065	6,613
Alpena	23,068	22,359	21,209	18,501	16,663	14,957	14,421	13,979
Antrim	18,258	17,517	18,306	20,213	21,100	22,692	23,347	23,534
Arenac	1,083	789	804	1,230	751	510	383	286

Benzie	644	1,131	990	1,040	1,168	665	476	296
Charlevoix	689	924	1,116	1,462	1,495	1,279	1,284	2,316
Cheboygan	70	45	58	65	62	57	48	49
Clare	935	1,021	953	851	670	790	910	775
Crawford	4,766	4,374	3,879	3,381	3,299	3,272	3,475	3,768
Gladwin	641	543	496	499	343	256	100	38
Grand Traverse	5,243	4,737	4,763	4,085	3,648	3,038	2,960	2,879
Iosco	695	1,078	1,160	1,161	824	584	443	166
Kalkaska	13,795	13,336	10,483	9,766	9,850	8,859	7,433	6,868
Lake	0	0	0	0	0	14	400	852
Manistee	15,064	13,737	13,259	12,878	11,463	10,348	9,753	10,020
Mason	768	474	477	381	1,195	602	318	164
Mecosta	603	549	797	655	579	578	573	725
Missaukee	330	272	241	217	170	67	69	79
Montmorency	81,634	77,175	71,451	65,535	60,002	54,385	52,469	48,370
Newaygo	408	322	262	272	287	315	461	476
Oceana	4,342	5,596	3,001	2,498	2,671	2,683	2,119	833
Ogemaw	3,619	3,002	2,551	2,110	1,708	1,331	1,318	1,252
Osceola	2,569	2,432	2,227	2,082	1,822	1,576	1,675	1,797
Oscoda	8,840	9,486	8,804	8,543	8,156	7,934	8,413	8,265
Otsego	77,907	72,813	70,216	67,196	64,175	58,139	53,693	49,943
Presque Isle	862	510	627	654	515	316	247	181
Roscommon	46	70	41	55	33	21	39	40
Wexford	95	107	125	145	161	202	182	150
NLP Total	272,658	262,354	247,346	234,269	220,948	202,938	194,076	184,714
SLP Total	14,470	10,819	9,797	10,550	8,590	8,676	7,409	5,953
State	287,128	273,173	257,144	244,819	229,538	211,614	201,485	190,667

**Table A5.17. Distribution of Michigan lands and oil and gas wells by ecoregion and county, 2005.**

Ecoregion/ county	County Land Area	State- owned Land Area	State Forest Land Area	Wells on Private. Land	Wells on State Land	State Oil- Gas Wells	State Land Area
	Acres			Wells		Percent of Area Total	
<b>Western Upper Peninsula</b>							
Menominee	667,853	98,289	97,591	0	0	0.0%	14.7%
Ontonagon	839,379	69,259	16,898	0	0	0.0%	8.3%
Dickinson	490,458	230,594	230,594	0	0	0.0%	47.0%
Baraga	578,560	78,474	69,372	0	0	0.0%	13.6%
Keweenaw	346,221	12,361	11,622	0	0	0.0%	3.6%
Delta	748,819	68,885	68,102	0	0	0.0%	9.2%
Houghton	647,501	44,261	43,652	0	0	0.0%	6.8%
Marquette	1,165,472	262,873	261,846	0	0	0.0%	22.6%
Iron	746,470	83,967	83,660	0	0	0.0%	11.2%
Gogebic	705,190	11,933	0	0	0	0.0%	1.7%
WUP total	6,935,923	960,895	883,338	0	0	0.0%	13.9%
<b>Eastern Upper Peninsula</b>							
Luce	577,971	306,474	292,087	0	0	0.0%	53.0%
Mackinac	653,811	210,614	210,426	0	0	0.0%	32.2%
Chippewa	999,078	213,093	181,316	0	0	0.0%	21.3%
Schoolcraft	753,990	290,187	289,257	0	0	0.0%	38.5%
Alger	587,411	96,332	93,783	0	0	0.0%	16.4%
EUP total	3,572,262	1,116,699	1,066,870	0	0	0.0%	31.3%
<b>Northern Lower Peninsula</b>							
Charlevoix	266,778	49,134	45,598	149	20	11.8%	18.4%
Lake	363,162	59,301	59,301	8	7	46.7%	16.3%
Montmorency	350,483	138,183	137,888	1,220	1,024	45.6%	39.4%
Iosco	351,430	22,752	22,622	6	6	50.0%	6.5%
Missaukee	362,720	102,250	102,250	369	15	3.9%	28.2%
Clare	362,752	51,479	51,443	239	24	9.1%	14.2%
Mecosta	355,642	13,067	0	38	1	2.6%	3.7%
Manistee	347,910	25,160	20,129	581	182	23.9%	7.2%
Crawford	357,197	206,191	197,775	162	376	69.9%	57.7%
Grand Traverse	297,645	69,572	68,239	293	134	31.4%	23.4%
Kalkaska	359,053	174,879	174,879	284	256	47.4%	48.7%
Emmet	299,405	77,212	66,309	0	0	0.0%	25.8%
Leelanau	223,021	6,816	5,085	0	0	0.0%	3.1%
Gladwin	324,352	85,495	85,175	192	57	22.9%	26.4%
Alcona	431,635	10,093	8,200	301	44	12.8%	2.3%
Wexford	361,914	53,551	53,291	23	11	32.4%	14.8%
Mason	316,909	4,657	0	36	1	2.7%	1.5%
Roscommon	333,696	202,438	201,078	136	85	38.5%	60.7%

