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Minnesota's Forest Statistics, 1987: An Inventory Update

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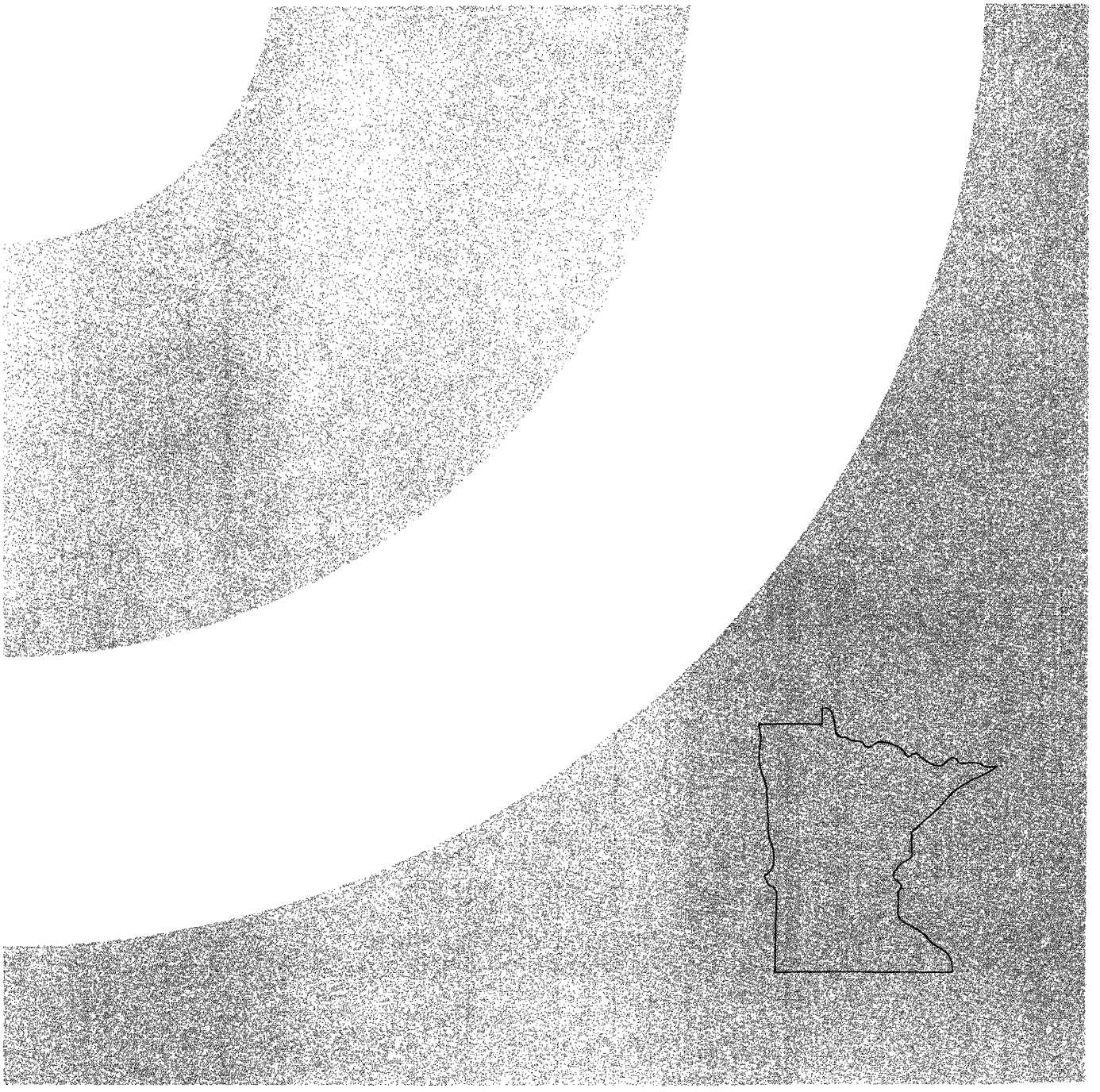

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FOREWORD

Forest Inventory and Analysis (FIA) is a continuing endeavor as mandated by the Forest and Rangeland Renewable Resources Planning Act of 1974, which was preceded by the McSweeney-McNary Forest Research Act of 1928. The objective of FIA is to periodically inventory the Nation's forest land to determine its extent, condition, and volume of timber, growth, and depletions. Up-to-date resource information is essential for framing intelligent forest policies and programs. USDA Forest Service regional experiment stations are responsible for conducting these inventories and publishing summary reports for individual States. The North Central Forest Experiment Station is responsible for Forest Inventory and Analysis work in Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, South Dakota, and Wisconsin.

We were aided in making area estimates by the Minnesota Department of Natural Resources, Minnesota forest industry, and Region 9 of the Forest Service.

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MINNESOTA'S FOREST STATISTICS, 1987: AN INVENTORY UPDATE

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UPDATE HIGHLIGHTS

Timberland

- Timberland area declined from 13.7 million acres in 1977 to 13.5 million acres in 1987, a loss of less than 1 percent.
- Aspen is still the dominant forest type with 5.3 million acres or 39 percent of Minnesota's 1987 timberland area.
- The area of maple-birch forest type climbed 1.2 percent to 1.3 million acres as Minnesota's second-growth forests continue to mature.
- Red pine is still the most popular plantation species as shown by the 70,000-acre gain in the red pine forest type since 1977. This estimate is based on information received from Minnesota Department of Natural Resources and forest industry experts.

Timber Volume

- Growing-stock volume in 1987 was 13.7 billion cubic feet, 14 percent higher than the 12.0 billion cubic feet reported in 1977. Average growing-stock volume per acre in 1987 was 1,013 cubic feet, compared with 881 cubic feet in 1977.
- Sawtimber volume totaled 30.9 billion board feet in 1987, up 30 percent from the 1977 figure adjusted to conform to changed volume equations.

Net Growth

- Annual net growth increased from 26 cubic feet per acre per year in 1976 to 36 cubic feet in 1986. The 1976 figure was adjusted to conform to changed volume equations.
- Mortality declined from 0.8 percent of inventory in 1976 to 0.6 percent in 1986. Much of the decline is attributed to increased management activity reflected by the update.
- The growth processor used in this study does not accommodate catastrophic mortality. Therefore the estimate of balsam fir volume should be 60 to 70 million cubic feet lower because of loss from spruce budworm attacks primarily in St. Louis, Lake, and Cook Counties in the Aspen-Birch Unit. This would represent a reduction of about 10 percent in the reported balsam fir volume in the Unit. The impact on forest area would be a shift of acres from the older age classes balsam fir (50 to 70 years) to the youngest age class.
- Additional loss may have also occurred in elm because of the increase in dutch elm disease in the State. As much as 10 to 15 percent of the reported volume may be affected.

Removals

- Annual growing-stock removals climbed sharply from 194 million cubic feet in 1976 to 251 million cubic feet in 1986. Major industrial expansion in the waferboard and pulp industry in northern Minnesota is primarily responsible for the increase.

Biomass

- Tree biomass totaled 797 million green tons in 1987. Of this volume, 73 percent was in growing-stock trees, 14 percent was in cull trees, and 13 percent was in trees less than 5 inches d.b.h.
- The average green weight per cubic foot (including bark) for softwood species was 45 pounds; the average for hardwoods was 53 pounds.

BACKGROUND

Current facts about the Nation's forest resources such as area, timber volume, biomass, and prospective supply and demand are essential for forming sound management practices and policies. The Forest and Rangeland Renewable Resources Planning Act of 1974

(RPA) requires the Forest Service to make and keep current a comprehensive inventory and analysis of renewable forest and rangeland resources.

The most recent field inventory data available for Minnesota are dated 1977; however, tree growth models developed at the North Central Forest Experiment Station have made it possible for the Forest Inventory and Analysis (FIA) work unit to update inventory data to estimate the current resource. The purpose of this report is to present updated statistics for Minnesota that will be used for the 1990 RPA assessment. The tables provide data by Forest Survey Unit (fig. 1) and represent the timberland base as of January 1, 1987. The term "update", as it is used here, is an estimate of current forest statistics derived by modeling the dynamic change in a forest from a known time in the past. The major components of this change are land change, growth, mortality, regeneration, and removals.

METHODOLOGY

Land Base Change

The basic sample design used by FIA in the North Central Region is a two-phase sample consisting of (1) a photo sample to estimate forest-nonforest area and

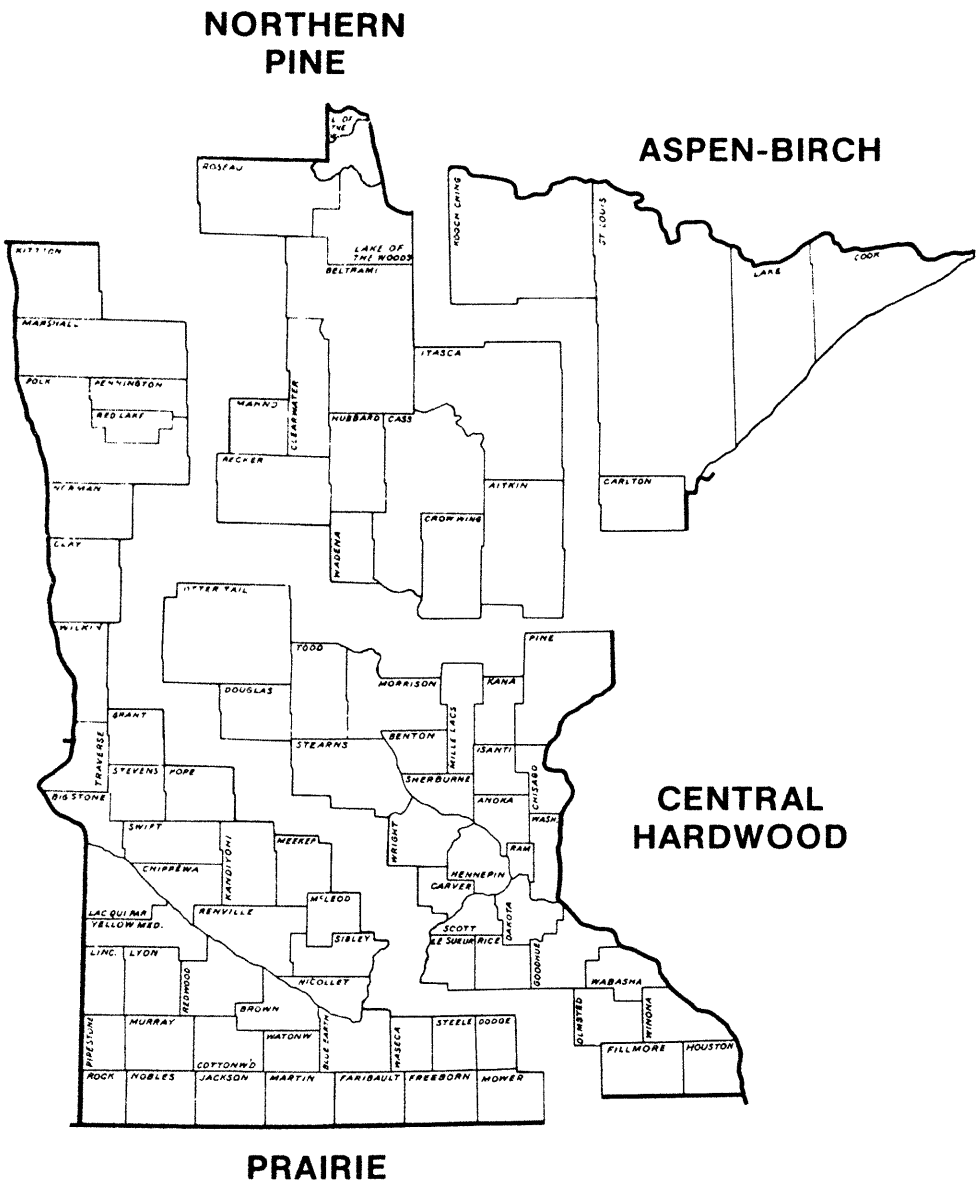

Figure 1.—*Minnesota's four Forest Survey Units.*

(2) a ground phase, which is a subsample of the photo sample, to provide information about the volume and condition of the forest.

New photo work for an update of the entire region would be too costly and time consuming with current technology. However, we've found that for update periods of 10 years or less, area change at the State level can be estimated using trend analysis and gathering information from local resource managers. These data then provide the first-phase area factors to be applied to the updated plots.

We assumed the timberland area for public and industry ownerships was stable during the update period. For all other ownerships, a modest annual decline of about 0.1 percent was assumed, which reflects the resource managers' view that urbanization and agricultural expansion have not seriously eroded the timberland base of the region.

The timberland area figures presented here represent the most recent data available at the time the update was processed. The reader is cautioned to contact the appropriate public agency to verify or update area figures for any analysis that may be sensitive to local changes in the timberland base, such as recently designated reserved or deferred forest lands. Area and volume figures would have to be adjusted accordingly for any ownerships affected by significant changes in the timberland base.

Public agencies are able to provide detailed information about management plans that outline the policies and programs designed to ensure a viable forest resource into the future. Additional information is available about non-industrial private owners and their objectives in the North Central Station report, "The Private Forest Landowners of Minnesota" (Carpenter *et al.* 1985).

Growth and Mortality

(We used the Stand and Tree Evaluation and Modeling System (STEMS) (Belcher 1981) to update to the year 1987 8,547 forest inventory plots established during the 1977 field survey.) STEMS is a distance-independent, individual tree growth model designed to simulate tree growth and mortality for a diverse range of forest conditions.

Growth and mortality functions were calibrated and validated with data from throughout the Lake States (Buchman 1983, Holdaway and Brand 1983, 1985). Test projections over a range of forest conditions produced reliable results when compared with remeasurement data from the Lake States. Adjustment factors derived from recent remeasurement data in the Lake States were used to fine tune the model and improve precision (Holdaway 1985).

Regeneration

Although STEMS regeneration routines for the Lake States had not been fully developed at the time of the update, the outcome was not significantly affected. Most trees that became established on harvested land or in seedling stands at the beginning of the update would not have grown to merchantable size by the end of the 9-year period.

Removals

Removals data were derived by trend analysis using periodic pulpwood (Blyth and Smith 1985), saw log (Blyth *et al.* 1981), and veneer (Blyth and Smith 1984) reports and base year data for all removals provided in the 1977 Minnesota report (Jakes 1980). Removals attributed to loss of timberland were made by adjusting plot expansion factors to arrive at a specified set of current area figures by forest type. Estimates of timber removals in the Lake States may be reviewed in more detail in a recent article, "Tracking Timber Demand in the Lake States" (Smith and Blyth 1986).

The Lake States version of STEMS was modified to simulate actual removals. Computerized management guides (Brand 1981) were used to select a subset of inventory plots that were eligible for silvicultural treatment during the update period. These guides were used in lieu of detailed information on Minnesota management strategies. A special removals algorithm scanned each selected plot to determine if it would be cut. The volume from cut plots was accumulated until the estimated volume of growing-stock removals by species was reached. Volume estimates were produced using volume equations developed for the Lake States (Hahn 1984, Smith 1985).

All area and volume figures for the update were reviewed by personnel from the Minnesota Department of Natural Resources, the National Forest System, industry resource managers, and other private individuals to assure reasonableness and consistency. A more detailed description of the methodology will be presented later in a publication on inventory updating procedures in the North Central Region.

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APPENDIX

METRIC EQUIVALENT OF UNITS USED IN THIS REPORT

1 acre = 4,046.86 square meters or 0.405 hectare.

1,000 acres = 405 hectares.

1 cubic foot = 0.0283 cubic meter.

1 foot = 30.48 centimeters or 0.3048 meter.

1 inch = 25.4 millimeters, 2.54 centimeters, or 0.0254 meter.

TREE SPECIES GROUPS IN MINNESOTA[1]

SOFTWOODS
Eastern white pine ..... *Pinus strobus*
Red pine ..... *Pinus resinosa*
Jack pine ..... *Pinus banksiana*
White spruce ..... *Picea glauca*
Black spruce ..... *Picea mariana*
Balsam fir ..... *Abies balsamea*
Tamarack ..... *Larix laricina*
Northern white-cedar ..... *Thuja occidentalis*
Other softwoods
  Eastern redcedar ..... *Juniperus virginiana*
  Scotch pine ..... *Pinus sylvestris*

HARDWOODS
White oak
  White oak ..... *Quercus alba*
  Swamp white oak ..... *Quercus bicolor*
  Bur oak ..... *Quercus macrocarpa*
Select red oak
  Northern red oak ..... *Quercus rubra*
Other red oak
  Northern pin oak ..... *Quercus ellipsoidalis*
  Black oak ..... *Quercus velutina*
Hickory
  Bitternut hickory ..... *Carya cordiformis*
  Shagbark hickory ..... *Carya ovata*
Hard maple
  Sugar maple ..... *Acer saccharum*
  Black maple ..... *Acer nigrum*
Soft maple
  Red maple ..... *Acer rubrum*
  Silver maple ..... *Acer saccharinum*
Ash
  White ash ..... *Fraxinus americana*
  Black ash ..... *Fraxinus nigra*
  Green ash ..... *Fraxinus pennsylvanica*
Balsam poplar ..... *Populus balsamifera*
Eastern cottonwood ..... *Populus deltoides*
Bigtooth aspen ..... *Populus grandidentata*
Quaking aspen ..... *Populus tremuloides*
Basswood ..... *Tilia americana*
Black walnut ..... *Juglans nigra*
Black cherry ..... *Prunus serotina*
Butternut ..... *Juglans cinerea*
Elm
  American elm ..... *Ulmus americana*
  Slippery elm ..... *Ulmus rubra*
  Rock elm ..... *Ulmus thomasii*
Paper birch ..... *Betula papyrifera*
Other hardwoods
  Boxelder ..... *Acer negundo*
  River birch ..... *Betula nigra*
  Black willow ..... *Salix nigra*
  Hackberry ..... *Celtis occidentalis*
  Kentucky coffeetree ..... *Gymnocladus dioicus*

[1] *The common and scientific names are based on: Little, Elbert L., Jr. 1976. Checklist of United States trees (native and naturalized). Agric. Handb. 541. Washington, DC: U.S. Department of Agriculture, Forest Service. 375 p.*

DEFINITIONS

Acceptable trees.—Growing-stock trees of commercial species that meet specified standards of size and quality.

Basal area.—The area in square feet of the cross section at breast height of a single tree. When the basal area of all trees in a stand are summed, the result is usually expressed as square feet of basal area per acre.