Alpena	367,456	49,429	47,506	656	148	18.4%	13.5%
Antrim	305,242	44,285	44,232	1,150	404	26.0%	14.5%
Arenac	234,778	31,628	28,495	241	18	6.9%	13.5%
Cheboygan	457,984	182,339	180,921	4	13	76.5%	39.8%
Benzie	205,638	62,771	62,093	10	21	67.7%	30.5%
Newaygo	539,117	6,344	0	65	9	12.2%	1.2%
Presque Isle	422,445	86,201	80,578	41	33	44.6%	20.4%
Ogemaw	361,152	77,636	73,113	519	232	30.9%	21.5%
Oscoda	361,600	56,679	56,679	168	197	54.0%	15.7%
Osceola	362,227	18,461	18,461	201	4	2.0%	5.1%
Otsego	329,306	100,343	100,288	2,961	1,207	29.0%	30.5%
Oceana	345,894	5,544	0	103	0	0.0%	1.6%
NLP	10,358,541	2,073,890	1,991,626	10,156	4,529	30.8%	20.0%
<b>Southern Lower Peninsula</b>							
Ingham	357,882	4,978	0	154	6	3.8%	1.4%
Huron	535,373	14,360	0	1	0	0.0%	2.7%
Hillsdale	383,258	3,306	0	348	0	0.0%	0.9%
Gratiot	364,883	16,650	0	17	0	0.0%	4.6%
Allegan	529,574	50,819	0	193	0	0.0%	9.6%
Cass	314,995	4,226	0	61	0	0.0%	1.3%
Berrien	365,440	3,279	0	0	0	0.0%	0.9%
Bay	284,320	5,990	0	524	10	1.9%	2.1%
Genesee	409,370	0	0	27	0	0.0%	0.0%
Calhoun	453,581	0	0	385	0	0.0%	0.0%
Clinton	365,734	10,852	0	0	0	0.0%	3.0%
Eaton	368,902	791	0	79	0	0.0%	0.2%
Branch	324,742	405	0	0	0	0.0%	0.1%
Barry	355,930	25,931	0	21	0	0.0%	7.3%
Midland	333,562	43,150	43,150	248	15	5.7%	12.9%
Wayne	393,056	2,266	0	1	6	85.7%	0.6%
Washtenaw	454,362	15,540	0	3	0	0.0%	3.4%
Van Buren	390,950	771	0	8	0	0.0%	0.2%
Tuscola	519,955	31,887	0	124	0	0.0%	6.1%
Shiawassee	344,787	933	0	5	0	0.0%	0.3%
Sanilac	616,832	10,284	0	0	0	0.0%	1.7%
St. Joseph	322,381	2,214	0	0	0	0.0%	0.7%
St. Clair	463,597	19,516	0	167	0	0.0%	4.2%
Saginaw	517,715	17,285	0	54	1	1.8%	3.3%
Ottawa	362,016	3,326	0	176	0	0.0%	0.9%
Oakland	558,406	28,723	0	55	3	5.2%	5.1%
Muskegon	325,837	12,289	0	12	0	0.0%	3.8%
Monroe	352,704	4,857	0	7	0	0.0%	1.4%
Ionia	366,854	11,153	0	0	0	0.0%	3.0%
Lenawee	480,320	4,197	0	2	0	0.0%	0.9%
Isabella	367,533	2,742	2,384	286	10	3.4%	0.7%

Jackson	452,224	17,050	0	147	0	0.0%	3.8%
Kalamazoo	359,590	6,261	0	0	0	0.0%	1.7%
Kent	547,949	8,311	0	175	0	0.0%	1.5%
Montcalm	453,146	13,636	0	38	0	0.0%	3.0%
Lapeer	418,688	13,019	0	98	0	0.0%	3.1%
Livingston	363,776	17,905	0	91	4	4.2%	4.9%
Macomb	307,482	1,044	0	59	3	4.8%	0.3%
SLP Total	15,487,706	429,943	45,533	3,566	58	1.6%	2.8%
<b>Michigan</b>							
State Total	30,123,699	3,632,465	3,104,029	13,722	4,587	25.1%	12.1%

**Table A5.18. Mineral occurrences by commodity group, development status, ecoregion and county.**

Ecoregion/ County	Development Status	Clay	Stone	Sand And Gravel	Other Non- metallic	Iron	Copper	Gold/ Silver	Other Metallic
<b>Western Upper Peninsula</b>									
Baraga	Past Producer		1	5	6	19			
	Producer			2	2				
	Occurrence								4
	Prospect				1	1		8	1
Delta	Past Producer	2	3	1	1				
	Producer		2	11	1				
Dickinson	Past Producer	1	1			64			1
	Producer		3	11	1				
	Plant					1			
	Prospect					7			
Gogebic	Past Producer		1	2		52			
	Producer			8			1		
	Occurrence					41	1		
	Prospect	1			1	2	1	2	
	Unknown			1					
Houghton	Past Producer	1	5				90	2	
	Producer		5	8					
	Prospect		1				32		1
Iron	Past Producer		1		1	182			1
	Producer			14		2			
	Occurrence					82			
	Prospect				1	624			1
	Unknown					1			
Keweenaw	Past Producer						98	1	2
	Producer			5			6		
	Occurrence						4		
	Prospect						33		
Marquette	Past Producer		1		6	194	1	2	
	Producer		1	9		12	1	2	
	Plant					7		1	
	Occurrence					4	33	22	20
	Prospect					28		30	
Menominee	Producer			12					
Ontonagon	Past Producer		1	1			76	8	
	Producer		2	3			2		
	Plant						2		
	Occurrence							2	
	Prospect						8	2	

Ecoregion/ County	Development Status	Clay	Stone	Sand And Gravel	Other Non- metallic	Iron	Copper	Gold/ Silver	Other Metallic
<b>Eastern Upper Peninsula</b>									
Alger	Past Producer	1	1	2					
	Producer			3					
Chippewa	Past Producer	4							
	Producer		1	13	2				1
Luce	Past Producer		2						
	Producer			6					
Mackinac	Past Producer	1	3						
	Producer		2	19	2				1
	Prospect		2						
Schoolcraft	Past Producer				1				
	Producer		1	6	3				

Ecoregion/ County	Development Status	Clay	Stone	Sand And Gravel	Other Non- metallic	Iron	Copper	Gold/ Silver	Other Metallic
<b>Northern Lower Peninsula</b>									
Alcona	Past Producer	1		2					
	Producer			3					
Alpena	Past Producer	1	1	4	1				1
	Producer		1	2	1				
	Plant		1						
Antrim	Past Producer	4		1					
	Producer	1		7					
	Prospect	2							
Arenac	Past Producer	3	3		2				
	Producer		4	1					
Benzie	Producer			1					1
Charlevoix	Past Producer	4	1						
	Producer		2	5	1				
	Prospect	2							
Cheboygan	Past Producer	1	4	2					
	Producer			3					
	Prospect	6	1						
Clare	Past Producer	1		1					
	Producer			5					
	Prospect	1							
	Unknown			1					
Crawford	Past Producer			1					
	Producer			1					
Emmet	Past Producer	1	5						
	Producer			9					

Ecoregion/ County	Development Status	Clay	Stone	Sand And Gravel	Other Non- metallic	Iron	Copper	Gold/ Silver	Other Metallic
	Prospect	1							
Gladwin	Past Producer	1							
	Producer			1					
	Prospect	2							
Grand Traverse	Producer			8		1			
	Prospect	2							
Iosco	Past Producer	2			2				
	Producer			1	6				
Kalkaska	Producer			2					
Lake	Past Producer	1							
	Producer			7					
Leelanau	Past Producer	1							
	Producer			5					
Manistee	Past Producer	3			1				
	Producer			4	1				5
Mason	Past Producer	2		1					1
	Producer			3	1				
	Plant								1
Mecosta	Past Producer	1							
	Producer			10					
	Prospect				1				
Missaukee	Past Producer	2							
	Producer			5					
Montmorency	Past Producer	1							
	Producer			7					
	Prospect	1							
Newaygo	Past Producer	1		2					
	Producer			10					
	Prospect	1							
Oceana	Past Producer	3		1					
	Producer			8					
Ogemaw	Past Producer	1		3					
	Producer			9					
Osceola	Producer			3	1				
	Past Producer	1		1					
	Producer			3					
Otsego	Past Producer	1		1					
	Producer			12					
Presque Isle	Past Producer				1				
	Producer		2	8	3				
	Prospect	3			2				
Roscommon	Past Producer			3					