Biomass.—The total above-ground weight, excluding foliage, of all live trees reported in green tons. Biomass is made up of 5 components:

Growing-stock bole and stump.—Biomass of a growing-stock tree from ground level to a 4-inch top.

Growing-stock top and limbs.—Biomass of a growing-stock tree above a 4-inch top and all limbs below the 4-inch top.

Cull bole and stump.—Biomass of a cull tree from ground level to a 4-inch top.

Cull top and limbs.—Biomass of a cull tree above a 4-inch top and all limbs below the 4-inch top.

1- to 5-inch trees.—Above ground biomass of all live trees 1- to 5-inches in diameter at breast height.

Commercial species.—Tree species presently or prospectively suitable for industrial wood products. (Note: Excludes species of typically small size, poor

form, or inferior quality such as hophornbeam and hawthorn.)

County and municipal land.—Land owned by counties and local public agencies or municipalities, or land leased to these governmental units for 50 years or more.

Cropland.—Land under cultivation within the past 24 months; including cropland harvested, crop failures, cultivated summer fallow, idle cropland used only for pasture, orchards, and land in soil improvement crops, but excluding land cultivated in developing improved pasture.

Cull.—Portions of a tree that are unusable for industrial wood products because of rot, form, or other defect.

Diameter classes.—A classification of trees based on diameter outside bark, measured at breast height (4.5 feet above the ground). (Note: D.b.h. is the common abbreviation for diameter at breast height. Two-inch diameter classes are commonly used in Forest Survey, with the even inch the approximate midpoint for a class. For example, the 6-inch class includes trees 5.0 through 6.9 inches d.b.h.)

Farm.—Any place from which $1,000 or more of agricultural products were produced and sold during the year.

Farmer-owned land.—Land owned by farm operators. (Note: Excludes land leased by farm operators from nonfarm owners, such as railroad companies and States.)

Forest industry land.—Land owned by companies or individuals operating primary wood-using plants.

Forest land.—Land at least 16.7 percent stocked by forest trees of any size, or formerly having had such tree cover, and not currently developed for nonforest use. (Note: Stocking is measured by comparison of basal area and/or number of trees, by age or size and spacing with specified standards.) The minimum area for classification of forest land is 1 acre. Roadside, streamside, and shelterbelt strips of timber must have a crown width of at least 120 feet to qualify as forest land. Unimproved roads and trails, streams, or other bodies of water or clearings in forest areas shall be classed as forest if less than 120 feet wide. Also see definitions for land area, timberland, nontimberland, reserved forest land, stocking, woodland, and water.

Forest industry land.—Land owned by companies or individuals operating primary wood-using plants. Excludes land owned by small sawmill firms sawing less than 100,000 board feet annually.

Forest trees.—Woody plants having a well-developed stem and usually more than 12 feet tall at maturity.

Forest type.—A classification of forest land based on the species forming a plurality of live tree stocking. Major forest types are:

Jack pine.—Forests in which jack pine comprises a plurality of the stocking. (Common associates include eastern white pine, red pine, aspen, birch, and maple.)

Red pine.—Forests in which red pine comprises a plurality of the stocking. (Common associates include eastern white pine, jack pine, aspen, birch, and maple.)

White pine.—Forests in which eastern white pine comprises a plurality of the stocking. (Common associates include red pine, jack pine, aspen, birch, and maple.)

Balsam fir.—Forests in which balsam fir and white spruce comprise a plurality of stocking with balsam fir the most common. (Common associates include aspen, maple, birch, northern white-cedar, and tamarack.)

White spruce.—Forests in which white spruce and balsam fir comprise a plurality of the stocking with white spruce the most common. (Common associates include aspen, maple, birch, northern white-cedar, and tamarack.)

Black spruce.—Forests in which swamp conifers comprise a plurality of the stocking with black spruce the most common. (Common associates include tamarack and northern white-cedar.)

Northern white-cedar.—Forests in which swamp conifers comprise a plurality of the stocking with northern white-cedar the most common. (Common associates include tamarack and black spruce.)

Tamarack.—Forests in which swamp conifers comprise a plurality of the stocking with tamarack the most common. (Common associates include black spruce and northern white-cedar.)

Oak-hickory.—Forests in which northern red oak, white oak, bur oak, or hickories, singly or in combination, comprise a plurality of the stocking. (Common associates include jack pine, elm, and maple.)

Elm-ash-soft maple.—Forests in which lowland elm, ash, cottonwood, and red maple, singly or in combination, comprise a plurality of the stocking. (Common associates include birches, spruce, and balsam fir.)

Maple-birch.—Forests in which sugar maple, basswood, yellow birch, upland American elm, and red maple, singly or in combination, comprise a plurality of the stocking. (Common associates include white pine, elm, and basswood.)

Aspen.—Forests in which quaking aspen or bigtooth aspen, singly or in combination, comprise a

plurality of the stocking. (Common associates include balsam poplar, balsam fir, and paper birch.)

Paper birch.—Forests in which paper birch comprises a plurality of the stocking. (Common associates include maple, aspen, and balsam fir.)

Balsam poplar.—Forests in which balsam poplar comprises a plurality of the stocking. (Common associates include aspen, elm, and ash.)

Gross area.—The entire area of land and water as determined by the Bureau of the Census.

Growing-stock trees.—Live trees of commercial species qualifying as acceptable trees. (Note: Excludes rough, rotten, and dead trees.)

Growing-stock volume.—Net volume in cubic feet of growing-stock trees 5 inches d.b.h. and over, from a 1-foot stump to a minimum 4 inch top diameter outside bark of the central stem. Cubic feet can be converted to cords by dividing by 79 cubic feet per solid wood cord.

Hardwoods.—Dicotyledonous trees, usually broad-leaved and deciduous.

Idle farmland.—Includes former cropland, orchards, improved pastures, and farm sites not tended within the past 2 years and presently less than 16.7 percent stocked with trees.

Improved pasture.—Land currently improved for grazing by cultivating, seeding, irrigating, or clearing of trees or brush and less than 16.7 percent stocked with live trees.

Indian land.—All lands held in trust by the United States for individual Indians or tribes, or all lands, titles to which are held by individual Indians or tribes, subject to federal restrictions against alienation.

Industrial wood.—All roundwood products, except fuelwood.

Land area.—*Bureau of the Census.*—The area of dry land and land temporarily or partly covered by water such as marshes, swamps, and river flood plains (omitting tidal flats below mean high tide); streams, sloughs, estuaries, and canals less than one-eighth of a statute mile wide; and lakes, reservoirs, and ponds less than 40 acres in area.

Forest Inventory and Analysis.—The same as the Bureau of the Census, except minimum width of streams, etc., is 120 feet and minimum size of lakes, etc., is 1 acre.

Live trees.—Growing-stock, rough, and rotten trees 1 inch d.b.h. and larger.

Marsh.—Nonforest land that characteristically supports low, generally herbaceous or shrubby vegetation and that is intermittently covered with water.

Merchantable.—Refers to a pulpwood or saw log section that meets pulpwood or saw log specifications, respectively.

Miscellaneous federal land.—Federal land other than National Forest.

Miscellaneous private land.—Privately owned land other than forest-industry and farmer-owned land.

Mortality.—The volume of sound wood in growing-stock and sawtimber trees that die annually.

National Forest land.—Federal land that has been legally designated as National Forest or purchase units, and other land administered by the USDA Forest Service.

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

Net annual growth of sawtimber.—The annual change in the volume of live sawtimber trees and the total volume of trees reaching sawtimber size, less volume losses resulting from natural causes.

Net volume.—Gross volume less deductions for rot, sweep, or other defect affecting use for timber products.

Nontimberland.—(a) Woodland and (b) reserved forest land.

Noncommercial species.—Tree species of typically small size, poor form, or inferior quality that normally do not develop into trees suitable for industrial wood products.

Nonforest land.—Land that has never supported forests, and land formerly forested where use for timber management is precluded by development for other uses. (Note: Includes areas 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 40-acre areas of water classified by the Bureau of the Census as land. If intermingled in forest areas, unimproved roads and nonforest strips must be more than 120 feet wide and more than 1 acre in area to qualify as nonforest land.)

a. *Nonforest land without trees.*—Nonforest land with no live trees present.

b. *Nonforest land with trees.*—Nonforest land with one or more trees per acre at least 5 inches d.b.h.

Nonstocked land.—Timberland less than 16.7 percent stocked with growing-stock trees.

Other removals.—Growing-stock trees removed but not utilized for products, or trees left standing but "removed" from the timberland classification by land use change. Examples are removals from cultural operations such as timber stand improvement work, land clearing, and changes in land use.

Ownership.—Property owned by one owner, regardless of the number of parcels in a specified area.

Pasture and range.—Land which is currently improved for grazing by cultivation, seeding, or irrigation, plus land on which the natural plant cover is composed principally of native grasses, forbs, or shrubs valuable for forage.

Pastured timberland.—Timberland for which the primary use is wood production, but is presently used for grazing.

Physiographic class.—A measure of soil and water conditions that affect tree growth on a site. The physiographic classes are:

Xeric sites.—Very dry soils where excessive drainage seriously limits both growth and species occurrence. Example: sandy jack pine plains.

Xeromesic sites.—Moderately dry soils where excessive drainage limits growth and species occurrence to some extent. Example: dry oak ridge.

Mesic sites.—Deep, well-drained soils. Growth and species occurrence are limited only by climate.

Hydromesic sites.—Moderately wet soils where insufficient drainage or infrequent flooding limits growth and species occurrence to some extent. Example: better drained bottomland hardwood sites.

Hydric sites.—Very wet sites where excess water seriously limits both growth and species occurrence. Example: frequently flooded river bottoms and spruce bogs.

Poletimber stands.—(See stand-size class.)

Poletimber trees.—Growing-stock trees of commercial species at least 5 inches d.b.h. but smaller than sawtimber size.

Reserved forest land.—Forest land sufficiently productive to qualify as timberland but withdrawn from timber utilization through statute, administrative regulation, designation, or exclusive use for Christmas tree production, as indicated by annual shearing.

Rotten trees.—Live trees of commercial species that do not contain at least one 12-foot saw log or two saw logs 8 feet or longer, now or prospectively, and/or do not meet regional specifications for freedom from defect primarily because of rot; that is, when more than 50 percent of extra cull volume in a tree is rotten.

Rough trees.—(a) Live trees of commercial species that do not contain at least one merchantable 12-foot saw log or two saw logs 8 feet or longer, now or prospectively, and/or do not meet regional specifications for freedom from defect primarily because of roughness or poor form, and (b) all live trees of noncommercial species.

Salvable dead trees.—Standing or down dead trees that are considered merchantable by regional standards.

Saplings.—Live trees 1 to 5 inches d.b.h.

Sapling-seedling stands.—(See stand-size class.)

Saw log.—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 outside bark (d.o.b.) for softwoods of 7 inches (9 inches for hardwoods) or other combinations of size and defect specified by regional standards.

Saw log portion.—That part of the bole of sawtimber trees between the stump and the saw log top.

Saw log top.—The point on the bole of sawtimber trees above which a saw log cannot be produced. The minimum saw log top is 7 inches d.o.b. for softwoods and 9 inches d.o.b. for hardwoods.

Sawtimber stands.—(See stand-size class.)

Sawtimber trees.—Growing-stock trees of commercial species containing at least a 12-foot saw log or two noncontiguous saw logs 8 feet or longer, and meeting regional specifications for freedom from defect. Softwoods must be at least 9 inches d.b.h. Hardwoods must be at least 11 inches d.b.h.

Sawtimber volume.—Net volume of the saw log portion of live sawtimber in board feet, International 1/4-inch rule, from stump to a minimum 7 inches top d.o.b. for softwoods and a minimum 9 inches top d.o.b. for hardwoods.

Seedlings.—Live trees less than 1 inch d.b.h. that are expected to survive. Only softwood seedlings more than 6 inches tall and hardwood seedlings more than 1 foot tall are counted.

Short-log (rough tree).—Sawtimber-size trees of commercial species that contain at least one merchantable 8- to 11-foot saw log but not a 12-foot saw log.

Site class.—A classification of forest land in terms of inherent capacity to grow crops of industrial wood based on fully stocked natural stands.

Site index.—An expression of forest site quality based on the total height of free-growing dominant or codominant trees of a representative species in the forest type at age 50.

Softwoods.—Coniferous trees, usually evergreen, having needles or scale-like leaves.

Stand.—A growth of trees on a minimum of 1 acre of forest land that is stocked by forest trees of any size.

Stand-age class.—Age of the main stand. Main stand refers to trees of the dominant forest type and stand-size class.

Stand-area class.—The extent of a continuous forested area of the same forest type, stand-size class, and stand-density class.

Stand-size class.—A classification of forest land based on the size class of all live trees; that is, sawtimber, poletimber of seedlings and saplings. Only those types contributing to no more than 16 percent stocking at a point will be used to determine stand size class. Remember that stands with less than 16.7 percent stocking in growing stock trees will be classified as non-stocked. Non-commercial trees are not used for determining stand size classes.

Sawtimber stands.—Stands with at least the all live stocking in sawtimber and poletimber trees and with the sawtimber stocking equal to or larger than the poletimber stocking.

Poletimber stands.—Stands with at least half of the all live stocking in sawtimber and poletimber trees and with the poletimber stocking larger than the sawtimber stocking.

Sapling-seedling stands.—Stands with more than half of the all live stocking in saplings and/or seedlings.

State land.—Land owned by States, or land leased to these governmental units for 50 years or more.

Stocking.—The degree of occupancy of land by trees, measured by basal area and/or the number of trees in a stand by size or age and spacing, compared to the basal area and/or number of trees required to fully utilize the growth potential of the land; that is, the stocking standard. A stocking percent of 100 indicates full utilization of the site and is equivalent to 80 square feet of basal area per acre in trees 5 inches d.b.h. and larger. In a stand of trees less than 5 inches d.b.h., a stocking percent of 100 would indicate that the present number of trees is sufficient to produce 80 square feet of basal area per acre when the trees reach 5 inches d.b.h. Stands are grouped into the following stocking classes:

Overstocked stands.—Stands in which stocking of trees is 134.0 percent or more.

Fully stocked stands.—Stands in which stocking of trees is from 101.0 to 133.9 percent.

Medium stocked stands.—Stands in which stocking of trees is from 61.0 to 100.9 percent.

Poorly stocked stands.—Stands in which stocking of trees is from 16.7 to 60.9 percent.

Nonstocked areas.—Timberland on which stocking of trees is less than 16.7 percent.

Timber removals from growing stock.—The volume of sound wood in live sawtimber and poletimber trees removed annually for forest products (including roundwood products and logging residues) and for other removals. Roundwood products are logs, bolts, or other round sections cut from trees. Logging residues are the unused portions of cut trees plus unused trees killed by logging. Other removals are growing-stock trees removed by cultural operations such as timber stand improvement work, and by land clearing and changes in land use.

Timber removals from sawtimber.—The net board-foot volume of live sawtimber trees removed for forest products annually (including roundwood products and logging residues) and for other removals.

Timberland.—Forest land producing or capable of producing crops of industrial wood and not withdrawn from timber utilization. (Note: Areas qualifying as timberland are capable of producing more than 20 cubic feet per acre per year of annual growth under management. Currently inaccessible and inoperable areas are included, except when the areas involved are small and unlikely to become suitable for producing of industrial wood in the foreseeable future.) Also see definition of pastured timberland.

Tree biomass.—The total aboveground weight (including the bark) of all live trees.

Tree size class.—A classification of trees based on diameter at breast height, including sawtimber trees, poletimber trees, saplings, and seedlings.

Upper stem portion.—That part of the bole of sawtimber trees above the saw log top to a minimum top diameter of 4 inches outside bark or to the point where the central stem breaks into limbs.

Urban and other areas.—Areas within the legal boundaries of cities and towns; suburban areas developed for residential, industrial, or recreational purposes; schoolyards; cemeteries; roads; railroads; airports; beaches; power lines; and other rights-of-way; or other nonforest land not included in any other specified land use class.

Water.—*Bureau of the Census.*—Permanent inland water surfaces, such as lakes, reservoirs, and ponds having 40 acres or more of area; streams, sloughs, estuaries, and canals one-eighth of a statute mile or more in width.

Noncensus.—Permanent inland water surfaces, such as lakes, reservoirs, and ponds having 1 to 39.9 acres of area; streams, sloughs, estuaries, and canals 120 feet to one-eighth of a statute mile in width.

Windbreak.—A group of trees less than 120 feet wide used for the protection of soil, cropfields, and buildings in use.

Wooded pasture.—Improved pasture with more than 16.7 percent stocking in live trees but less than 25 percent stocking in growing-stock trees. Area is currently improved for grazing or there is other evidence of grazing.

Wooded strip.—An acre or more of natural continuous forest land that would otherwise meet survey standards for timberland except that it is less than 120 feet wide.

Woodland.—Forest land incapable of producing 20 cubic feet per acre of annual growth or of yielding crops of industrial wood under natural conditions because of adverse site conditions. (Note: Adverse conditions include shallow soils, dry climate, poor drainage, high elevation, steepness, and rockiness).