Ecoregion/ County	Development Status	Clay	Stone	Sand And Gravel	Other Non- metallic	Iron	Copper	Gold/ Silver	Other Metallic
	Producer			7					
	Prospect	2							
Wexford	Past Producer	1							
	Producer			6					2
	Prospect	1							

Ecoregion/ County	Development Status	Clay	Stone	Sand And Gravel	Other Non- metallic	Iron	Copper	Gold/ Silver	Other Metallic
<b>Michigan</b>									
State	Past Producer	148	43	136	51	511	266	13	20
	Producer	7	38	694	50	19	10	2	30
	Plant		1	1		8	2	1	3
	Occurrence					127	38	24	24
	Prospect	42	4	2	7	662	74	42	3
	Unknown				6	1	1		

Data source: U.S. Geological Survey, 2005, Mineral Resources Data System: U.S. Geological Survey, Reston, Virginia. (<http://tin.er.usgs.gov/mrds/>)

**Table A5.19. Area (thousand acres) of State-owned land, by ownership rights, ecoregion, and county.**

<b>Ecoregion/ County</b>	<b>Surface</b>	<b>Mineral and Surface</b>	<b>Minerals</b>	<b>Mixed Ownership</b>	<b>Other Rights</b>
<b>Western Upper Peninsula</b>					
Baraga	13	64	61	2	6
Delta	3	64	152	1	0
Dickinson	30	191	52	5	0
Gogebic	7	5	98	1	11
Houghton	5	40	55	3	0
Iron	11	72	91	5	1
Keweenaw	7	4	4	0	0
Marquette	48	211	97	5	0
Menominee	7	90	72	2	0
Ontonagon	26	39	121	3	18
WUP Total	158	780	804	27	37
<b>Eastern Upper Peninsula</b>					
Alger	5	92	59	2	47
Chippewa	45	173	155	4	0
Luce	9	281	19	8	0
Mackinac	12	187	133	9	0
Schoolcraft	27	262	69	2	22
EUP Total	97	996	435	25	70
<b>Northern Lower Peninsula</b>					
Alcona	1	8	100	0	0
Alpena	4	44	29	2	0
Antrim	2	42	20	2	1
Arenac	1	29	18	2	0
Benzie	2	58	16	3	1
Charlevoix	4	54	16	1	0
Cheboygan	4	176	41	5	0
Clare	10	42	11	2	0
Crawford	11	164	19	5	8
Emmet	2	75	24	2	0
Gladwin	2	83	23	2	0
Grand Traverse	3	64	13	4	1
Iosco	1	23	64	1	0
Kalkaska	28	127	29	5	2
Lake	3	57	44	2	1
Leelanau	0	8	12	0	0
Manistee	1	22	46	2	0
Mason	0	6	21	0	
Mecosta	1	12	11	2	0
Missaukee	15	87	18	2	1
Montmorency	8	128	27	2	1

Newaygo	3	3	53	1	0
Oceana	0	5	30	0	0
Ogemaw	7	68	37	2	0
Osceola	1	18	21	1	0
Oscoda	4	49	74	3	1
Otsego	1	96	28	5	1
Presque Isle	4	84	30	2	0
Roscommon	10	187	8	6	0
Wexford	13	40	57	2	1
NLP Total	146	1,860	940	70	19
<b>State</b>	465	3,983	2,247	150	130

Data Source: Compiled from Statewide DNR ownership GIS shapefile database.

**Table A5.20. Per-capita water use and per-acre withdrawals from ground and surface water, by ecoregion and county, 2000.**

Ecoregion/ County	Total pop- ulation	Per- capita use	Land area	Total water use	Ground- water with- drawals	Ground- water with- drawals	Surface water with- drawals	Total with- drawals
	Thousan d persons	Gal/Day	Thousan d Acres	Gal/Acre/ Day	Gal/Acre/ Day	Million Gal/Day	Million Gal/Day	Million Gal/Day
<b>Western Upper Peninsula</b>								
Baraga	8,750	237	578.6	3.58	0.71	0.41	1.66	2.07
Delta	38,520	1,678	748.8	86.31	3.15	2.36	62.27	64.63
Dickinson	27,470	799	490.5	44.75	8.09	3.97	17.98	21.95
Gogebic	17,370	147	705.2	3.63	3.63	2.56	0	2.56
Houghton	36,020	136	647.5	7.55	7.51	4.86	0.03	4.89
Iron	13,140	197	746.5	3.47	3.22	2.4	0.19	2.59
Keweenaw	2,300	96	346.2	0.64	0.58	0.2	0.02	0.22
Marquette	64,630	4,548	1,165.5	252.20	3.99	4.65	289.28	293.93
Menominee	25,330	209	667.9	7.94	2.41	1.61	3.69	5.3
Ontonagon	7,820	2,515	839.4	23.43	0.52	0.44	19.23	19.67
WUP	241	1,731	6,936	60.2	3.4	23.5	394.4	417.8
<b>Eastern Upper Peninsula</b>								
Alger	9,860	690	587.4	11.58	2.42	1.42	5.38	6.8
Chippewa	38,540	139	999.1	5.35	2.41	2.41	2.94	5.35
Luce	7,020	161	578.0	1.96	1.96	1.13	0	1.13
Mackinac	11,940	861	653.8	15.72	1.30	0.85	9.43	10.28
Schoolcraft	8,900	1,300	754.0	15.35	0.73	0.55	11.02	11.57
EUP	76	461	3,572	9.8	1.8	6.4	28.8	35.1
<b>Northern Lower Peninsula</b>								
Alcona	11,720	108	431.6	2.92	2.80	1.21	0.05	1.26
Alpena	31,310	4,117	367.5	350.79	5.17	1.9	127	128.9
Antrim	23,110	194	305.2	14.71	14.35	4.38	0.11	4.49
Arenac	17,270	2,195	234.8	161.43	5.58	1.31	36.59	37.9
Benzie	16,000	156	205.6	12.16	12.11	2.49	0.01	2.5
Charlevoix	26,090	1,737	266.8	169.92	48.28	12.88	32.45	45.33
Cheboygan	26,450	148	458.0	8.56	7.88	3.61	0.31	3.92
Clare	31,250	133	362.8	11.47	9.65	3.5	0.66	4.16
Crawford	14,270	170	357.2	6.80	6.58	2.35	0.08	2.43
Emmet	31,440	192	299.4	20.21	20.21	6.05	0	6.05
Gladwin	26,020	93	324.4	7.49	7.40	2.4	0.03	2.43
Grand Traverse	77,650	151	297.6	39.31	22.17	6.6	5.1	11.7
Iosco	27,340	117	351.4	9.08	4.84	1.7	1.49	3.19
Kalkaska	16,570	237	359.1	10.92	10.19	3.66	0.26	3.92
Lake	11,330	103	363.2	3.22	3.14	1.14	0.03	1.17
Leelanau	21,120	164	223.0	15.56	15.07	3.36	0.11	3.47

Manistee	24,530	1,764	347.9	124.40	13.51	4.7	38.58	43.28
Mason	28,270	815	316.9	72.73	8.52	2.7	20.35	23.05
Mecosta	40,550	167	355.6	19.06	14.14	5.03	1.75	6.78
Missaukee	14,480	159	362.7	6.34	6.04	2.19	0.11	2.3
Montmorency	10,320	120	350.5	3.54	3.00	1.05	0.19	1.24
Newaygo	47,870	161	539.1	14.26	13.08	7.05	0.64	7.69
Oceana	26,870	207	345.9	16.05	14.08	4.87	0.68	5.55
Ogemaw	21,640	116	361.2	6.92	6.56	2.37	0.13	2.5
Osceola	23,200	229	362.2	14.66	14.16	5.13	0.18	5.31
Oscoda	9,420	140	361.6	3.65	2.99	1.08	0.24	1.32
Otsego	23,300	167	329.3	11.84	11.69	3.85	0.05	3.9
Presque Isle	14,410	553	422.4	18.87	6.65	2.81	5.16	7.97
Roscommon	25,470	104	333.7	7.94	7.91	2.64	0.01	2.65
Wexford	30,480	274	361.9	23.07	22.74	8.23	0.12	8.35
NLP	8,871	1,033	15,488	591.5	38.2	592.2	8,568.8	9,161.0
<b>State</b>	9,938	1,006	36,354	275.0	20.2	734.3	9,264.3	9,998.6