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Table 19.—All live tree biomass on timberland by species group and tree biomass component

Table 1.--Area of land by land class and Forest Survey Unit, Minnesota, 1977 and 1987

(In thousand acres)

			Forest survey unit							
	All units		Aspen-birch		Northern pine		Central hardwood		Prairie	
Land use class	1977	1987	1977	1987	1977	1987	1977	1987	1977	1987
Forest land										
Timberland										
Jack pine	496.9	468.1	167.2	157.6	318.4	300.2	11.3	10.3	-	-
Red pine	262.9	310.4	118.6	119.9	133.8	173.6	10.5	16.9	-	-
White pine	65.7	65.7	34.6	34.6	24.1	24.1	7.0	7.0	-	-
Balsam fir	812.2	801.8	594.9	588.2	209.7	206.0	7.6	7.6	-	-
White spruce	118.1	121.8	87.6	89.2	30.5	32.6	-	-	-	-
Black spruce	1,058.1	1,037.3	768.1	756.5	272.2	264.1	17.8	16.7	-	-
Northern white-cedar	479.0	496.0	297.4	306.4	181.6	189.6	-	-	-	-
Tamarack	473.5	468.4	157.3	157.3	284.1	284.1	31.1	26.0	1.0	1.0
Oak-hickory	893.3	873.7	5.3	5.3	247.1	237.7	571.4	561.2	69.5	69.5
Elm-ash-cottonwood	725.4	712.8	245.0	255.0	296.6	293.5	129.2	114.6	54.6	49.7
Maple-basswood	1,275.4	1,290.3	203.9	220.9	467.7	471.7	486.3	490.5	117.5	107.2
Aspen	5,328.2	5,278.0	1,950.2	1,933.9	2,564.3	2,551.0	560.6	550.1	253.1	243.0
Paper birch	959.3	963.6	511.3	511.3	368.3	372.6	79.7	79.7	-	-
Balsam poplar	547.8	550.3	205.6	205.6	298.9	304.8	10.7	12.6	32.6	27.3
Nonstocked	138.1	138.1	44.6	44.6	60.1	60.1	27.7	27.7	5.7	5.7
Subtotal	13,633.9	13,576.3	5,391.6	5,386.3	5,757.4	5,765.7	1,950.9	1,920.9	534.0	503.4
Woodland	1,834.4	1,834.4	969.8	969.8	706.9	706.9	119.1	119.1	38.6	38.6
Reserved	1,178.4	1,178.4	1,050.6	1,050.6	46.9	46.9	72.3	72.3	8.6	8.6
Total	16,646.7	16,589.1	7,412.0	7,406.7	6,511.2	6,519.5	2,142.3	2,112.3	581.2	550.6
Nonforest land										
Cropland	26,426.5	26,386.0	330.3	330.3	2,006.0	1,971.0	7,252.9	7,247.4	16,837.3	16,837.3
Pasture and range	1,124.8	1,124.8	95.4	95.4	581.0	581.0	290.2	290.2	158.2	158.2
Other	6,846.8	6,644.9	795.7	801.0	1,956.9	1,983.6	2,233.8	2,269.3	1,560.4	1,591.0
Total	34,098.1	34,155.7	1,221.4	1,226.7	4,543.9	4,535.6	9,776.9	9,806.9	18,555.9	18,586.5
Total land	50,744.8	50,744.8	8,633.4	8,633.4	11,055.1	11,055.1	11,919.2	11,919.2	19,137.1	19,137.1
Water (Bureau of Census)	3,058.7	3,058.7	715.1	715.1	1,437.7	1,437.7	581.9	581.9	324.0	324.0
Total land and water	53,803.5	53,803.5	9,348.5	9,348.5	12,492.8	12,492.8	12,501.1	12,501.1	19,461.1	19,461.1

Table 2.--Area of timberland by ownership class and Forest Survey Unit, Minnesota, 1987

(In thousand acres)

		Forest survey unit			
Ownership class	All units	Aspen-birch	Northern pine	Central hardwood	Prairie
National forest	1,668.8	1,108.0	560.8	-	-
Bureau of land mgmt.	43.6	8.0	35.6	-	-
Miscellaneous fed.	111.7	20.3	62.1	20.3	9.0
State	2,656.7	1,128.6	1,237.3	246.2	44.6
County and municipal	2,333.9	1,180.8	1,093.9	59.2	-
Indian	464.6	98.1	362.2	4.3	-
Forest industry	791.2	531.2	256.5	0.5	3.0
Farmer	3,346.1	540.1	1,312.9	1,121.1	372.0
Misc. private-corp.	471.2	247.7	154.9	63.0	5.6
Misc. private-indiv.	1,688.5	523.5	689.5	406.3	69.2
All owners	13,576.3	5,386.3	5,765.7	1,920.9	503.4

Table 3.--Area of timberland by forest type, stand-age class, and Forest Survey Unit, Minnesota, 1987

(In thousand acres)

Forest type	All ages	Stand-age class(years) 1-20	21-30	31-40	41-50	51-60	61-70	71-80	81-100	101-120	121+
ALL UNITS											
Jack pine	468.1	115.1	25.8	37.6	108.2	106.6	57.5	13.2	4.1	-	-
Red pine	310.4	75.0	10.4	21.9	73.7	25.8	14.8	18.8	30.5	31.2	8.3
White pine	65.7	-	3.3	-	5.0	6.9	4.2	9.8	13.0	22.2	1.3
Balsam fir	801.8	56.4	70.8	77.3	98.4	227.0	150.5	61.1	42.0	18.3	-
White spruce	121.8	33.2	35.0	5.3	4.2	10.7	13.4	4.3	15.7	-	-
Black spruce	1,037.3	117.2	106.9	172.8	145.2	108.1	111.3	98.2	145.2	28.1	4.3
Northern white-cedar	496.0	5.5	11.2	26.1	22.7	20.4	43.3	63.0	120.6	81.4	101.8
Tamarack	468.4	37.2	75.5	48.6	31.0	37.0	60.3	26.4	77.1	46.9	28.4
Oak-hickory	873.7	91.1	37.6	12.9	54.9	141.9	126.3	138.6	181.5	88.9	-
Elm-ash-cottonwood	712.8	77.0	50.4	45.8	38.1	77.1	113.5	102.0	131.1	69.7	8.1
Maple-basswood	1,290.3	33.2	56.2	40.3	92.0	192.2	235.8	197.2	275.1	131.7	36.6
Aspen	5,278.0	1,065.4	528.7	422.8	796.9	1,130.9	836.6	286.7	161.2	45.3	3.5
Paper birch	963.6	49.1	45.9	38.7	107.3	240.1	251.9	123.7	80.8	23.4	2.7
Balsam poplar	550.3	67.4	76.0	44.4	89.8	120.3	79.1	38.7	32.9	1.7	-
Nonstocked	138.1	127.6	2.8	1.6	1.3	4.8	-	-	-	-	-
All types	13,576.3	1,950.4	1,136.5	996.1	1,668.7	2,449.8	2,098.5	1,181.7	1,310.8	588.8	195.0
ASPEN-BIRCH											
Jack pine	157.6	67.8	9.0	2.7	47.4	17.0	10.4	3.3	-	-	-
Red pine	119.9	2.1	3.7	1.1	68.6	5.8	9.5	10.0	16.6	1.2	1.3
White pine	34.6	-	1.4	-	-	-	-	3.8	8.5	19.6	1.3
Balsam fir 1/	588.2	44.0	45.9	50.8	80.7	165.7	115.5	38.7	29.9	17.0	-
White spruce	89.2	17.9	33.7	1.5	4.2	10.7	5.5	1.4	14.3	-	-
Black spruce	756.5	73.6	87.1	113.2	108.3	85.2	81.1	70.1	113.5	23.0	1.4
Northern white-cedar	306.4	3.7	8.5	17.4	18.5	15.6	26.7	31.6	75.4	39.9	69.1
Tamarack	157.3	15.9	31.1	21.4	14.0	15.1	14.7	11.8	15.1	12.0	6.2
Oak-hickory	5.3	-	-	-	1.2	2.7	1.4	-	-	-	-
Elm-ash-cottonwood	255.0	30.5	21.7	10.2	12.7	31.2	38.3	34.9	43.2	28.1	4.2
Maple-basswood	220.9	6.5	17.5	6.1	15.2	47.2	37.7	15.5	39.6	15.2	20.4
Aspen	1,933.9	397.3	178.8	160.0	241.3	376.7	346.1	117.2	74.3	38.7	3.5
Paper birch	511.3	36.8	27.9	21.5	45.5	121.2	140.6	67.2	45.3	3.9	1.4
Balsam poplar	205.6	24.6	15.0	11.4	34.4	52.2	34.9	15.2	16.6	1.3	-
Nonstocked	44.6	44.6	-	-	-	-	-	-	-	-	-
All types	5,386.3	765.3	481.3	417.3	692.0	946.3	862.4	420.7	492.3	199.9	108.8
NORTHERN PINE											
Jack pine	300.2	45.8	16.8	32.7	57.3	86.5	47.1	9.9	4.1	-	-
Red pine	173.6	67.4	4.6	14.6	5.1	18.6	5.3	8.8	12.2	30.0	7.0
White pine	24.1	-	-	-	5.0	6.9	2.8	3.0	3.8	2.6	-
Balsam fir	206.0	12.4	22.9	26.5	17.7	57.0	33.7	22.4	12.1	1.3	-
White spruce	32.6	15.3	1.3	3.8	-	-	7.9	2.9	1.4	-	-
Black spruce	264.1	43.6	18.3	52.3	36.2	21.4	26.1	26.5	31.7	5.1	2.9
Northern white-cedar	189.6	1.8	2.7	8.7	4.2	4.8	16.6	31.4	45.2	41.5	32.7
Tamarack	284.1	21.3	39.4	25.5	16.4	16.2	41.5	12.1	58.7	32.1	20.9
Oak-hickory	237.7	23.5	15.4	7.4	18.1	59.5	45.0	29.5	29.4	9.9	-
Elm-ash-cottonwood	293.5	25.4	17.4	23.6	16.1	21.2	45.1	42.2	68.6	31.4	2.5
Maple-basswood	471.7	6.8	14.5	13.9	35.6	79.3	110.5	66.0	86.2	46.8	12.1
Aspen	2,551.0	496.7	267.5	200.7	393.1	566.1	405.5	140.0	74.8	6.6	-
Paper birch	372.6	8.2	11.0	11.9	45.0	98.7	97.7	52.1	27.2	19.5	1.3
Balsam poplar	304.8	36.5	54.8	29.9	48.4	58.5	39.4	22.5	14.4	0.4	-
Nonstocked	60.1	58.5	-	-	-	1.6	-	-	-	-	-
All types	5,765.7	863.2	486.6	451.5	698.2	1,096.3	924.2	469.3	469.8	227.2	79.4

(Table 3 continued on next page)

(Table 3 continued)

Forest type	All ages	Stand-age class(years) 1-20	21-30	31-40	41-50	51-60	61-70	71-80	81-100	101-120	121+
CENTRAL HARDWOOD											
Jack pine	10.3	1.5	-	2.2	3.5	3.1	-	-	-	-	-
Red pine	16.9	5.5	2.1	6.2	-	1.4	-	-	1.7	-	-
White pine	7.0	-	1.9	-	-	-	1.4	3.0	0.7	-	-
Balsam fir	7.6	-	2.0	-	-	4.3	1.3	-	-	-	-
White spruce	-	-	-	-	-	-	-	-	-	-	-
Black spruce	16.7	-	1.5	7.3	0.7	1.5	4.1	1.6	-	-	-
Northern white-cedar	-	-	-	-	-	-	-	-	-	-	-
Tamarack	26.0	-	4.0	1.7	0.6	5.7	4.1	2.5	3.3	2.8	1.3
Oak-hickory	561.2	58.8	20.9	5.5	34.3	73.7	77.2	99.0	128.6	63.2	-
Elm-ash-cottonwood	114.6	16.8	11.3	6.3	4.1	15.8	20.5	17.7	16.9	5.2	-
Maple-basswood	490.5	18.7	18.4	15.4	39.8	60.9	72.0	92.5	117.8	51.9	3.1
Aspen	550.1	104.1	42.3	38.3	122.2	144.2	69.6	22.0	7.4	-	-
Paper birch	79.7	4.1	7.0	5.3	16.8	20.2	13.6	4.4	8.3	-	-
Balsam poplar	12.6	1.6	1.6	-	-	3.7	3.8	-	1.9	-	-
Nonstocked	27.7	23.1	1.4	1.6	-	1.6	-	-	-	-	-
All types	1,920.9	234.2	114.4	89.8	222.0	336.1	267.6	242.7	286.6	123.1	4.4
PRAIRIE											
Jack pine	-	-	-	-	-	-	-	-	-	-	-
Red pine	-	-	-	-	-	-	-	-	-	-	-
White pine	-	-	-	-	-	-	-	-	-	-	-
Balsam fir	-	-	-	-	-	-	-	-	-	-	-
White spruce	-	-	-	-	-	-	-	-	-	-	-
Black spruce	-	-	-	-	-	-	-	-	-	-	-
Northern white-cedar	-	-	-	-	-	-	-	-	-	-	-
Tamarack	1.0	-	1.0	-	-	-	-	-	-	-	-
Oak-hickory	69.5	8.8	1.3	-	1.3	6.0	2.7	10.1	23.5	15.8	-
Elm-ash-cottonwood	49.7	4.3	-	5.7	5.2	8.9	9.6	7.2	2.4	5.0	1.4
Maple-basswood	107.2	1.2	5.8	4.9	1.4	4.8	15.6	23.2	31.5	17.8	1.0
Aspen	243.0	67.3	40.1	23.8	40.3	43.9	15.4	7.5	4.7	-	-
Paper birch	-	-	-	-	-	-	-	-	-	-	-
Balsam poplar	27.3	4.7	4.6	3.1	7.0	5.9	1.0	1.0	-	-	-
Nonstocked	5.7	1.4	1.4	-	1.3	1.6	-	-	-	-	-
All types	503.4	87.7	54.2	37.5	56.5	71.1	44.3	49.0	62.1	38.6	2.4

1/ The reader is cautioned to review the highlights section of this report particularly the section titled "Net Growth", before further analysis

Table 4.--Area of timberland by forest type, site-index class, and Forest Survey Unit, Minnesota, 1987

(In thousand acres)

Forest type	All classes	Site-index class (feet) 11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91+
ALL UNITS										
Jack pine	468.1	-	-	14.8	105.8	170.0	115.0	56.3	5.0	1.2
Red pine	310.4	-	-	5.7	80.8	66.0	76.0	60.0	21.9	-
White pine	65.7	-	-	8.7	16.5	29.2	8.5	2.8	-	-
Balsam fir	801.8	-	20.8	155.0	280.1	235.6	95.4	11.0	3.9	-
White spruce	121.8	-	-	12.4	59.5	15.3	34.6	-	-	-
Black spruce	1,037.3	20.4	290.0	399.4	242.4	77.3	6.7	1.1	-	-
Northern white-cedar	496.0	95.0	259.2	99.2	28.2	10.3	4.1	-	-	-
Tamarack	468.4	4.4	91.8	172.9	130.4	53.5	12.4	3.0	-	-
Oak-hickory	873.7	-	7.5	160.3	288.8	220.0	144.1	38.4	11.8	2.8
Elm-ash-cottonwood	712.8	-	2.9	139.2	228.8	225.1	81.0	28.8	5.6	1.4
Maple-basswood	1,290.3	-	-	65.0	277.5	484.7	319.5	117.0	26.6	-
Aspen	5,278.0	1.3	3.2	74.0	398.8	1,202.6	1,753.0	1,323.6	459.5	62.0
Paper birch	963.6	-	3.1	27.7	165.2	364.1	307.8	74.4	19.8	1.5
Balsam poplar	550.3	-	-	25.1	110.3	132.5	172.0	75.4	30.9	4.1
Nonstocked	138.1	4.3	20.9	30.5	30.8	29.5	13.9	8.2	-	-
All types	13,576.3	125.4	699.4	1,389.9	2,443.9	3,315.7	3,144.0	1,800.0	585.0	73.0
ASPEN-BIRCH										
Jack pine	157.6	-	-	2.7	53.5	61.4	27.8	12.2	-	-
Red pine	119.9	-	-	1.3	17.5	21.5	28.5	29.2	21.9	-
White pine	34.6	-	-	8.7	12.5	12.0	1.4	-	-	-
Balsam fir	588.2	-	13.1	116.6	209.6	176.2	67.3	2.6	2.8	-
White spruce	89.2	-	-	12.4	36.0	12.1	28.7	-	-	-
Black spruce	756.5	15.0	201.7	290.9	182.8	59.9	5.1	1.1	-	-
Northern white-cedar	306.4	61.5	160.7	54.8	18.4	6.9	4.1	-	-	-
Tamarack	157.3	1.2	40.6	51.8	44.0	17.0	2.7	-	-	-
Oak-hickory	5.3	-	-	-	1.2	1.4	1.4	1.3	-	-
Elm-ash-cottonwood	255.0	-	-	64.8	98.3	78.0	10.9	3.0	-	-
Maple-basswood	220.9	-	-	16.2	60.4	99.0	41.3	2.9	1.1	-
Aspen	1,933.9	-	-	23.5	154.7	524.8	652.7	438.6	117.3	22.3
Paper birch	511.3	-	1.5	17.5	95.1	223.8	144.8	27.1	1.5	-
Balsam poplar	205.6	-	-	8.4	28.5	51.7	63.5	32.9	17.8	2.8
Nonstocked	44.6	-	3.5	9.3	13.4	7.2	8.4	2.8	-	-
All types	5,386.3	77.7	421.1	678.9	1,025.9	1,352.9	1,088.6	553.7	162.4	25.1
NORTHERN PINE										
Jack pine	300.2	-	-	12.1	50.7	105.4	85.2	40.6	5.0	1.2
Red pine	173.6	-	-	4.4	57.8	39.3	43.4	28.7	-	-
White pine	24.1	-	-	-	2.6	14.6	5.5	1.4	-	-
Balsam fir	206.0	-	7.7	36.4	69.0	55.3	28.1	8.4	1.1	-
White spruce	32.6	-	-	-	23.5	3.2	5.9	-	-	-
Black spruce	264.1	5.4	86.8	95.9	57.0	17.4	1.6	-	-	-
Northern white-cedar	189.6	33.5	98.5	44.4	9.8	3.4	-	-	-	-
Tamarack	284.1	3.2	49.4	118.3	72.2	32.4	7.3	1.3	-	-
Oak-hickory	237.7	-	4.6	33.1	77.7	64.6	44.6	9.1	4.0	-
Elm-ash-cottonwood	293.5	-	1.3	55.6	96.6	88.7	40.0	10.0	1.3	-
Maple-basswood	471.7	-	-	21.8	90.5	177.4	118.5	53.4	10.1	-
Aspen	2,551.0	1.3	1.7	35.0	144.6	430.5	832.1	737.8	328.3	39.7
Paper birch	372.6	-	-	4.8	50.1	117.9	139.6	40.4	18.3	1.5
Balsam poplar	304.8	-	-	12.5	66.6	69.5	101.1	40.7	13.1	1.3
Nonstocked	60.1	4.3	15.8	11.6	10.4	11.5	1.1	5.4	-	-
All types	5,765.7	47.7	265.8	485.9	879.1	1,231.1	1,454.0	977.2	381.2	43.7

(Table 4 continued on next page)

(Table 4 continued)