## Glossary of selected forest inventory terms

<b>Annual mortality</b>	The average annual volume of sound wood in growing-stock trees that died from natural causes during the period between inventories.
<b>Annual removals</b>	The net volume of growing stock trees removed from the inventory during a specified year by harvesting, cultural operations such as timber stand improvement, or land clearing.
<b>Bureau of Land Management (BLM)</b>	An ownership class of Federal lands administered by the Bureau of Land Management, U.S. Department of the Interior.
<b>Commercial species</b>	Tree species suitable for industrial wood products.
<b>County and municipal</b>	An ownership class of public lands owned by counties or local public agencies, or lands leased by these governmental units for more than 50 years.
<b>Cull tree</b>	A live tree, 5.0 inches in diameter at breast height (d.b.h.) or larger, that is unmerchantable for saw logs now or prospectively because of rot, roughness, or species. (See definitions for rotten and rough trees.)
<b>Diameter class</b>	A classification of trees based on diameter outside bark measured at breast height (4-1/2 feet above ground). D.b.h. is the common abbreviation for diameter at breast height. With 2-inch diameter classes, the 6-inch class, for example, includes trees 5.0 through 6.9 inches d.b.h.
<b>Federal</b>	An ownership class of public lands owned by the U.S. Government.
<b>Fiber products</b>	Products derived from wood and bark residues, such as pulp, composition board products, and wood chips for export.
<b>Forest industry</b>	An ownership class of private lands owned by companies or individuals operating wood-using plants.
<b>Forest land</b>	Land at least 10 percent stocked by forest trees of any size, including land that formerly had such tree cover and that will be naturally or artificially regenerated. Forest land includes transition zones, such as areas between heavily forested and nonforested lands that are at least 10 percent stocked with forest trees and forest areas adjacent to urban and built-up lands. Also included are pinyon-juniper and chaparral areas in the West and afforested areas. The minimum area for classification of forest land is 1 acre. Roadside, streamside, and shelterbelt strips of trees must have a crown width of at least 120 feet to qualify as forest land. Unimproved roads and trails, streams, and clearings in forest areas are classified as forest if less than 120 feet wide.
<b>Forest type</b>	A classification of forest land based on the species presently forming a plurality of the live-tree stocking.
<b>Forest type group</b>	A combination of forest types that share closely associated species or site requirements and are generally combined for brevity of reporting.
<b>White-red-jack pine</b>	Forests in which eastern white pine, red pine, or jack pine, singly or in combination, comprise a plurality of the stocking. Common associates include hemlock, aspen, birch, and maple.
<b>Spruce-fir</b>	Forests in which spruce or true firs, singly or in combination, comprise a plurality of the stocking. Common associates include white cedar, tamarack, maple, birch, and hemlock.
<b>Longleaf-slash pine</b>	Forests in which longleaf or slash pine, singly or in combination, comprise a plurality of the stocking. Common associates include other southern pines, oak, and gum.
<b>Loblolly-shortleaf pine</b>	Forests in which loblolly pine, shortleaf pine, or southern 13 yellow pines, except longleaf or slash pine, singly or in combination, comprise a plurality of the stocking. Common associates include oak, hickory, and gum.
<b>Oak-pine</b>	Forests in which hardwoods (usually upland oaks) comprise a plurality of the stocking, but in which pine or eastern redcedar comprises 25-50 percent of the stocking. Common associates include gum, hickory, and yellow-poplar.

	roads and nonforest strips must be more than 120 feet wide, and clearings, etc., must be more than 1 acre in area, to qualify as nonforest land.)
<b>Nonindustrial private</b>	An ownership class of private lands where the owner does not operate wood-using plants.
<b>Nonstocked areas</b>	Timberland less than 10 percent stocked with all live trees.
<b>Other Federal</b>	An ownership class of Federal lands other than those administered by the Forest Service or the Bureau of Land Management. This category includes the National Park Service, Fish and Wildlife Service, Departments of Defense and Energy, and miscellaneous Federal ownerships.
<b>Other forest land</b>	Forest land other than timberland and reserved forest land. It includes available forest land, which is incapable of annually producing 20 cubic feet per acre of industrial wood under natural conditions because of adverse site conditions such as sterile soils, dry climate, poor drainage, high elevation, steepness, or rockiness.
<b>Other land</b>	Nonforest land less the area in streams, sloughs, estuaries, and canals between 120 and 200 feet wide and lakes, reservoirs, and ponds between 1 and 4.5 acres in area.
<b>Other private</b>	An ownership class of private lands that are not owned by forest industry or farmers.
<b>Other products</b>	A miscellaneous category of roundwood products that includes such items as cooperage, pilings, poles, posts, shakes, shingles, board mills, charcoal, and export logs.
<b>Other public</b>	An ownership class that includes all public lands except national forests. This category generally includes State, county, and municipal ownerships.
<b>Other red oaks</b>	A group of species in the genus <i>Quercus</i> that includes scarlet oak, northern pin oak, southern red oak, bear oak, shingle oak, laurel oak, blackjack oak, water oak, pin oak, willow oak, and black oak.
<b>Other removals</b>	Unutilized wood volume from cut or otherwise killed growing stock, from cultural operations such as precommercial thinnings, or from timberland clearing. Does not include volume removed from inventory through reclassification of timberland to productive reserved forest land.
<b>Other sources</b>	Sources of roundwood products that are not growing stock. These include salvable dead trees, rough and rotten trees, trees of noncommercial species, trees less than 5.0 inches d.b.h., tops, and roundwood harvested from nonforest land (for example, fence rows).
<b>Other white oaks</b>	A group of species in the genus <i>Quercus</i> that includes overcup oak, chestnut oak, and post oak.
<b>Ownership</b>	The property owned by one ownership unit, including all parcels of land in the United States.
<b>Ownership unit</b>	A classification of ownership encompassing all types of legal entities having an ownership interest in land, regardless of the number of people involved. A unit may be an individual; a combination of persons; a legal entity such as a corporation, partnership, club, or trust; or a public agency. An ownership unit has control of a parcel or group of parcels of land.
<b>Poletimber trees</b>	Live trees at least 5.0 inches in d.b.h. but smaller than sawtimber trees.
<b>Primary wood-using mill</b>	A mill that converts roundwood products into other wood products. Common examples are sawmills that convert saw logs into lumber and pulpmills that convert pulpwood into wood pulp.
<b>Productivity class</b>	A classification of forest land in terms of potential annual cubic-foot volume growth per acre at culmination of mean annual increment in fully stocked natural stands.
<b>Pulpwood</b>	Roundwood, whole-tree chips, or wood residues that are used for the production of wood pulp.
<b>Reserved forest land</b>	Forest land withdrawn from timber utilization through statute, administrative regulation, or designation without regard to productive status.
<b>Residues</b>	Bark and woody materials that are generated in primary wood-using mills when roundwood products are converted to other products. Examples are slabs, edgings, trimmings, miscuts, sawdust, shavings, veneer cores and clippings, and pulp screenings. Includes bark