Forest type	All classes	Site-index class(feet) 11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91+
CENTRAL HARDWOOD										
Jack pine	10.3	-	-	-	1.6	3.2	2.0	3.5	-	-
Red pine	16.9	-	-	-	5.5	5.2	4.1	2.1	-	-
White pine	7.0	-	-	-	1.4	2.6	1.6	1.4	-	-
Balsam fir	7.6	-	-	2.0	1.5	4.1	-	-	-	-
White spruce	-	-	-	-	-	-	-	-	-	-
Black spruce	16.7	-	1.5	12.6	2.6	-	-	-	-	-
Northern white-cedar	-	-	-	-	-	-	-	-	-	-
Tamarack	26.0	-	0.8	2.8	14.2	4.1	2.4	1.7	-	-
Oak-hickory	561.2	-	1.6	96.1	191.7	141.1	92.1	28.0	7.8	2.8
Elm-ash-cottonwood	114.6	-	1.6	11.0	23.8	40.7	19.7	13.5	4.3	-
Maple-basswood	490.5	-	-	20.8	105.9	169.1	136.0	44.7	14.0	-
Aspen	550.1	-	1.5	2.6	36.2	150.0	220.1	125.8	13.9	-
Paper birch	79.7	-	1.6	5.4	20.0	22.4	23.4	6.9	-	-
Balsam poplar	12.6	-	-	1.9	3.4	3.5	2.0	1.8	-	-
Nonstocked	27.7	-	1.6	9.6	2.7	9.4	4.4	-	-	-
All types	1,920.9	-	10.2	164.8	410.5	555.4	507.8	229.4	40.0	2.8
PRAIRIE										
Jack pine	-	-	-	-	-	-	-	-	-	-
Red pine	-	-	-	-	-	-	-	-	-	-
White pine	-	-	-	-	-	-	-	-	-	-
Balsam fir	-	-	-	-	-	-	-	-	-	-
White spruce	-	-	-	-	-	-	-	-	-	-
Black spruce	-	-	-	-	-	-	-	-	-	-
Northern white-cedar	-	-	-	-	-	-	-	-	-	-
Tamarack	1.0	-	1.0	-	-	-	-	-	-	-
Oak-hickory	69.5	-	1.3	31.1	18.2	12.9	6.0	-	-	-
Elm-ash-cottonwood	49.7	-	-	7.8	10.1	17.7	10.4	2.3	-	1.4
Maple-basswood	107.2	-	-	6.2	20.7	39.2	23.7	16.0	1.4	-
Aspen	243.0	-	-	12.9	63.3	97.3	48.1	21.4	-	-
Paper birch	-	-	-	-	-	-	-	-	-	-
Balsam poplar	27.3	-	-	2.3	11.8	7.8	5.4	-	-	-
Nonstocked	5.7	-	-	-	4.3	1.4	-	-	-	-
All types	503.4	-	2.3	60.3	128.4	176.3	93.6	39.7	1.4	1.4

Table 5.--Area of timberland by forest type, stand-size class, and Forest Survey Unit, Minnesota, 1987

(In thousand acres)

Forest type	All classes	Stand size class: Sawtimber	Poletimber	Sapling & seedling	Nonstocked
ALL UNITS					
Jack pine	468.1	95.8	209.7	162.6	-
Red pine	310.4	110.6	59.7	140.1	-
White pine	65.7	54.7	7.7	3.3	-
Balsam fir	801.8	140.5	441.2	220.1	-
White spruce	121.8	22.4	26.7	72.7	-
Black spruce	1,037.3	21.7	387.7	627.9	-
Northern white-cedar	496.0	157.2	261.6	77.2	-
Tamarack	468.4	43.6	201.0	223.8	-
Oak-hickory	873.7	389.4	342.6	141.7	-
Elm-ash-cottonwood	712.8	164.5	365.5	182.8	-
Maple-basswood	1,290.3	678.0	494.4	117.9	-
Aspen	5,278.0	754.4	2,690.3	1,833.3	-
Paper birch	963.6	137.0	703.0	123.6	-
Balsam poplar	550.3	117.5	248.6	184.2	-
Nonstocked	138.1	-	-	-	138.1
All types	13,576.3	2,887.3	6,439.7	4,111.2	138.1
ASPEN-BIRCH					
Jack pine	157.6	23.2	56.1	78.3	-
Red pine	119.9	41.8	27.9	50.2	-
White pine	34.6	33.2	-	1.4	-
Balsam fir	588.2	108.1	328.1	152.0	-
White spruce	89.2	15.2	19.6	54.4	-
Black spruce	756.5	15.2	299.0	442.3	-
Northern white-cedar	306.4	117.2	134.3	54.9	-
Tamarack	157.3	9.9	53.5	93.9	-
Oak-hickory	5.3	-	5.3	-	-
Elm-ash-cottonwood	255.0	42.9	140.9	71.2	-
Maple-basswood	220.9	92.0	97.9	31.0	-
Aspen	1,933.9	266.3	977.8	689.8	-
Paper birch	511.3	56.0	376.7	78.6	-
Balsam poplar	205.6	48.5	104.9	52.2	-
Nonstocked	44.6	-	-	-	44.6
All types	5,386.3	869.5	2,622.0	1,850.2	44.6
NORTHERN PINE					
Jack pine	300.2	71.3	147.7	81.2	-
Red pine	173.6	67.1	25.0	81.5	-
White pine	24.1	16.4	7.7	-	-
Balsam fir	206.0	30.0	109.9	66.1	-
White spruce	32.6	7.2	7.1	18.3	-
Black spruce	264.1	6.5	83.7	173.9	-
Northern white-cedar	189.6	40.0	127.3	22.3	-
Tamarack	284.1	26.9	135.5	121.7	-
Oak-hickory	237.7	56.0	134.0	47.7	-
Elm-ash-cottonwood	293.5	59.4	160.2	73.9	-
Maple-basswood	471.7	199.8	236.5	35.4	-
Aspen	2,551.0	419.1	1,275.9	856.0	-
Paper birch	372.6	67.2	275.6	29.8	-
Balsam poplar	304.8	69.0	119.3	116.5	-
Nonstocked	60.1	-	-	-	60.1
All types	5,765.7	1,135.9	2,845.4	1,724.3	60.1

(Table 5 continued on next page)

(Table 5 continued)

Forest type	All classes	Stand size class: Sawtimber	Poletimber	Sapling & seedling	Nonstocked
CENTRAL HARDWOOD					
Jack pine	10.3	1.3	5.9	3.1	-
Red pine	16.9	1.7	6.8	8.4	-
White pine	7.0	5.1	-	1.9	-
Balsam fir	7.6	2.4	3.2	2.0	-
White spruce	-	-	-	-	-
Black spruce	16.7	-	5.0	11.7	-
Northern white-cedar	-	-	-	-	-
Tamarack	26.0	6.8	12.0	7.2	-
Oak-hickory	561.2	292.0	185.3	83.9	-
Elm-ash-cottonwood	114.6	34.1	48.5	32.0	-
Maple-basswood	490.5	300.2	148.0	42.3	-
Aspen	550.1	62.7	329.8	157.6	-
Paper birch	79.7	13.8	50.7	15.2	-
Balsam poplar	12.6	-	9.4	3.2	-
Nonstocked	27.7	-	-	-	27.7
All types	1,920.9	720.1	804.6	368.5	27.7
PRAIRIE					
Jack pine	-	-	-	-	-
Red pine	-	-	-	-	-
White pine	-	-	-	-	-
Balsam fir	-	-	-	-	-
White spruce	-	-	-	-	-
Black spruce	-	-	-	-	-
Northern white-cedar	-	-	-	-	-
Tamarack	1.0	-	-	1.0	-
Oak-hickory	69.5	41.4	18.0	10.1	-
Elm-ash-cottonwood	49.7	28.1	15.9	5.7	-
Maple-basswood	107.2	86.0	12.0	9.2	-
Aspen	243.0	6.3	106.8	129.9	-
Paper birch	-	-	-	-	-
Balsam poplar	27.3	-	15.0	12.3	-
Nonstocked	5.7	-	-	-	5.7
All types	503.4	161.8	167.7	168.2	5.7

Table 6.--Net volume of growing stock on timberland by forest type, stand-age class, and Forest Survey Unit, Minnesota, 1987

(In thousand cubic feet)

Forest type	All ages	Stand-age class(years) 1-20	21-30	31-40	41-50	51-60	61-70	71-80	81-100	101-120	121+
ALL UNITS											
Jack pine	441,543	24,720	20,049	39,236	125,742	156,022	64,486	6,558	4,730	-	-
Red pine	523,614	7,641	18,837	42,417	154,000	60,366	29,223	40,406	72,969	76,631	21,124
White pine	125,406	-	615	-	9,142	14,527	10,849	19,608	24,548	44,016	2,101
Balsam fir	841,156	22,638	37,614	58,246	112,823	311,996	170,451	67,287	46,819	13,282	-
White spruce	113,352	5,880	21,678	6,526	8,537	17,982	21,677	8,335	22,737	-	-
Black spruce	593,220	10,525	40,996	62,897	56,847	78,387	92,071	86,193	143,771	19,098	2,435
Northern white-cedar	548,935	3,062	3,801	13,365	18,812	22,090	44,146	71,442	154,000	88,692	129,525
Tamarack	254,113	5,794	21,314	18,240	11,847	27,820	46,151	19,838	52,284	37,542	13,283
Oak-hickory	923,845	8,282	18,327	6,505	63,721	192,062	176,502	179,804	209,589	69,053	-
Elm-ash-cottonwood	712,795	15,899	24,167	29,069	34,153	101,439	142,222	128,212	152,592	75,459	9,583
Maple-basswood	1,677,989	16,094	32,803	27,630	110,869	252,058	344,929	274,852	391,806	179,400	47,548
Aspen	5,116,323	270,324	314,847	416,661	1.064,072	1,623,356	967,583	262,632	156,147	40,701	-
Paper birch	1,250,056	12,926	29,333	36,419	141,013	355,863	364,556	167,138	103,656	35,597	3,555
Balsam poplar	577,042	23,825	32,011	35,868	98,298	174,757	107,096	56,402	45,669	3,116	-
Nonstocked	12,032	10,675	665	-	224	468	-	-	-	-	-
All types	13,711,421	438,285	617,057	793,079	2,010,100	3,389,193	2,581,942	1,388,707	1,581,317	682,587	229,154
ASPEN-BIRCH											
Jack pine	108,052	18,315	9,877	2,192	40,854	25,131	10,508	1,175	-	-	-
Red pine	247,710	2,501	486	3,066	143,356	12,576	17,387	23,854	40,364	2,134	1,986
White pine	64,326	-	615	-	-	-	-	8,346	15,756	37,508	2,101
Balsam fir 1/	613,020	18,680	28,251	35,018	96,710	222,074	127,582	39,392	33,043	12,270	-
White spruce	89,861	5,880	21,253	1,216	8,537	17,982	10,663	3,235	21,095	-	-
Black spruce	479,165	8,187	37,691	46,615	46,123	63,448	74,982	68,623	117,005	16,070	421
Northern white-cedar	345,833	2,327	2,515	8,747	15,041	16,101	26,369	37,882	103,681	42,419	90,751
Tamarack	70,102	2,672	7,512	9,444	3,849	9,948	8,237	9,051	8,753	8,545	2,091
Oak-hickory	8,527	-	-	-	1,220	4,507	2,800	-	-	-	-
Elm-ash-cottonwood	243,961	7,014	10,520	6,287	7,628	35,128	46,963	43,496	52,846	29,149	4,930
Maple-basswood	263,952	4,694	15,595	3,673	16,664	52,833	45,402	21,367	56,577	24,976	22,171
Aspen	1,909,244	114,827	124,741	148,490	320,240	542,628	432,461	111,343	82,246	32,268	-
Paper birch	651,705	10,079	20,501	20,515	59,057	184,565	206,763	83,064	60,323	4,860	1,978
Balsam poplar	256,035	10,307	8,742	8,555	45,417	83,086	47,140	22,978	27,384	2,426	-
Nonstocked	5,256	5,256	-	-	-	-	-	-	-	-	-
All types	5,356,749	210,739	288,299	293,818	804,696	1,270,007	1,057,257	473,806	619,073	212,625	126,429
NORTHERN PINE											
Jack pine	321,967	6,405	10,172	35,561	79,129	126,609	53,978	5,383	4,730	-	-
Red pine	252,232	5,140	8,308	31,199	10,644	45,234	11,836	16,552	29,684	74,497	19,138
White pine	49,421	-	-	-	9,142	14,527	5,372	6,366	7,506	6,508	-
Balsam fir	221,223	3,958	8,559	23,228	16,113	84,449	42,233	27,895	13,776	1,012	-
White spruce	23,491	-	425	5,310	-	-	11,014	5,100	1,642	-	-
Black spruce	106,520	2,338	3,226	13,568	10,510	14,586	14,280	16,204	26,766	3,028	2,014
Northern white-cedar	203,102	735	1,286	4,618	3,771	5,989	17,777	33,560	50,319	46,273	38,774
Tamarack	162,736	3,122	10,861	7,821	7,694	12,440	33,829	8,990	41,465	27,204	9,310
Oak-hickory	263,681	2,616	8,109	3,542	19,895	84,214	62,539	43,084	31,619	8,063	-
Elm-ash-cottonwood	307,074	4,782	7,971	13,446	15,133	30,029	60,355	57,029	79,256	35,570	3,503
Maple-basswood	697,615	2,612	7,914	8,272	50,098	118,679	182,940	105,934	133,583	67,922	19,661
Aspen	2,534,960	108,220	145,219	214,236	555,304	855,910	453,074	131,380	63,184	8,433	-
Paper birch	516,652	2,471	6,347	12,160	65,868	144,730	140,712	77,168	34,882	30,737	1,577
Balsam poplar	294,259	11,162	21,354	25,673	47,698	83,279	55,875	31,733	16,795	690	-
Nonstocked	3,231	3,103	-	-	-	128	-	-	-	-	-
All types	5,958,164	156,664	239,751	398,634	890,999	1,620,803	1,145,814	566,378	535,207	309,937	93,977

(Table 6 continued on next page)

(Table 6 continued)

Forest type	All ages	Stand-age class (years) 1-20	21-30	31-40	41-50	51-60	61-70	71-80	81-100	101-120	121+
CENTRAL HARDWOOD											
Jack pine	11,524	-	-	1,483	5,759	4,282	-	-	-	-	-
Red pine	23,672	-	10,043	8,152	-	2,556	-	-	2,921	-	-
White pine	11,659	-	-	-	-	-	5,477	4,896	1,286	-	-
Balsam fir	6,913	-	804	-	-	5,473	636	-	-	-	-
White spruce	-	-	-	-	-	-	-	-	-	-	-
Black spruce	7,535	-	79	2,714	214	353	2,809	1,366	-	-	-
Northern white-cedar	-	-	-	-	-	-	-	-	-	-	-
Tamarack	20,942	-	2,608	975	304	5,432	4,085	1,797	2,066	1,793	1,882
Oak-hickory	578,566	3,610	10,218	2,963	39,800	97,153	107,196	125,931	146,059	45,636	-
Elm-ash-cottonwood	108,083	3,689	5,676	3,113	3,562	24,287	25,468	19,778	18,235	4,275	-
Maple-basswood	583,099	8,788	7,208	12,386	42,406	74,614	97,265	116,400	157,346	61,930	4,756
Aspen	492,096	29,340	23,720	36,089	143,880	171,631	68,369	12,216	6,851	-	-
Paper birch	81,699	376	2,485	3,744	16,088	26,568	17,081	6,906	8,451	-	-
Balsam poplar	9,037	195	635	-	-	3,582	3,135	-	1,490	-	-
Nonstocked	2,266	2,092	120	-	-	54	-	-	-	-	-
All types	1,937,091	48,090	63,596	71,619	252,013	415,985	331,521	289,290	344,705	113,634	6,638
PRAIRIE											
Jack pine	-	-	-	-	-	-	-	-	-	-	-
Red pine	-	-	-	-	-	-	-	-	-	-	-
White pine	-	-	-	-	-	-	-	-	-	-	-
Balsam fir	-	-	-	-	-	-	-	-	-	-	-
White spruce	-	-	-	-	-	-	-	-	-	-	-
Black spruce	-	-	-	-	-	-	-	-	-	-	-
Northern white-cedar	-	-	-	-	-	-	-	-	-	-	-
Tamarack	333	-	333	-	-	-	-	-	-	-	-
Oak-hickory	73,071	2,056	-	-	2,806	6,188	3,967	10,789	31,911	15,354	-
Elm-ash-cottonwood	53,677	414	-	6,223	7,830	11,995	9,436	7,909	2,255	6,465	1,150
Maple-basswood	133,323	-	2,086	3,299	1,701	5,932	19,322	31,151	44,300	24,572	960
Aspen	180,023	17,937	21,167	17,846	44,648	53,187	13,679	7,693	3,866	-	-
Paper birch	-	-	-	-	-	-	-	-	-	-	-
Balsam poplar	17,711	2,161	1,280	1,640	5,183	4,810	946	1,691	-	-	-
Nonstocked	1,279	224	545	-	224	286	-	-	-	-	-
All types	459,417	22,792	25,411	29,008	62,392	82,398	47,350	59,233	82,332	46,391	2,110

1/ The reader is cautioned to review the highlights section of this report particularly the section titled "Net Growth", before further analysis

Table 7.--Net volume of sawtimber on timberland by forest type, stand-age class, and Forest Survey Unit, Minnesota, 1987

(In thousand board feet) 1/

Forest type	All ages	Stand-age class(years) 1-20	21-30	31-40	41-50	51-60	61-70	71-80	81-100	101-120	121+
ALL UNITS											
Jack pine	1,008,842	28,147	11,870	53,123	251,873	432,680	186,753	21,276	23,120	-	-
Red pine	1,846,604	18,298	4,225	44,735	442,844	189,143	130,840	178,379	348,755	386,118	103,267
White pine	514,904	-	2,923	-	27,537	51,485	51,561	86,640	97,086	185,635	12,037
Balsam fir	1,862,704	55,075	80,196	99,439	213,559	656,962	390,914	187,095	132,907	46,557	-
White spruce	276,762	-	33,608	6,953	20,508	56,123	51,416	28,568	79,586	-	-
Black spruce	628,475	14,031	47,096	30,899	41,600	88,117	126,172	92,096	182,400	5,615	449
Northern white-cedar	1,260,617	6,007	7,898	14,450	24,431	39,825	80,318	109,276	343,602	202,137	432,673
Tamarack	361,296	9,141	29,514	12,402	9,371	27,694	80,918	33,683	78,280	64,217	16,076
Oak-hickory	2,752,096	16,890	48,938	9,187	125,741	381,287	484,012	582,568	804,775	298,698	-
Elm-ash-cottonwood	1,603,932	31,829	42,404	31,912	53,495	197,558	312,961	306,173	398,854	195,127	33,619
Maple-basswood	5,105,256	47,561	63,756	39,920	211,870	537,982	941,455	921,692	1,450,899	701,104	189,017
Aspen	10,075,853	577,165	402,319	598,929	1,755,367	3,390,436	2,204,025	590,477	451,770	105,365	-
Paper birch	2,213,685	10,839	42,723	21,659	213,079	548,207	621,265	333,410	264,802	145,816	11,885
Balsam poplar	1,319,024	42,136	48,809	25,087	172,524	386,768	301,348	183,566	149,123	9,663	-
Nonstocked	26,244	24,677	487	-	-	1,080	-	-	-	-	-
All types	30,856,294	881,796	866,766	988,695	3,563,799	6,985,347	5,963,958	4,805,959	2,346,052	2,346,052	799,023
ASPEN-BIRCH											
Jack pine	205,620	13,556	530	5,149	79,058	81,271	24,654	1,402	-	-	-
Red pine	852,364	10,565	771	5,867	406,066	44,765	82,741	95,802	188,183	9,638	7,966
White pine	263,111	-	2,923	-	-	-	-	36,692	60,070	151,389	12,037
Balsam fir	1.352,921	40,194	72,675	59,032	179,798	455,104	301,477	95,542	106,702	42,397	-
White spruce	220,163	-	31,892	5,634	20,508	56,123	20,576	12,403	73,027	-	-
Black spruce	503,629	9,740	43,839	16,402	32,000	72,019	105,475	65,307	155,221	3,177	449
Northern white-cedar	867,205	4,339	6,319	8,423	21,584	32,197	47,457	64,714	256,302	108,940	316,930
Tamarack	94,742	6,988	13,884	2,371	6,314	7,999	8,792	13,531	16,807	12,713	5,343
Oak-hickory	16,989	-	-	-	3,585	7,573	5,831	-	-	-	-
Elm-ash-cottonwood	468,288	11,578	17,844	2,617	12,164	55,136	71,755	91,246	123,269	66,845	15,834
Maple-basswood	728,287	11,021	26,914	5,867	24,225	106,649	99,842	66,642	206,769	93,705	86,653
Aspen	3,675,483	232,167	153,522	251,141	554,058	1,057,542	882,923	219,342	242,205	82,583	-
Paper birch	1,056,702	6,761	32,919	9,294	83,411	284,873	326,690	148,643	135,889	22,442	5,780
Balsam poplar	607,876	23,482	13,528	9,159	95,882	179,592	113,855	73,369	91,484	7,525	-
Nonstocked	11,015	11,015	-	-	-	-	-	-	-	-	-
All types	10,924,395	381,406	417,560	380,956	1,518,653	2,440,843	2,092,068	984,635	1,655,928	601,354	450,992
NORTHERN PINE											
Jack pine	776,896	14,591	11,340	44,443	160,042	341,387	162,099	19,874	23,120	-	-
Red pine	971,158	7,733	2,233	35,450	36,778	139,079	48,099	82,577	147,428	376,480	95,301
White pine	194,369	-	-	-	27,537	51,485	22,475	26,958	31,668	34,246	-
Balsam fir	493,143	14,881	7,521	40,407	33,761	187,085	87,570	91,553	26,205	4,160	-
White spruce	56,599	-	1,716	1,319	-	-	30,840	16,165	6,559	-	-
Black spruce	118,199	4,291	3,257	10,528	9,600	16,098	18,019	26,789	27,179	2,438	-
Northern white-cedar	393,412	1,668	1,579	6,027	2,847	7,628	32,861	44,562	87,300	93,197	115,743
Tamarack	221,943	2,153	10,854	9,763	2,752	14,750	58,530	15,111	56,215	43,220	8,595
Oak-hickory	564,701	2,234	17,760	3,122	25,137	130,914	133,059	118,292	102,012	32,171	-
Elm-ash-cottonwood	688,670	9,836	13,682	11,330	17,441	46,358	152,666	130,242	206,485	88,094	12,536
Maple-basswood	1,901,225	9,787	16,208	6,917	92,647	233,902	479,246	300,742	444,392	240,719	76,665
Aspen	5,280,121	263,764	190,825	300,750	950,226	1,924,136	1,116,852	334,799	175,987	22,782	-
Paper birch	1,002,192	2,017	7,744	9,403	100,653	222,068	263,104	169,393	98,331	123,374	6,105
Balsam poplar	671,032	16,643	31,768	14,838	70,660	194,508	180,157	104,390	55,930	2,138	-
Nonstocked	8,100	7,563	-	-	-	537	-	-	-	-	-
All types	13,341,760	357,161	316,487	494,297	1,530,081	3,509,935	2,785,577	1,481,447	1,488,811	1,063,019	314,945

(Table 7 continued on next page)

(Table 7 continued)

Forest type	All ages	Stand-age class (years) 1-20	21-30	31-40	41-50	51-60	61-70	71-80	81-100	101-120	121+
CENTRAL HARDWOOD											
Jack pine	26,326	-	-	3,531	12,773	10,022	-	-	-	-	-
Red pine	23,082	-	1,221	3,418	-	5,299	-	-	13,144	-	-
White pine	57,424	-	-	-	-	-	29,086	22,990	5,348	-	-
Balsam fir	16,640	-	-	-	-	14,773	1,867	-	-	-	-
White spruce	-	-	-	-	-	-	-	-	-	-	-
Black spruce	6,647	-	-	3,969	-	-	2,678	-	-	-	-
Northern white-cedar	-	-	-	-	-	-	-	-	-	-	-
Tamarack	44,611	-	4,776	268	305	4,945	13,596	5,041	5,258	8,284	2,138
Oak-hickory	1,899,995	7,938	31,178	6,065	90,064	224,617	335,091	425,097	580,883	199,062	-
Elm-ash-cottonwood	291,795	9,390	10,878	6,588	6,946	63,459	56,639	58,756	61,649	17,490	-
Maple-basswood	1,936,429	26,753	16,016	17,918	89,715	176,489	294,214	423,210	612,036	259,059	21,019
Aspen	874,534	64,833	33,664	33,717	199,793	314,466	181,160	23,315	23,586	-	-
Paper birch	154,791	2,061	2,060	2,962	29,015	41,266	31,471	15,374	30,582	-	-
Balsam poplar	19,357	1,130	3,513	-	-	6,782	6,223	-	1,709	-	-
Nonstocked	5,560	5,017	-	-	-	543	-	-	-	-	-
All types	5,357,191	117,122	103,306	78,436	428,611	862,661	952,025	973,783	1,334,195	483,895	23,157
PRAIRIE											
Jack pine	-	-	-	-	-	-	-	-	-	-	-
Red pine	-	-	-	-	-	-	-	-	-	-	-
White pine	-	-	-	-	-	-	-	-	-	-	-
Balsam fir	-	-	-	-	-	-	-	-	-	-	-
White spruce	-	-	-	-	-	-	-	-	-	-	-
Black spruce	-	-	-	-	-	-	-	-	-	-	-
Northern white-cedar	-	-	-	-	-	-	-	-	-	-	-
Tamarack	-	-	-	-	-	-	-	-	-	-	-
Oak-hickory	270,411	6,718	-	-	6,955	18,183	10,031	39,179	121,880	67,465	-
Elm-ash-cottonwood	155,179	1,025	-	11,377	16,944	32,605	31,901	25,929	7,451	22,698	5,249
Maple-basswood	539,315	-	4,618	9,218	5,283	20,942	68,153	131,098	187,702	107,621	4,680
Aspen	245,715	16,401	24,308	13,321	51,290	94,292	23,090	13,021	9,992	-	-
Paper birch	-	-	-	-	-	-	-	-	-	-	-
Balsam poplar	20,759	881	-	1,090	5,982	5,886	1,113	5,807	-	-	-
Nonstocked	1,569	1,082	487	-	-	-	-	-	-	-	-
All types	1,232,948	26,107	29,413	35,006	86,454	171,908	134,288	215,034	327,025	197,784	9,929

1/ International 1/4 inch rule.

Table 8.--Growing stock volume and periodic growth on timberland by forest type, component of growth, and Forest Survey Unit, Minnesota, 1977-1987

(In thousand cubic feet)

Forest type	1977 growing stock volume 1/	Components: Survivor growth	Ingrowth	Other growth 2/	Mortality	Net growth	Removals	Other removals	1987 growing stock volume
ALL UNITS									
Jack pine	475,351	100,465	36,740	49,178	-59,953	126,430	-130,027	-30,211	441,543
Red pine	380,987	106,619	50,038	19,573	-10,374	165,856	-23,229	-	523,614
White pine	98,460	29,842	2,060	1,930	-3,677	30,155	-3,209	-	125,406
Balsam fir	663,733	224,433	66,786	51,451	-89,073	253,597	-66,931	-9,243	841,156
White spruce	62,406	34,764	11,968	23,215	-6,884	63,063	-12,117	-	113,352
Black spruce	580,795	107,688	60,078	39,813	-122,174	85,405	-64,300	-8,680	593,220
Northern white-cedar	468,710	84,557	33,442	25,878	-53,079	90,798	-10,573	-	548,935
Tamarack	229,222	44,125	23,857	12,511	-32,177	48,316	-19,927	-3,498	254,113
Oak-hickory	901,544	179,552	17,391	32,208	-58,737	170,414	-128,094	-20,019	923,845
Elm-ash-cottonwood	665,574	130,429	43,743	42,826	-68,116	148,882	-82,432	-19,229	712,795
Maple-basswood	1,430,114	338,577	46,742	62,573	-131,719	316,173	-54,977	-13,321	1,677,989
Aspen	4,648,232	1,300,858	360,335	481,502	-566,323	1,576,372	-1,070,990	-37,291	5,116,323
Paper birch	995,854	264,149	76,160	43,174	-72,905	310,578	-56,376	-	1,250,056
Balsam poplar	407,908	174,063	32,288	29,809	-54,591	181,569	-10,395	-2,040	577,042
Nonstocked	8,476	3,205	1,214	1,194	-1,071	4,542	-986	-	12,032
All types	12,017,366	3,123,326	862,842	916,835	-1,330,853	3,572,150	-1,734,563	-143,532	13,711,421
ASPEN-BIRCH									
Jack pine	129,853	25,966	11,447	15,556	-18,224	34,745	-45,825	-10,721	108,052
Red pine	177,665	59,518	20,131	6,558	-5,556	80,651	-10,606	-	247,710
White pine	51,339	14,628	572	737	-1,947	13,990	-1,003	-	64,326
Balsam fir	468,570	170,961	54,556	41,068	-65,673	200,912	-50,644	-5,818	613,020
White spruce	49,860	27,863	8,337	17,258	-4,520	48,938	-8,937	-	89,861
Black spruce	470,525	87,523	47,921	33,021	-101,899	66,566	-52,694	-5,232	479,165
Northern white-cedar	295,451	54,916	22,772	16,860	-36,157	58,391	-8,009	-	345,833
Tamarack	59,339	13,254	9,248	5,494	-9,934	18,062	-7,299	-	70,102
Oak-hickory	6,353	2,274	163	26	-289	2,174	-	-	8,527
Elm-ash-cottonwood	208,698	49,631	17,756	24,187	-23,721	67,853	-32,590	-	243,961
Maple-basswood	188,505	62,454	13,735	25,478	-16,757	84,910	-9,463	-	263,952
Aspen	1,715,921	505,198	164,838	209,950	-232,441	647,545	-442,618	-11,604	1,909,244
Paper birch	508,435	145,648	46,216	24,775	-40,469	176,170	-32,900	-	651,705
Balsam poplar	184,726	80,869	13,615	11,727	-27,800	78,411	-7,102	-	256,035
Nonstocked	3,194	1,667	490	596	-429	2,324	-262	-	5,256
All types	4,518,434	1,302,370	431,797	433,291	-585,816	1,581,642	-709,952	-33,375	5,356,749
NORTHERN PINE									
Jack pine	335,083	71,333	24,826	32,038	-40,271	87,926	-82,473	-18,569	321,967
Red pine	191,867	42,078	24,055	9,857	-4,481	71,509	-11,144	-	252,232
White pine	38,026	12,608	1,488	1,187	-1,682	13,601	-2,206	-	49,421
Balsam fir	189,860	51,917	11,785	10,047	-22,674	51,075	-16,287	-3,425	221,223
White spruce	12,546	6,901	3,631	5,957	-2,364	14,125	-3,180	-	23,491
Black spruce	104,124	18,581	11,501	6,191	-19,244	17,029	-11,462	-3,171	106,520
Northern white-cedar	173,259	29,641	10,670	9,018	-16,922	32,407	-2,564	-	203,102
Tamarack	148,372	27,257	13,118	6,606	-20,214	26,767	-12,403	-	162,736
Oak-hickory	244,701	57,035	7,734	9,462	-17,091	57,140	-28,630	-9,530	263,681
Elm-ash-cottonwood	285,462	52,979	20,087	12,967	-27,223	58,810	-34,176	-3,022	307,074
Maple-basswood	581,091	142,896	20,290	20,027	-43,248	139,965	-23,441	-	697,615
Aspen	2,385,095	631,277	145,171	236,255	-279,121	733,582	-571,854	-11,863	2,534,960
Paper birch	419,045	102,531	26,423	16,821	-27,956	117,819	-20,212	-	516,652
Balsam poplar	203,101	84,714	17,228	15,258	-23,255	93,945	-2,787	-	294,259
Nonstocked	2,525	768	294	452	-555	959	-253	-	3,231
All types	5,314,157	1,332,516	338,301	392,143	-546,301	1,516,659	-823,072	-49,580	5,958,164

(Table 8 continued on next page)

(Table 8 continued)

Forest type	1977 growing stock volume 1/	Components: Survivor growth	Ingrowth	Other 2/ growth	Mortality	Net growth	Removals	Other removals	1987 growing stock volume
CENTRAL HARDWOOD									
Jack pine	10,415	3,166	467	1,584	-1,458	3,759	-1,729	-921	11,524
Red pine	11,455	5,023	5,852	3,158	-337	13,696	-1,479	-	23,672
White pine	9,095	2,606	-	6	-48	2,564	-	-	11,659
Balsam fir	5,303	1,555	445	336	-726	1,610	-	-	6,913
White spruce	-	-	-	-	-	-	-	-	-
Black spruce	6,146	1,584	656	601	-1,031	1,810	-144	-277	7,535
Northern white-cedar	-	-	-	-	-	-	-	-	-
Tamarack	21,190	3,561	1,491	407	-1,984	3,475	-225	-3,498	20,942
Oak-hickory	583,180	108,037	8,417	21,454	-37,733	100,175	-94,300	-10,489	578,566
Elm-ash-cottonwood	115,195	18,289	4,082	4,198	-10,003	16,566	-12,665	-11,013	108,083
Maple-basswood	509,393	111,215	11,710	14,473	-48,588	88,810	-15,104	-	583,099
Aspen	407,536	117,812	35,811	26,329	-34,819	145,133	-52,463	-8,110	492,096
Paper birch	68,374	15,970	3,521	1,578	-4,480	16,589	-3,264	-	81,699
Balsam poplar	6,783	2,628	149	1,884	-2,257	2,404	-150	-	9,037
Nonstocked	2,115	580	-	129	-87	622	-471	-	2,266
All types	1,756,180	392,026	72,601	76,137	-143,551	397,213	-181,994	-34,308	1,937,091
PRAIRIE									
Jack pine	-	-	-	-	-	-	-	-	-
Red pine	-	-	-	-	-	-	-	-	-
White pine	-	-	-	-	-	-	-	-	-
Balsam fir	-	-	-	-	-	-	-	-	-
White spruce	-	-	-	-	-	-	-	-	-
Black spruce	-	-	-	-	-	-	-	-	-
Northern white-cedar	-	-	-	-	-	-	-	-	-
Tamarack	321	53	-	4	-45	12	-	-	333
Oak-hickory	67,310	12,206	1,077	1,266	-3,624	10,925	-5,164	-	73,071
Elm-ash-cottonwood	56,219	9,530	1,818	1,474	-7,169	5,653	-3,001	-5,194	53,677
Maple-basswood	151,125	22,012	1,007	2,595	-23,126	2,488	-6,969	-13,321	133,323
Aspen	139,680	46,571	14,515	8,968	-19,942	50,112	-4,055	-5,714	180,023
Paper birch	-	-	-	-	-	-	-	-	-
Balsam poplar	13,298	5,852	1,296	940	-1,279	6,809	-356	-2,040	17,711
Nonstocked	642	190	430	17	-	637	-	-	1,279
All types	428,595	96,414	20,143	15,264	-55,185	76,636	-19,545	-26,269	459,417

1/ Figures have been adjusted from those published after the 1977 survey to conform to changes in survey definitions and procedures.

2/ Includes growth on ingrowth, mortality and removals.