<b>Oak-hickory</b>	Forests in which upland oaks or hickory, singly or in combination, comprise a plurality of the stocking except where pines comprise 25-50 percent, in which case the stand is classified as oak-pine. Common associates include yellow-poplar, elm, maple, and black walnut.
<b>Oak-gum-cypress</b>	Bottomland forests in which tupelo, blackgum, sweetgum, oaks, or southern cypress, singly or in combination, comprise a plurality of the stocking except where pines comprise 25-50 percent, in which case the stand is classified as oak-pine. Common associates include cottonwood, willow, ash, elm, hackberry, and maple.
<b>Elm-ash-cottonwood</b>	Forests in which elm, ash, or cottonwood, singly or in combination, comprise a plurality of the stocking. Common associates include willow, sycamore, beech, and maple.
<b>Maple-beech-birch</b>	Forests in which maple, beech, or yellow birch, singly or in combination, comprise a plurality of the stocking. Common associates include hemlock, elm, basswood, and white pine.
<b>Aspen-birch</b>	Forests in which aspen, balsam poplar, paper birch, or gray birch, singly or in combination, comprise a plurality of the stocking. Common associates include maple and balsam fir.
<b>Other softwoods</b>	Forests in which other softwood species not mentioned above comprise a plurality of the stocking. These are primarily black spruce forests in interior Alaska.
<b>Fuelwood</b>	Wood used for conversion to some form of energy, primarily in residential use.
<b>Growing stock</b>	A classification of timber inventory that includes live trees of commercial species meeting specified standards of quality or vigor. Cull trees are excluded. When associated with volume, includes only trees 5.0 inches d.b.h. and larger.
<b>Hardwood</b>	A dicotyledonous tree, usually broad-leaved and deciduous.
<b>Industrial wood</b>	All commercial roundwood products except fuelwood.
<b>Land area</b>	The area of dry land and land temporarily or partly covered by water, such as marshes, swamps, and river flood plains; streams, sloughs, estuaries, and canals less than 200 feet wide; and lakes, reservoirs, and ponds less than 4.5 acres in area.
<b>Live cull</b>	A classification that includes live cull trees. When associated with volume, it is the net volume in live cull trees that are 5.0 inches d.b.h. and larger.
<b>Logging residues</b>	The unused portions of growing-stock and non-growing-stock trees cut or killed by logging and left in the woods (footnote on table 40).
<b>Lowland forest types</b>	Generally refers to the elm-ash-cottonwood and oak-gum-cypress forest types.
<b>National forest</b>	An ownership class of Federal lands, designated by Executive order or statute as national forests or purchase units, and other lands under the administration of the Forest Service including experimental areas and Bankhead-Jones Title III lands.
<b>Native American land</b>	(a) Lands held in trust by the United States or individual States for Native American tribes or individual Native Americans; (b) Lands owned in fee by Native American tribes whether subject to Federal or State restrictions against alienation or not.
<b>Net annual growth</b>	The average annual net increase in the volume of trees during the period between inventories. Components include the increment in net volume of trees at the beginning of the specific year surviving to its end, plus the net volume of trees reaching the minimum size class during the year, minus the volume of trees that died during the year, and minus the net volume of trees that became cull trees during the year.
<b>Net volume in cubic feet</b>	The gross volume in cubic feet less deductions for rot, roughness, and poor form. Volume is computed for the central stem from a 1-foot stump to a minimum 4.0-inch top diameter outside bark, or to the point where the central stem breaks into limbs.
<b>Noncommercial species</b>	Tree species of typically small size, poor form, or inferior quality, which normally do not develop into trees suitable for industrial wood products.
<b>Nonforest land</b>	Land that has never supported forests and lands formerly forested where use of timber management is precluded by development for other uses. (Note: Includes area used for crops, improved pasture, residential areas, city parks, improved roads of any width and adjoining clearings, powerline clearings of any width, and 1- to 4.5-acre areas of water classified by the Bureau of the Census as land. If intermingled in forest areas, unimproved