Table 9.--Growing stock volume and periodic growth on timberland by species group, component of growth, and Forest Survey Unit, Minnesota, 1977-1987

(In thousand cubic feet)

ALL UNITS

Species group	1977 growing stock volume 1/	Components: Survivor growth	Ingrowth	Other 2/ growth	Mortality	Net growth	Removals	Other removals	1987 growing stock volume
Softwoods									
Jack pine	517,900	98,025	27,262	52,624	-81,888	96,023	-155,949	-24,794	433,180
Red pine	426,989	116,341	56,262	28,730	-807	200,526	-56,218	-2,349	568,948
White pine	196,373	55,617	1,054	10,619	-4,408	62,882	-33,338	-814	225,103
White spruce	185,701	142,048	18,859	41,407	-6,532	195,782	-29,908	-969	350,606
Black spruce	577,723	96,788	46,500	42,217	-146,259	39,246	-70,134	-7,568	539,267
Balsam fir 3/	809,707	323,835	80,056	92,594	-132,437	364,048	-93,185	-6,319	1,074,251
Tamarack	285,924	50,119	28,100	13,664	-38,163	53,720	-21,269	-4,599	313,776
Eastern redcedar	3,723	1,412	535	77	-	2,024	-	-38	5,709
Northern white-cedar	446,978	87,858	32,796	17,284	-11,652	126,286	-10,339	-1,056	561,869
Other softwoods	1,064	422	-	-	-	422	-	-	1,486
Total	3,452,082	972,465	291,424	299,216	-422,146	1,140,959	-470,340	-48,506	4,074,195
Hardwoods									
Select white oak	384,254	73,773	10,213	6,552	-1,325	89,213	-25,015	-7,310	441,142
Select red oak	653,067	148,619	5,865	23,153	-49,351	128,286	-74,951	-11,504	694,898
Other red oak	13,100	1,974	-	533	-1,858	649	-1,735	-230	11,784
Select hickory	12,380	2,248	734	114	-684	2,412	-381	-211	14,200
Other hickory	5,997	1,100	-	88	-456	732	-228	-147	6,354
Basswood	469,392	133,247	11,390	12,579	-17,514	139,702	-12,383	-4,973	591,738
Yellow birch	13,800	2,198	129	722	-1,716	1,333	-310	-15	14,808
Hard maple	251,181	67,149	32,474	12,465	-7,263	104,825	-7,599	-1,263	347,144
Soft maple	175,487	52,461	36,781	9,976	-8,713	90,505	-6,070	-2,074	257,848
Elm	465,624	92,262	4,683	20,769	-101,657	16,057	-39,436	-9,094	433,151
Black ash	533,315	88,177	63,824	21,098	-51,134	121,965	-28,924	-7,478	618,878
White & green ash	110,490	28,118	4,899	3,027	-6,704	29,340	-1,367	-2,618	135,845
Cottonwood	27,651	3,614	-	919	-3,456	1,077	-2,693	-1,498	24,537
Willow	23,638	4,623	-	109	-636	4,096	-	-2,298	25,436
Hackberry	4,476	1,397	-	106	-354	1,149	-136	-180	5,309
Balsam poplar	523,789	230,760	19,020	47,969	-81,344	216,405	-39,502	-4,014	696,678
Bigtooth aspen	194,539	60,927	3,727	19,007	-27,092	56,569	-46,015	-1,822	203,271
Quaking aspen	3,283,216	859,758	245,811	392,893	-479,168	1,019,294	-906,352	-28,596	3,367,562
Paper birch	1,366,347	286,441	128,161	44,049	-64,064	394,587	-69,608	-7,534	1,683,792
River birch	441	211	-	-	-	211	-	-35	617
Black cherry	11,936	2,741	1,411	381	-107	4,426	-510	-193	15,659
Black walnut	6,886	1,430	-	199	-662	967	-486	-212	7,155
Butternut	7,883	1,887	366	58	-127	2,184	-118	-112	9,837
Other hardwoods	26,395	5,746	1,930	853	-3,322	5,207	-404	-1,615	29,583
Total	8,565,284	2,150,861	571,418	617,619	-908,707	2,431,191	-1,264,223	-95,026	9,637,226
All species	12,017,366	3,123,326	862,842	916,835	-1,330,853	3,572,150	-1,734,563	-143,532	13,711,421

(Table 9 continued on next page)

(Table 9 continued)

ASPEN-BIRCH

Species group	1977 growing stock volume 1/	Components: Survivor growth	Ingrowth	Other 2/ growth	Mortality	Net growth	Removals	Other removals	1987 growing stock volume
Softwoods									
Jack pine	158,752	26,861	3,574	18,223	-26,478	22,180	-62,249	-8,242	110,441
Red pine	165,197	52,984	22,155	10,790	-136	85,793	-24,084	-662	226,244
White pine	99,535	26,048	282	6,469	-3,411	29,388	-22,788	-432	105,703
White spruce	135,205	104,912	12,834	27,503	-4,468	140,781	-20,035	-612	255,339
Black spruce	452,018	77,153	35,878	32,161	-116,346	28,846	-51,759	-4,907	424,198
Balsam fir 3/	516,104	222,443	60,578	66,916	-90,290	259,647	-58,549	-3,949	713,253
Tamarack	88,851	16,815	12,431	6,920	-13,646	22,520	-11,196	-475	99,700
Eastern redcedar	109	50	165	16	-	231	-	-	340
Northern white-cedar	273,532	56,844	24,761	12,100	-8,525	85,180	-8,582	-639	349,491
Other softwoods	-	-	-	-	-	-	-	-	-
Total	1,889,303	584,110	172,658	181,098	-263,300	674,566	-259,242	-19,918	2,284,709
Hardwoods									
Select white oak	4,941	1,384	163	102	-	1,649	-	-71	6,519
Select red oak	10,792	3,581	345	691	-1,034	3,583	-270	-12	14,093
Other red oak	-	-	-	-	-	-	-	-	-
Select hickory	-	-	-	-	-	-	-	-	-
Other hickory	-	-	-	-	-	-	-	-	-
Basswood	34,246	14,010	1,823	3,180	-1,358	17,655	-365	-85	51,451
Yellow birch	8,747	1,365	-	564	-986	943	-96	-4	9,590
Hard maple	58,872	20,226	12,576	5,839	-1,820	36,821	-740	-42	94,911
Soft maple	38,718	14,944	17,247	5,056	-2,173	35,074	-1,128	-108	72,556
Elm	45,609	11,723	571	3,316	-10,390	5,220	-1,871	-57	48,901
Black ash	199,668	38,870	27,428	11,252	-20,436	57,114	-5,638	-439	250,705
White & green ash	9,647	3,817	694	870	-321	5,060	-439	-28	14,240
Cottonwood	418	151	-	-	-	151	-	-22	547
Willow	-	-	-	-	-	-	-	-	-
Hackberry	-	-	-	-	-	-	-	-	-
Balsam poplar	228,683	102,434	6,721	21,880	-38,333	92,702	-20,503	-718	300,164
Bigtooth aspen	36,465	10,886	1,337	4,125	-6,168	10,180	-8,056	-116	38,473
Quaking aspen	1,282,891	343,382	111,711	172,415	-209,056	418,452	-384,467	-8,904	1,307,972
Paper birch	669,191	151,373	78,523	22,887	-30,441	222,342	-27,137	-2,851	861,545
River birch	-	-	-	-	-	-	-	-	-
Black cherry	105	45	-	-	-	45	-	-	150
Black walnut	-	-	-	-	-	-	-	-	-
Butternut	-	-	-	-	-	-	-	-	-
Other hardwoods	138	69	-	16	-	85	-	-	223
Total	2,629,131	718,260	259,139	252,193	-322,516	907,076	-450,710	-13,457	3,072,040
All species	4,518,434	1,302,370	431,797	433,291	-585,816	1,581,642	-709,952	-33,375	5,356,749

(Table 9 continued on next page)

(Table 9 continued)

NORTHERN PINE

Species group	1977 growing stock volume 1/	Components: Survivor growth	Ingrowth	Other 2/ growth	Mortality	Net growth	Removals	Other removals	1987 growing stock volume
Softwoods									
Jack pine	347,807	68,795	22,904	32,163	-53,653	70,209	-89,647	-15,697	312,672
Red pine	244,202	56,242	27,378	14,127	-671	97,076	-29,385	-1,548	310,345
White pine	82,612	24,994	519	3,813	-949	28,377	-10,024	-225	100,740
White spruce	48,009	35,838	5,931	13,507	-2,064	53,212	-9,873	-276	91,072
Black spruce	120,702	18,536	10,024	9,686	-28,983	9,263	-18,375	-2,475	109,115
Balsam fir 3/	287,022	98,611	19,299	24,827	-40,833	101,904	-34,345	-2,245	352,336
Tamarack	168,599	28,469	14,295	6,343	-21,899	27,208	-9,837	-552	185,418
Eastern redcedar	381	164	-	-	-	164	-	-12	533
Northern white-cedar	173,446	31,014	8,035	5,184	-3,127	41,106	-1,757	-417	212,378
Other softwoods	-	-	-	-	-	-	-	-	-
Total	1,472,780	362,663	108,385	109,650	-152,179	428,519	-203,243	-23,447	1,674,609
Hardwoods									
Select white oak	130,633	28,895	7,078	2,686	-521	38,138	-5,478	-2,158	161,135
Select red oak	257,810	66,724	3,287	10,007	-22,396	57,622	-23,711	-5,076	286,645
Other red oak	1,102	273	-	215	-270	218	-	-	1,320
Select hickory	-	-	-	-	-	-	-	-	-
Other hickory	570	102	-	29	-	131	-123	-14	564
Basswood	237,311	72,549	5,871	5,070	-7,274	76,216	-5,759	-743	307,025
Yellow birch	4,864	815	129	147	-730	361	-108	-11	5,106
Hard maple	110,394	27,323	16,090	4,747	-3,375	44,785	-3,998	-140	151,041
Soft maple	81,154	24,069	12,794	3,412	-3,392	36,883	-3,794	-499	113,744
Elm	165,767	42,748	1,970	6,710	-27,698	23,730	-8,485	-1,178	179,834
Black ash	260,101	39,852	32,121	6,599	-24,958	53,614	-10,132	-1,752	301,831
White & green ash	27,017	7,750	2,125	591	-1,574	8,892	-517	-111	35,281
Cottonwood	87	17	-	-	-	17	-	-	104
Willow	77	34	-	-	-	34	-	-	111
Hackberry	-	-	-	-	-	-	-	-	-
Balsam poplar	258,400	112,037	10,783	22,224	-38,205	106,839	-14,957	-844	349,438
Bigtooth aspen	124,860	39,249	1,802	12,129	-16,443	36,737	-32,110	-1,281	128,206
Quaking aspen	1,597,070	394,345	97,344	190,722	-219,849	462,562	-475,363	-9,031	1,575,238
Paper birch	579,405	111,801	37,548	17,016	-27,283	139,082	-35,137	-3,232	680,118
River birch	-	-	-	-	-	-	-	-	-
Black cherry	1,273	354	472	128	-	954	-157	-8	2,062
Black walnut	-	-	-	-	-	-	-	-	-
Butternut	1,661	428	-	-	-	428	-	-34	2,055
Other hardwoods	1,821	488	502	61	-154	897	-	-21	2,697
Total	3,841,377	969,853	229,916	282,493	-394,122	1,088,140	-619,829	-26,133	4,283,555
All species	5,314,157	1,332,516	338,301	392,143	-546,301	1,516,659	-823,072	-49,580	5,958,164

(Table 9 continued on next page)

(Table 9 continued)

CENTRAL HARDWOOD

Species group	1977 growing stock volume 1/	Components: Survivor growth	Ingrowth	Other 2/ growth	Mortality	Net growth	Removals	Other removals	1987 growing stock volume
Softwoods									
Jack pine	11,022	2,294	784	2,238	-1,757	3,559	-4,053	-855	9,673
Red pine	17,084	7,001	6,729	3,813	-	17,543	-2,749	-139	31,739
White pine	14,226	4,575	253	337	-48	5,117	-526	-157	18,660
White spruce	2,016	1,133	94	397	-	1,624	-	-54	3,586
Black spruce	4,844	1,083	598	366	-885	1,162	-	-186	5,820
Balsam fir 3/	6,491	2,719	179	851	-1,314	2,435	-291	-125	8,510
Tamarack	28,055	4,785	1,374	373	-2,618	3,914	-42	-3,565	28,362
Eastern redcedar	2,265	929	-	28	-	957	-	-16	3,206
Northern white-cedar	-	-	-	-	-	-	-	-	-
Other softwoods	1,064	422	-	-	-	422	-	-	1,486
Total	87,067	24,941	10,011	8,403	-6,622	36,733	-7,661	-5,097	111,042
Hardwoods									
Select white oak	181,546	31,994	1,828	2,948	-756	36,014	-15,816	-3,115	198,629
Select red oak	365,684	74,693	2,233	12,170	-24,532	64,564	-50,084	-5,612	374,552
Other red oak	11,479	1,622	-	308	-1,588	342	-1,626	-223	9,972
Select hickory	12,380	2,248	734	114	-684	2,412	-381	-211	14,200
Other hickory	4,935	898	-	59	-456	501	-105	-108	5,223
Basswood	160,336	39,511	3,450	3,949	-6,464	40,446	-6,259	-998	193,525
Yellow birch	189	18	-	11	-	29	-106	-	112
Hard maple	71,565	17,612	3,808	1,420	-1,407	21,433	-2,091	-246	90,661
Soft maple	51,536	12,990	6,740	1,426	-2,828	18,328	-129	-1,169	68,566
Elm	189,473	32,128	1,937	8,505	-41,490	1,080	-21,827	-2,600	166,126
Black ash	65,775	8,646	3,934	2,825	-5,054	10,351	-10,630	-4,601	60,895
White & green ash	48,718	11,915	1,611	1,273	-3,073	11,726	-178	-399	59,867
Cottonwood	13,188	1,454	-	426	-1,900	-20	-1,663	-470	11,035
Willow	9,161	1,925	-	98	-440	1,583	-	-792	9,952
Hackberry	2,617	853	-	36	-266	623	-	-28	3,212
Balsam poplar	12,409	4,344	281	2,594	-2,679	4,540	-3,648	-215	13,086
Bigtooth aspen	33,173	10,750	588	2,753	-4,481	9,610	-5,849	-425	36,509
Quaking aspen	286,497	83,071	22,367	21,906	-30,730	96,614	-45,857	-5,702	331,552
Paper birch	114,876	22,831	11,400	3,988	-6,159	32,060	-6,723	-1,258	138,955
River birch	441	211	-	-	-	211	-	-35	617
Black cherry	9,407	2,117	509	236	-107	2,755	-353	-185	11,624
Black walnut	5,530	1,174	-	171	-487	858	-486	-114	5,788
Butternut	6,101	1,447	366	58	-127	1,744	-118	-62	7,665
Other hardwoods	12,097	2,633	804	460	-1,221	2,676	-404	-643	13,726
Total	1,669,113	367,085	62,590	67,734	-136,929	360,480	-174,333	-29,211	1,826,049
All species	1,756,180	392,026	72,601	76,137	-143,551	397,213	-181,994	-34,308	1,937,091

(Table 9 continued on next page)

(Table 9 continued)

PRAIRIE

Species group	1977 growing stock volume 1/	Components: Survivor growth	Ingrowth	Other growth 2/	Mortality	Net growth	Removals	Other removals	1987 growing stock volume
Softwoods									
Jack pine	319	75	-	-	-	75	-	-	394
Red pine	506	114	-	-	-	114	-	-	620
White pine	-	-	-	-	-	-	-	-	-
White spruce	471	165	-	-	-	165	-	-27	609
Black spruce	159	16	-	4	-45	-25	-	-	134
Balsam fir 3/	90	62	-	-	-	62	-	-	152
Tamarack	419	50	-	28	-	78	-194	-7	296
Eastern redcedar	968	269	370	33	-	672	-	-10	1,630
Northern white-cedar	-	-	-	-	-	-	-	-	-
Other softwoods	-	-	-	-	-	-	-	-	-
Total	2,932	751	370	65	-45	1,141	-194	-44	3,835
Hardwoods									
Select white oak	67,134	11,500	1,144	816	-48	13,412	-3,721	-1,966	74,859
Select red oak	18,781	3,621	-	285	-1,389	2,517	-886	-804	19,608
Other red oak	519	79	-	10	-	89	-109	-7	492
Select hickory	-	-	-	-	-	-	-	-	-
Other hickory	492	100	-	-	-	100	-	-25	567
Basswood	37,499	7,177	246	380	-2,418	5,385	-	-3,147	39,737
Yellow birch	-	-	-	-	-	-	-	-	-
Hard maple	10,350	1,988	-	459	-661	1,786	-770	-835	10,531
Soft maple	4,079	458	-	82	-320	220	-1,019	-298	2,982
Elm	64,775	5,663	205	2,238	-22,079	-13,973	-7,253	-5,259	38,290
Black ash	7,771	809	341	422	-686	886	-2,524	-686	5,447
White & green ash	25,108	4,636	469	293	-1,736	3,662	-233	-2,080	26,457
Cottonwood	13,958	1,992	-	493	-1,556	929	-1,030	-1,006	12,851
Willow	14,400	2,664	-	11	-196	2,479	-	-1,506	15,373
Hackberry	1,859	544	-	70	-88	526	-136	-152	2,097
Balsam poplar	24,297	11,945	1,235	1,271	-2,127	12,324	-394	-2,237	33,990
Bigtooth aspen	41	42	-	-	-	42	-	-	83
Quaking aspen	116,758	38,960	14,389	7,850	-19,533	41,666	-665	-4,959	152,800
Paper birch	2,875	436	690	158	-181	1,103	-611	-193	3,174
River birch	-	-	-	-	-	-	-	-	-
Black cherry	1,151	225	430	17	-	672	-	-	1,823
Black walnut	1,356	256	-	28	-175	109	-	-98	1,367
Butternut	121	12	-	-	-	12	-	-16	117
Other hardwoods	12,339	2,556	624	316	-1,947	1,549	-	-951	12,937
Total	425,663	95,663	19,773	15,199	-55,140	75,495	-19,351	-26,225	455,582
All species	428,595	96,414	20,143	15,264	-55,185	76,636	-19,545	-26,269	459,417

1/ Figures have been adjusted from those published after the 1977 survey to conform to changes in survey definitions and procedures.

2/ Includes growth on ingrowth, mortality and removals.

3/ The reader is cautioned to review the highlights section of this report particularly the section titled "Net Growth", before further analysis.

Table 10.--Sawtimber volume and periodic growth on timberland by forest type and component of growth, Minnesota, 1977-1987

(In thousand board feet) 1/

Forest type	1977 sawtimber volume 2/	Components: Survivor growth	Ingrowth	Other growth 3/	Mortality	Net growth	Removals	Other removals	1987 sawtimber volume
Jack pine	1,081,762	154,699	241,872	214,551	-146,273	464,849	-466,287	-71,482	1,008,842
Red pine	1,315,883	305,130	241,537	76,570	-22,108	601,129	-70,408	-	1,846,604
White pine	382,913	116,522	23,991	10,959	-14,961	136,511	-4,520	-	514,904
Balsam fir	1,257,348	381,354	394,786	220,832	-164,931	832,041	-209,250	-17,435	1,862,704
White spruce	149,239	61,144	62,765	56,053	-16,525	163,437	-35,914	-	276,762
Black spruce	484,906	88,191	170,954	70,858	-86,505	243,498	-92,912	-7,017	628,475
Northern white-cedar	1,023,892	138,339	192,913	72,385	-128,592	275,045	-38,320	-	1,260,617
Tamarack	258,240	52,753	83,145	25,431	-32,183	129,146	-20,167	-5,923	361,296
Oak-hickory	2,547,760	376,986	382,998	181,595	-154,800	786,779	-528,476	-53,967	2,752,096
Elm-ash-cottonwood	1,410,185	203,223	302,903	139,372	-199,312	446,186	-207,903	-44,536	1,603,932
Maple-basswood	4,074,323	762,634	643,140	230,125	-425,930	1,209,969	-126,950	-52,086	5,105,256
Aspen	7,556,483	1,751,198	2,877,376	2,365,457	-1,036,615	5,957,416	-3,383,646	-54,400	10,075,853
Paper birch	1,429,720	377,555	495,822	185,600	-138,849	920,128	-136,163	-	2,213,685
Balsam poplar	740,000	276,724	298,008	122,835	-104,944	592,623	-11,448	-2,151	1,319,024
Nonstocked	16,248	3,361	8,933	2,821	-2,388	12,727	-2,731	-	26,244
All types	23,728,902	5,049,813	6,421,143	3,975,444	-2,674,916	12,771,484	-5,335,095	-308,997	30,856,294

1/ International 1/4 inch rule.

2/ Figures have been adjusted from those published after the 1977 survey to conform to changes in survey definitions and procedures.

3/ Includes growth on ingrowth, mortality and removals.

Table 11.--Sawtimber volume and periodic growth on timberland by species group and component of growth, Minnesota, 1977-1987

(In thousand board feet) 1/

Species group	1977 sawtimber volume 2/	Components: Survivor growth	Ingrowth	Other 3/ growth	Mortality	Net growth	Removals	Other removals	1987 sawtimber volume
Softwoods									
Jack pine	1,393,270	167,279	262,229	253,527	-283,017	400,018	-595,574	-63,704	1,134,010
Red pine	1,880,496	405,760	276,999	128,469	-4,463	806,765	-274,527	-11,138	2,401,596
White pine	970,821	272,243	27,620	59,411	-25,329	333,945	-163,289	-4,169	1,137,308
White spruce	686,800	416,403	203,163	208,909	-25,241	803,234	-117,897	-3,329	1,368,808
Black spruce	467,555	73,124	117,278	76,296	-130,967	135,731	-93,982	-4,570	504,734
Balsam fir	1,256,349	469,142	501,692	310,110	-202,915	1,078,029	-199,961	-9,222	2,125,195
Tamarack	377,534	70,132	115,386	34,759	-47,842	172,435	-26,845	-7,702	515,422
Eastern redcedar	5,978	1,539	4,968	963	-	7,470	-	-37	13,411
Northern white-cedar	1,207,720	188,719	207,586	61,231	-47,140	410,396	-34,490	-2,944	1,580,682
Other softwoods	2,914	671	-	-	-	671	-	-	3,585
Total	8,249,437	2,065,012	1,716,921	1,133,675	-766,914	4,148,694	-1,506,565	-106,815	10,784,751
Hardwoods									
Select white oak	1,140,367	149,457	156,309	33,118	-2,652	336,232	-101,585	-23,518	1,351,496
Select red oak	1,879,382	341,182	331,245	128,567	-92,706	708,288	-335,213	-34,832	2,217,625
Other red oak	52,787	6,303	925	2,297	-7,535	1,990	-8,353	-1,093	45,331
Select hickory	26,974	2,755	7,900	608	-1,503	9,760	-1,792	-538	34,404
Other hickory	7,141	889	1,129	98	-	2,116	-	-119	9,138
Basswood	1,225,526	263,604	236,003	61,877	-44,846	516,638	-39,128	-17,593	1,685,443
Yellow birch	53,037	7,346	637	2,367	-5,086	5,264	-1,347	-	56,954
Hard maple	583,821	112,987	98,540	28,017	-13,077	226,467	-17,927	-3,538	788,823
Soft maple	250,341	36,374	78,402	12,735	-13,330	114,181	-13,912	-4,871	345,739
Elm	1,451,195	171,826	137,610	86,958	-405,779	-9,385	-131,281	-31,510	1,279,019
Black ash	674,855	60,247	252,755	49,255	-91,638	270,619	-52,906	-8,558	884,010
White & green ash	247,584	38,257	80,846	10,658	-5,438	124,323	-3,257	-8,299	360,351
Cottonwood	116,219	12,457	2,727	2,723	-16,419	1,488	-7,855	-6,400	103,452
Willow	66,559	10,329	7,857	964	-2,412	16,738	-	-6,482	76,815
Hackberry	13,211	3,835	2,348	1,284	-996	6,471	-638	-533	18,511
Balsam poplar	939,332	313,558	366,740	196,804	-176,952	700,150	-107,163	-5,929	1,526,390
Bigtooth aspen	355,304	75,063	157,923	113,921	-59,842	287,065	-148,787	-3,255	490,327
Quaking aspen	5,173,649	1,151,255	2,191,399	1,973,388	-882,883	4,433,159	-2,759,862	-35,254	6,811,692
Paper birch	1,105,834	210,561	565,939	132,063	-74,520	834,043	-94,950	-5,720	1,839,207
River birch	369	154	1,176	218	-	1,548	-	-37	1,880
Black cherry	20,348	2,661	4,749	447	-	7,857	-608	-282	27,315
Black walnut	25,719	3,741	5,533	1,020	-1,769	8,525	-1,966	-732	31,546
Butternut	23,369	3,409	4,024	249	-709	6,973	-	-378	29,964
Other hardwoods	46,542	6,551	11,506	2,133	-7,910	12,280	-	-2,711	56,111
Total	15,479,465	2,984,801	4,704,222	2,841,769	-1,908,002	8,622,790	-3,828,530	-202,182	20,071,543
All species	23,728,902	5,049,813	6,421,143	3,975,444	-2,674,916	12,771,484	-5,335,095	-308,997	30,856,294

1/ International 1/4 inch rule.

2/ Figures have been adjusted from those published after the 1977 survey to conform to changes in survey definitions and procedures.

3/ Includes growth on ingrowth, mortality and removals.

Table 12.--Net volume of growing stock on timberland by species group and forest type, Minnesota, 1987

(In thousand cubic feet)

Species group	All types	Jack pine	Red pine	White pine	Balsam fir	White spruce	Black spruce	Northern white-cedar
Softwoods								
Jack pine	433,180	305,693	30,756	3,608	5,955	2,255	11,648	313
Red pine	568,948	47,624	367,431	19,703	26,525	1,961	1,193	844
White pine	225,103	2,135	31,108	67,913	13,507	1,297	4,045	4,324
White spruce	350,606	3,825	6,116	7,649	69,314	70,150	5,875	4,536
Black spruce	539,267	6,908	3,330	1,979	46,311	1,695	379,140	37,889
Balsam fir	1,074,251	5,697	17,560	4,084	379,608	9,206	35,630	46,629
Tamarack	313,776	126	391	-	11,026	299	58,135	17,374
Eastern redcedar	5,709	-	-	-	-	-	237	-
Northern white-cedar	561,869	-	397	376	50,176	2,603	17,524	380,655
Other softwoods	1,486	-	779	-	-	-	-	-
Total	4,074,195	372,008	457,868	105,312	602,422	89,466	513,427	492,564
Hardwoods								
Select white oak	441,142	1,042	315	914	757	70	-	-
Select red oak	694,898	3,537	2,923	821	942	-	379	-
Other red oak	11,784	-	-	-	-	-	-	-
Select hickory	14,200	-	-	-	-	-	-	-
Other hickory	6,354	-	-	-	-	-	-	-
Basswood	591,738	587	-	612	1,310	-	-	-
Yellow birch	14,808	-	-	-	542	-	-	659
Hard maple	347,144	322	-	207	2,142	1,271	-	-
Soft maple	257,848	203	1,412	727	3,230	-	1,316	101
Elm	433,151	184	92	-	2,140	-	-	217
Black ash	618,878	134	1,361	109	11,971	-	5,973	12,588
White & green ash	135,845	-	-	385	109	-	150	154
Cottonwood	24,537	-	104	-	-	-	-	-
Willow	25,436	-	-	-	-	-	-	-
Hackberry	5,309	-	-	-	-	-	-	-
Balsam poplar	696,678	616	1,189	96	19,831	890	3,613	4,667
Bigtooth aspen	203,271	2,793	2,101	-	1,509	-	977	647
Quaking aspen	3,367,562	46,693	38,053	7,172	87,982	12,457	45,329	6,547
Paper birch	1,683,792	13,117	18,196	9,051	106,269	9,198	22,056	30,791
River birch	617	-	-	-	-	-	-	-
Black cherry	15,659	-	-	-	-	-	-	-
Black walnut	7,155	-	-	-	-	-	-	-
Butternut	9,837	-	-	-	-	-	-	-
Other hardwoods	29,583	307	-	-	-	-	-	-
Total	9,637,226	69,535	65,746	20,094	238,734	23,886	79,793	56,371
All species	13,711,421	441,543	523,614	125,406	841,156	113,352	593,220	548,935

(Table 12 continued)

Species group	Tamarack	Oak-hickory	Elm-ash-cottonwood	Maple-basswood	Aspen	Paper birch	Balsam poplar	Nonstocked
Softwoods								
Jack pine	854	7,749	249	5,098	49,744	7,865	1,185	208
Red pine	618	10,713	567	3,803	63,227	24,357	382	-
White pine	1,867	2,201	1,187	20,746	54,945	19,184	644	-
White spruce	1,620	1,378	7,786	17,493	116,163	28,514	10,187	-
Black spruce	21,030	-	2,428	3,691	28,196	4,239	1,948	483
Balsam fir	4,162	996	34,523	51,668	331,810	102,305	49,894	479
Tamarack	200,497	143	3,876	3,001	10,634	3,049	4,436	789
Eastern redcedar	-	3,149	108	1,336	107	584	188	-
Northern white-cedar	6,719	-	30,457	9,491	31,897	21,988	9,073	513
Other softwoods	-	707	-	-	-	-	-	-
Total	237,367	27,036	81,181	116,327	686,723	212,085	77,937	2,472
Hardwoods								
Select white oak	-	224,611	9,259	77,525	112,981	11,047	2,374	247
Select red oak	261	402,002	1,796	87,627	154,435	39,002	1,173	-
Other red oak	-	7,437	376	2,094	1,590	102	185	-
Select hickory	-	12,506	-	960	-	734	-	-
Other hickory	-	3,358	-	2,768	-	228	-	-
Basswood	-	34,139	14,411	403,807	106,544	26,603	3,725	-
Yellow birch	-	-	1,767	9,290	277	2,015	258	-
Hard maple	-	8,354	3,587	267,093	42,671	18,679	2,368	450
Soft maple	440	9,089	34,870	73,260	101,980	30,220	1,000	-
Elm	1,089	27,411	63,168	218,700	83,077	20,164	16,481	428
Black ash	1,410	4,260	352,282	60,378	100,186	34,041	33,382	803
White & green ash	-	7,699	10,659	86,428	24,584	3,286	2,113	278
Cottonwood	-	1,063	17,172	5,119	1,079	-	-	-
Willow	-	118	18,905	4,812	941	-	347	313
Hackberry	-	1,383	1,075	2,851	-	-	-	-
Balsam poplar	3,023	2,312	26,878	24,725	255,173	38,411	314,139	1,115
Bigtooth aspen	-	13,844	1,968	17,313	147,413	14,430	276	-
Quaking aspen	5,097	61,674	24,576	96,832	2,692,572	147,842	89,923	4,813
Paper birch	5,426	55,929	31,761	103,105	596,709	650,518	31,096	570
River birch	-	-	499	118	-	-	-	-
Black cherry	-	6,266	109	4,359	3,847	442	189	447
Black walnut	-	4,002	740	2,196	127	90	-	-
Butternut	-	6,700	87	2,014	919	117	-	-
Other hardwoods	-	2,652	15,669	8,288	2,495	-	76	96
Total	16,746	896,809	631,614	1,561,662	4,429,600	1,037,971	499,105	9,560
All species	254,113	923,845	712,795	1,677,989	5,116,323	1,250,056	577,042	12,032

Table 13.--Net volume of sawtimber on timberland by species group and forest type, Minnesota, 1987

(In thousand board feet) 1/

Species group	All types	Jack pine	Red pine	White pine	Balsam fir	White spruce	Black spruce	Northern white-cedar
Softwoods								
Jack pine	1,134,010	729,551	72,809	14,056	24,020	8,532	37,642	1,646
Red pine	2,401,596	177,423	1,480,138	91,566	108,572	9,547	6,835	4,855
White pine	1,137,308	7,310	144,098	337,534	73,738	6,839	18,574	24,756
White spruce	1,368,808	13,078	25,083	25,910	284,511	195,057	19,712	16,292
Black spruce	504,734	6,906	988	1,830	65,392	842	274,816	68,646
Balsam fir	2,125,195	10,256	24,985	5,242	708,489	12,516	46,046	64,192
Tamarack	515,422	686	543	-	26,789	1,571	83,286	31,106
Eastern redcedar	13,411	-	-	-	-	-	-	-
Northern white-cedar	1,580,682	-	1,511	562	175,921	11,786	31,604	956,126
Other softwoods	3,585	-	-	-	-	-	-	-
Total	10,784,751	945,210	1,750,155	476,700	1,467,432	246,690	518,515	1,167,619
Hardwoods								
Select white oak	1,351,496	1,164	507	1,141	1,918	-	-	-
Select red oak	2,217,625	4,624	4,056	3,486	539	-	594	-
Other red oak	45,331	-	-	-	-	-	-	-
Select hickory	34,404	-	-	-	-	-	-	-
Other hickory	9,138	-	-	-	-	-	-	-
Basswood	1,685,443	-	-	2,430	4,632	-	-	-
Yellow birch	56,954	-	-	-	1,117	-	-	1,829
Hard maple	788,823	-	-	1,114	705	1,625	-	-
Soft maple	345,739	-	799	681	2,999	-	1,435	-
Elm	1,279,019	536	-	-	4,928	-	-	803
Black ash	884,010	-	-	741	12,560	-	10,808	12,442
White & green ash	360,351	-	-	655	-	-	-	902
Cottonwood	103,452	-	-	-	-	-	-	-
Willow	76,815	-	-	-	-	-	-	-
Hackberry	18,511	-	-	-	-	-	-	-
Balsam poplar	1,526,390	541	1,974	-	39,008	785	4,364	7,292
Bigtooth aspen	490,327	5,336	4,641	-	3,604	-	1,518	1,180
Quaking aspen	6,811,692	45,246	66,921	21,616	174,307	13,391	72,247	17,944
Paper birch	1,839,207	6,185	17,551	6,340	148,955	14,271	18,994	50,606
River birch	1,880	-	-	-	-	-	-	-
Black cherry	27,315	-	-	-	-	-	-	-
Black walnut	31,546	-	-	-	-	-	-	-
Butternut	29,964	-	-	-	-	-	-	-
Other hardwoods	56,111	-	-	-	-	-	-	-
Total	20,071,543	63,632	96,449	38,204	395,272	30,072	109,960	92,998
All species	30,856,294	1,008,842	1,846,604	514,904	1,862,704	276,762	628,475	1,260,617

(Table 13 continued on next page)

(Table 13 continued)

Species group	Tamarack	Oak-hickory	Elm-ash-cottonwood	Maple-basswood	Aspen	Paper birch	Balsam poplar	Nonstocked
Softwoods								
Jack pine	2,840	24,457	-	22,076	165,201	29,052	2,128	-
Red pine	3,591	49,914	3,286	12,167	320,990	130,507	2,205	-
White pine	9,448	10,551	6,533	114,420	277,320	102,429	3,758	-
White spruce	5,023	6,917	38,591	81,206	485,342	121,898	50,188	-
Black spruce	12,972	-	4,918	6,331	42,207	11,430	7,024	432
Balsam fir	7,219	2,405	72,232	144,570	676,294	223,415	125,768	1,566
Tamarack	278,147	789	11,451	9,074	37,429	9,678	21,129	3,744
Eastern redcedar	-	6,661	622	2,987	-	2,032	1,109	-
Northern white-cedar	17,050	-	109,192	44,495	112,592	83,821	33,324	2,698
Other softwoods	-	3,585	-	-	-	-	-	-
Total	336,290	105,279	246,825	437,326	2,117,375	714,262	246,633	8,440
Hardwoods								
Select white oak	-	747,508	32,347	286,979	248,820	24,217	5,977	918
Select red oak	1,285	1,345,321	2,730	338,649	410,583	101,491	4,267	-
Other red oak	-	30,116	1,853	9,694	2,785	-	883	-
Select hickory	-	29,155	-	1,286	-	3,963	-	-
Other hickory	-	2,805	-	5,678	-	655	-	-
Basswood	-	81,276	49,883	1,306,971	186,941	47,893	5,417	-
Yellow birch	-	-	6,040	39,239	518	6,808	1,403	-
Hard maple	-	11,970	7,857	709,632	39,422	14,046	2,452	-
Soft maple	-	12,710	120,626	129,884	63,910	11,673	1,022	-
Elm	1,020	73,092	183,750	733,978	185,152	44,605	49,899	1,256
Black ash	-	2,641	543,005	108,969	113,463	40,987	38,394	-
White & green ash	-	17,725	35,895	261,437	32,612	6,475	3,025	1,625
Cottonwood	-	4,786	73,405	21,221	4,040	-	-	-
Willow	-	500	55,256	15,631	4,038	-	-	1,390
Hackberry	-	5,198	4,296	9,017	-	-	-	-
Balsam poplar	5,262	3,846	73,932	72,194	538,075	93,609	685,508	-
Bigtooth aspen	-	45,667	6,715	52,853	329,109	39,170	534	-
Quaking aspen	11,437	132,241	73,532	292,157	5,248,711	411,391	219,633	10,918
Paper birch	6,002	43,556	55,634	220,899	543,865	651,224	53,977	1,148
River birch	-	-	1,880	-	-	-	-	-
Black cherry	-	13,939	-	12,655	721	-	-	-
Black walnut	-	19,124	1,941	9,249	663	569	-	-
Butternut	-	20,157	-	6,152	3,008	647	-	-
Other hardwoods	-	3,484	26,530	23,506	2,042	-	-	549
Total	25,006	2,646,817	1,357,107	4,667,930	7,958,478	1,499,423	1,072,391	17,804
All species	361,296	2,752,096	1,603,932	5,105,256	10,075,853	2,213,685	1,319,024	26,244

1/ International 1/4 inch rule.