	residues and wood residues (both coarse and fine materials) but excludes logging residues.
<b>Rotten tree</b>	A live tree of commercial species that does not contain a saw log now or prospectively primarily because of rot (that is, when rot accounts for more than 50 percent of the total cull volume).
<b>Rough tree</b>	(a) A live tree of commercial species that does not contain a saw log now or prospectively primarily because of roughness (that is, when sound cull due to such factors as poor form, splits, or cracks accounts for more than 50 percent of the total cull volume) or (b) a live tree of noncommercial species.
<b>Roundwood products</b>	Logs, bolts, and other round timber generated from harvesting trees for industrial or consumer use.
<b>Salvable dead tree</b>	A downed or standing dead tree that is considered currently or potentially merchantable by regional standards.
<b>Saplings</b>	Live trees 1.0 inch through 4.9 inches d.b.h.
<b>Saw log</b>	A log meeting minimum standards of diameter, length, and defect, including logs at least 8 feet long, sound and straight, and with a minimum diameter inside bark of 6 inches for softwoods and 8 inches for hardwoods, or meeting other combinations of size and defect specified by regional standards.
<b>Seedlings</b>	Live trees less than 1.0 inch d.b.h. and at least 1 foot in height.
<b>Select red oaks</b>	A group of species in the genus <i>Quercus</i> that includes cherrybark oak, northern red oak, and Shumard oak.
<b>Select white oaks</b>	A group of species in the genus <i>Quercus</i> that includes white oak, swamp white oak, bur oak, swamp chestnut oak, and chinkapin oak.
<b>Softwood</b>	A coniferous tree, usually evergreen, having needles or scale-like leaves.
<b>Sound dead</b>	The net volume in salvable dead trees.
<b>Stand-size class</b>	A classification of forest land based on the size class of all live trees in the area. The classes include:
<b>Nonstocked stands</b>	Forest land that is stocked with less than 10 percent of full stocking with all live trees. Examples are recently cut-over areas or recently reverted agricultural fields.
<b>Seedling-sapling stands</b>	Forest land that is stocked with at least 10 percent of full stocking with all live trees with half or more of such stocking in seedlings or saplings or both.
<b>Poletimber stands</b>	Forest land that is stocked with at least 10 percent of full stocking with all live trees with half or more of such stocking in poletimber or sawtimber trees or both, and in which the stocking of poletimber exceeds that of sawtimber.
<b>Sawtimber stands</b>	Forest land that is stocked with at least 10 percent of full stocking with all live trees with half or more of such stocking in poletimber or sawtimber trees or both, and in which the stocking of sawtimber is at least equal to that of poletimber.
<b>State</b>	An ownership class of public lands owned by States or lands leased by States for more than 50 years.
<b>Stocking</b>	The degree of occupancy of land by trees, measured by basal area or number of trees by size and spacing, or both, compared to a stocking standard; that is, the basal area or number of trees, or both, required to fully utilize the growth potential of the land.
<b>Timberland</b>	Forest land that is producing or is capable of producing crops of industrial wood and not withdrawn from timber utilization by statute or administrative regulation. (Note: Areas qualifying as timberland are capable of producing in excess of 20 cubic feet per acre per year of industrial wood in natural stands. Currently inaccessible and inoperable areas are included.)
<b>Tops</b>	The wood of a tree above the merchantable height (or above the point on the stem 4.0 inches diameter outside bark [d.o.b.]). It includes the usable material in the uppermost stem.
<b>Unreserved forest</b>	Forest land that is not withdrawn from harvest by statute or administrative regulation.

<b>land</b>	Includes forest lands that are not capable of producing in excess of 20 cubic feet per acre per year of industrial wood in natural stands.
<b>Veneer log</b>	A roundwood product from which veneer is sliced or sawn and that usually meets certain standards of minimum diameter and length and maximum defect.
<b>Weight</b>	The weight of wood and bark, oven-dry basis (approximately 12 percent moisture content).

Source: Smith, W. Brad; Miles, Patrick D.; Vissage, John S.; Pugh, Scott A. 2003. Forest Resources of the United States, 2002. Gen. Tech. Rep. NC-241. St. Paul, MN: USDA-Forest Service, North Central Research Station. 137 p.