Table 14.--Net volume of growing stock on timberland by species group and diameter class, Minnesota, 1987

(In thousand cubic feet)

Species group	All classes	Diameter class(inches at breast height) 5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-28.9	29.0+
Softwoods												
Jack pine	433,180	84,443	130,299	110,948	64,747	31,604	8,950	2,189	-	-	-	-
Red pine	568,948	84,963	64,501	73,345	89,881	65,165	65,020	48,937	38,486	23,512	14,974	164
White pine	225,103	5,104	9,438	11,784	25,184	25,732	26,188	30,592	24,444	15,366	39,675	11,596
White spruce	350,606	38,546	41,348	51,470	57,221	51,244	41,110	33,881	15,616	10,315	9,855	-
Black spruce	539,267	236,986	190,256	72,096	24,624	10,855	2,120	1,765	369	-	196	-
Balsam fir	1,074,251	284,267	317,285	235,898	144,325	59,243	22,036	8,067	2,808	322	-	-
Tamarack	313,776	116,646	100,455	53,876	23,998	12,884	3,420	2,026	325	-	146	-
Eastern redcedar	5,709	1,593	1,833	1,186	688	294	115	-	-	-	-	-
Northern white-cedar	561,869	121,378	134,247	121,163	78,178	53,642	29,050	14,461	6,667	1,565	1,518	-
Other softwoods	1,486	305	545	101	116	306	113	-	-	-	-	-
Total	4,074,195	974,231	990,207	731,867	508,962	310,969	198,122	141,918	88,715	51,080	66,364	11,760
Hardwoods												
Select white oak	441,142	46,760	65,917	70,198	67,332	56,996	44,978	28,633	21,850	13,822	20,577	4,079
Select red oak	694,898	32,791	90,575	124,802	118,772	97,004	82,528	55,558	39,128	21,072	27,230	5,438
Other red oak	11,784	370	863	1,125	603	1,654	1,862	2,021	1,373	578	1,239	96
Select hickory	14,200	2,413	2,501	2,856	2,388	2,047	1,001	686	199	109	-	-
Other hickory	6,354	1,047	2,203	1,349	786	582	160	-	227	-	-	-
Basswood	591,738	51,797	86,521	108,992	91,674	77,739	58,364	47,938	26,898	18,872	18,225	4,718
Yellow birch	14,808	996	650	1,507	1,484	3,052	1,618	1,747	1,561	1,262	931	-
Hard maple	347,144	79,238	61,581	49,080	41,806	33,075	31,145	23,830	14,096	5,421	6,774	1,098
Soft maple	257,848	87,936	65,716	36,578	19,408	15,247	7,910	7,050	5,388	2,931	5,743	3,941
Elm	433,151	26,539	55,943	65,073	63,699	54,480	49,525	37,775	24,931	16,981	29,041	9,164
Black ash	618,878	195,945	162,494	114,640	72,787	39,453	19,116	7,680	4,066	1,447	1,146	104
White & green ash	135,845	19,551	25,156	25,470	21,885	15,433	12,584	5,393	4,642	2,601	3,024	106
Cottonwood	24,537	388	346	666	1,308	1,036	1,016	2,325	2,766	2,622	4,152	7,912
Willow	25,436	139	2,410	4,685	4,867	4,028	3,443	1,985	1,667	410	1,335	467
Hackberry	5,309	297	451	562	621	433	838	149	516	541	741	160
Balsam poplar	696,678	60,184	117,271	166,363	136,683	103,866	59,465	30,509	14,346	4,546	3,445	-
Bigtooth aspen	203,271	11,697	30,636	55,090	49,403	29,556	15,268	8,440	2,613	406	162	-
Quaking aspen	3,367,562	516,196	701,151	776,281	669,440	386,449	192,434	83,498	28,303	9,844	3,966	-
Paper birch	1,683,792	455,257	488,860	383,679	201,789	96,643	36,071	13,957	3,650	2,569	1,317	-
River birch	617	-	118	95	299	105	-	-	-	-	-	-
Black cherry	15,659	3,153	4,223	3,471	1,696	879	1,168	659	256	154	-	-
Black walnut	7,155	239	568	792	1,098	1,352	1,732	395	632	132	215	-
Butternut	9,837	1,252	1,611	1,728	1,713	694	1,429	821	263	118	208	-
Other hardwoods	29,583	6,264	8,022	5,398	3,524	3,248	1,203	903	582	266	173	-
Total	9,637,226	1,600,449	1,975,787	2,000,480	1,575,065	1,025,051	624,858	361,952	199,953	106,704	129,644	37,283
All species	13,711,421	2,574,680	2,965,994	2,732,347	2,084,027	1,336,020	822,980	503,870	288,668	157,784	196,008	49,043

Table 15.--Net volume of sawtimber on timberland by species group and diameter class, Minnesota, 1987

(In thousand board feet) 1/

Species group	All classes	Diameter class (inches at breast height) 9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-28.9	29.0+
Softwoods										
Jack pine	1,134,010	576,129	335,377	164,048	46,868	11,588	-	-	-	-
Red pine	2,401,596	420,378	513,870	370,727	370,682	280,339	221,561	135,992	87,085	962
White pine	1,137,308	46,216	117,822	130,635	139,704	169,117	138,771	88,981	235,062	71,000
White spruce	1,368,808	235,026	279,440	260,782	215,651	181,201	84,847	56,757	55,104	-
Black spruce	504,734	305,075	119,100	56,166	11,435	9,741	2,093	-	1,124	-
Balsam fir	2,125,195	990,742	670,575	291,899	112,754	42,421	15,062	1,742	-	-
Tamarack	515,422	282,692	129,003	70,554	19,033	11,434	1,851	-	855	-
Eastern redcedar	13,411	7,090	3,966	1,688	667	-	-	-	-	-
Northern white-cedar	1,580,682	604,490	402,719	283,390	156,560	79,222	36,929	8,789	8,583	-
Other softwoods	3,585	567	643	1,735	640	-	-	-	-	-
Total	10,784,751	3,468,405	2,572,515	1,631,624	1,073,994	785,063	501,114	292,261	387,813	71,962
Hardwoods										
Select white oak	1,351,496	-	383,994	302,025	228,218	142,611	107,126	67,462	100,041	20,019
Select red oak	2,217,625	-	588,049	478,233	407,129	275,549	195,097	106,255	138,879	28,434
Other red oak	45,331	-	2,982	7,782	8,833	9,633	6,646	2,827	6,142	486
Select hickory	34,404	-	13,612	10,774	4,992	3,505	983	538	-	-
Other hickory	9,138	-	4,325	2,985	737	-	1,091	-	-	-
Basswood	1,685,443	-	442,263	375,189	284,746	236,451	134,100	95,041	93,000	24,653
Yellow birch	56,954	-	6,257	13,945	7,776	8,869	8,180	6,781	5,146	-
Hard maple	788,823	-	201,660	163,351	156,769	122,140	73,501	28,723	36,570	6,109
Soft maple	345,739	-	110,548	78,869	38,810	33,883	25,287	13,591	26,533	18,218
Elm	1,279,019	-	275,727	237,473	219,880	170,188	114,250	78,918	137,595	44,988
Black ash	884,010	-	472,521	232,040	104,927	40,425	20,747	7,206	5,638	506
White & green ash	360,351	-	133,677	84,328	65,280	27,340	22,722	12,305	14,194	505
Cottonwood	103,452	-	5,419	4,273	4,284	9,830	12,056	11,460	18,572	37,558
Willow	76,815	-	20,330	16,524	14,339	8,418	7,202	1,808	6,018	2,176
Hackberry	18,511	-	2,797	1,880	3,836	717	2,384	2,536	3,583	778
Balsam poplar	1,526,390	-	551,060	451,578	270,616	143,740	69,602	22,474	17,320	-
Bigtooth aspen	490,327	-	222,756	137,674	73,026	41,030	12,963	2,055	823	-
Quaking aspen	6,811,692	-	3,159,856	1,948,008	1,012,516	454,312	157,897	56,043	23,060	-
Paper birch	1,839,207	-	1,021,100	505,765	193,500	76,330	20,398	14,516	7,598	-
River birch	1,880	-	1,394	486	-	-	-	-	-	-
Black cherry	27,315	-	10,487	5,081	6,251	3,443	1,303	750	-	-
Black walnut	31,546	-	6,852	7,982	9,564	2,121	3,274	676	1,077	-
Butternut	29,964	-	10,704	3,948	7,883	4,427	1,349	599	1,054	-
Other hardwoods	56,111	-	19,950	18,364	6,793	5,120	3,349	1,532	1,003	-
Total	20,071,543	-	7,668,320	5,088,557	3,130,705	1,820,082	1,001,507	534,096	643,846	184,430
All species	30,856,294	3,468,405	10,240,835	6,720,181	4,204,699	2,605,145	1,502,621	826,357	1,031,659	256,392

1/ International 1/4 inch rule.

Table 16.--Annual net growth, mortality and removals of growing stock and sawtimber on timberland by softwoods and harwoods, Minnesota, 1976 and 1986

Species group	Growing stock 1976	Growing stock 1986	Sawtimber 1976	Sawtimber 1986 1/
	Thousand cubic feet		Thousand board feet	
NET GROWTH				
Softwoods	119,781	160,431	380,319	585,105
Hardwoods	229,139	333,548	731,145	1,169,243
All species	348,920	493,979	1,111,464	1,754,348
MORTALITY				
Softwoods	33,728	44,452	50,462	81,228
Hardwoods	107,813	97,494	212,531	207,267
All species	141,541	141,946	262,993	288.494
REMOVALS				
Softwoods	68,800	57,200	269,942	141,300
Hardwoods	124,800	194,000	290,365	452,000
All species	193,600	251,200	560,307	593,300

1/ International 1/4 inch rule

Table 17.--Net volume in short-log trees on timberland by species group and diameter class, Minnesota, 1987

(In thousand cubic feet)

Species group	All classes	Diameter class(inches at breast height) 9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-28.9	29.0+
Softwoods										
Jack pine	3,033	904	1,075	942	112	-	-	-	-	-
Red pine	1,038	-	256	264	234	-	171	113	-	-
White pine	3,233	105	181	255	613	603	157	148	1,003	168
White spruce	640	-	351	-	289	-	-	-	-	-
Black spruce	2,249	937	404	764	144	-	-	-	-	-
Balsam fir	4,701	882	2,665	662	-	340	152	-	-	-
Tamarack	2,092	816	612	416	-	106	142	-	-	-
Eastern redcedar	557	219	183	-	78	-	77	-	-	-
Northern white-cedar	17,200	5,016	5,269	2,906	1,926	1,249	631	203	-	-
Total	34,743	8,879	10,996	6,209	3,396	2,298	1,330	464	1,003	168
Hardwoods										
Select white oak	17,621	-	2,924	3,661	3,576	2,223	1,124	1,864	1,483	766
Select red oak	17,775	-	1,390	5,169	3,287	2,649	2,903	482	1,520	375
Other red oak	622	-	-	209	85	-	234	94	-	-
Select hickory	281	-	-	170	111	-	-	-	-	-
Basswood	9,065	-	1,438	1,621	1,678	1,069	607	283	1,653	716
Yellow birch	1,989	-	182	848	393	125	308	-	133	-
Hard maple	12,406	-	923	2,901	3,319	1,564	1,834	945	484	436
Soft maple	4,235	-	221	320	901	782	360	485	322	844
Elm	21,148	-	2,924	4,899	3,359	3,177	2,151	897	2,884	857
Black ash	3,114	-	1,311	973	262	369	-	88	111	-
White & green ash	1,926	-	823	540	94	242	127	100	-	-
Cottonwood	439	-	-	185	-	-	-	-	110	144
Willow	613	-	-	103	-	126	264	-	120	-
Hackberry	405	-	-	-	-	144	120	-	141	-
Balsam poplar	6,220	-	1,313	1,640	1,030	990	1,113	134	-	-
Bigtooth aspen	2,977	-	-	1,177	805	446	549	-	-	-
Quaking aspen	51,009	-	5,601	16,450	14,760	8,766	2,997	1,831	604	-
Paper birch	15,432	-	2,665	6,045	3,934	1,306	624	99	759	-
River birch	221	-	-	-	-	221	-	-	-	-
Black cherry	91	-	-	-	91	-	-	-	-	-
Black walnut	212	-	-	-	-	212	-	-	-	-
Butternut	878	-	-	111	-	531	106	-	-	130
Other hardwoods	2,309	-	481	978	552	228	70	-	-	-
Total	170,988	-	22,196	48,000	38,237	25,170	15,491	7,302	10,324	4,268
All species	205,731	8,879	33,192	54,209	41,633	27,468	16,821	7,766	11,327	4,436

Table 18.--Net volume in short-log trees on timberland by species group and diameter class, Minnesota, 1987

(In thousand board feet) 1/

Species group	All classes	Diameter class(inches at breast height) 9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-22.9	23.0-28.9	29.0+
Softwoods										
Jack pine	10,543	3,096	3,750	3,308	389	-	-	-	-	-
Red pine	4,212	-	1,046	1,058	946	-	698	464	-	-
White pine	11,804	306	541	828	2,165	2,184	583	562	3,961	674
White spruce	2,910	-	1,536	-	1,374	-	-	-	-	-
Black spruce	6,611	2,487	1,202	2,450	472	-	-	-	-	-
Balsam fir	12,720	2,204	7,113	1,902	-	1,033	468	-	-	-
Tamarack	8,976	3,442	2,611	1,797	-	482	644	-	-	-
Eastern redcedar	2,925	1,183	932	-	404	-	406	-	-	-
Northern white-cedar	61,028	17,230	18,500	10,410	7,067	4,670	2,379	772	-	-
Total	121,729	29,948	37,231	21,753	12,817	8,369	5,178	1,798	3,961	674
Hardwoods										
Select white oak	47,687	-	8,760	10,230	9,582	5,739	2,872	4,746	3,799	1,959
Select red oak	40,019	-	3,090	11,495	7,354	5,967	6,607	1,104	3,517	885
Other red oak	1,435	-	-	478	198	-	541	218	-	-
Select hickory	776	-	-	480	296	-	-	-	-	-
Basswood	19,677	-	3,037	3,403	3,610	2,302	1,337	620	3,724	1,644
Yellow birch	4,677	-	390	1,891	919	317	794	-	366	-
Hard maple	30,326	-	2,128	6,813	8,093	3,859	4,591	2,417	1,266	1,159
Soft maple	11,153	-	664	942	2,444	2,057	916	1,213	799	2,118
Elm	54,030	-	7,103	12,156	8,449	8,208	5,604	2,387	7,738	2,385
Black ash	8,878	-	4,003	2,742	709	943	-	217	264	-
White & green ash	4,886	-	2,220	1,360	242	553	288	223	-	-
Cottonwood	1,390	-	-	544	-	-	-	-	357	489
Willow	1,897	-	-	306	-	389	813	-	389	-
Hackberry	1,075	-	-	-	-	368	324	-	383	-
Balsam poplar	14,861	-	2,926	3,792	2,488	2,465	2,842	348	-	-
Bigtooth aspen	4,935	-	-	1,897	1,330	759	949	-	-	-
Quaking aspen	120,215	-	12,191	37,490	35,172	21,493	7,560	4,726	1,583	-
Paper birch	43,281	-	7,144	16,719	11,197	3,742	1,846	298	2,335	-
River birch	736	-	-	-	-	736	-	-	-	-
Black cherry	242	-	-	-	242	-	-	-	-	-
Black walnut	574	-	-	-	-	574	-	-	-	-
Butternut	2,301	-	-	320	-	1,392	274	-	-	315
Other hardwoods	8,441	-	1,758	3,586	2,009	834	254	-	-	-
Total	423,492	-	55,414	116,644	94,334	62,697	38,412	18,517	26,520	10,954
All species	545,221	29,948	92,645	138,397	107,151	71,066	43,590	20,315	30,481	11,628

1/ International 1/4 inch rule.

Table 19.--All live tree biomass on timberland
by species group and tree biomass component, Minnesota, 1987

ALL UNITS

Species group	All components	Component: Growing stock: Bole	Component: Growing stock: Tops and limbs	Component: Cull: Bole	Component: Cull: Tops and limbs	Component: 1- to 5-inch trees	Average weight per cubic foot (including bark)
	- - -

(Table 19 continued)

ASPEN-BIRCH

Species group	All components	Component: Growing stock: Bole	Growing stock: Tops and limbs	Cull: Bole	Cull: Tops and limbs	1- to 5-inch trees	Average weight per cubic foot (including bark)
	Green tons						Pounds
Softwoods							
Jack pine	4,124,075	3,052,865	597,791	218,847	40,681	213,891	46
Red pine	7,616,412	6,152,625	1,120,664	89,529	17,116	236,478	46
White pine	3,654,286	2,867,594	481,964	206,320	42,075	56,333	45
White spruce	9,741,324	6,442,726	2,289,624	178,135	70,655	760,184	45
Black spruce	26,815,196	11,073,742	4,803,206	372,856	157,428	10,407,964	45
Balsam fir	43,663,456	19,672,799	8,394,758	1,044,471	443,833	14,107,595	47
Tamarack	5,894,047	3,048,347	681,731	487,634	109,014	1,567,321	52
Eastern redcedar	25,734	8,427	4,294	3,373	1,058	8,582	43
Northern white-cedar	17,102,280	7,374,559	3,254,485	2,421,358	1,030,944	3,020,934	36
Other softwoods	-	-	-	-	-	-	-
Total	118,636,810	59,693,684	21,628,517	5,022,523	1,912,804	30,379,282	44
Hardwoods							
Select white oak	422,826	236,939	104,298	15,870	6,219	59,500	58
Select red oak	929,315	546,251	219,383	117,557	46,124	-	64
Other red oak	-	-	-	-	-	-	-
Select hickory	-	-	-	-	-	-	-
Other hickory	-	-	-	-	-	-	-
Basswood	2,199,491	1,318,766	548,375	180,391	73,416	78,543	42
Yellow birch	1,215,417	361,051	130,282	509,399	182,210	32,475	61
Hard maple	10,177,444	3,582,980	1,617,288	2,342,838	959,302	1,675,036	63
Soft maple	8,043,006	2,398,435	1,129,818	1,697,835	750,257	2,066,661	55
Elm	2,911,179	1,639,484	671,968	351,063	139,814	108,850	55
Black ash	14,841,726	7,564,516	3,587,838	712,054	331,966	2,645,352	50
White & green ash	815,764	444,111	195,414	85,088	33,050	58,101	51
Cottonwood	45,897	17,087	7,256	12,331	4,236	4,987	51
Willow	12,088	-	-	8,444	3,644	-	48
Hackberry	-	-	-	-	-	-	-
Balsam poplar	17,144,747	9,788,618	3,796,614	1,718,531	652,164	1,188,820	53
Bigtooth aspen	1,712,909	1,191,694	364,816	119,229	37,170	-	50
Quaking aspen	74,366,860	40,863,109	13,424,801	10,008,013	3,156,145	6,914,792	50
Paper birch	55,003,911	28,561,301	12,816,929	4,883,157	2,075,525	6,666,999	55
River birch	-	-	-	-	-	-	-
Black cherry	68,277	4,344	2,061	4,436	2,140	55,296	49
Black walnut	-	-	-	-	-	-	-
Butternut	-	-	-	-	-	-	-
Other hardwoods	59,245	6,439	3,424	24,765	11,376	13,241	46
Noncommercial spp.	761,120	-	-	134,550	69,949	556,621	50
Total	190,731,222	98,525,125	38,620,565	22,925,551	8,534,707	22,125,274	53
All species	309,368,032	158,218,809	60,249,082	27,948,074	10,447,511	52,504,556	49

(Table 19 continued on next page)

(Table 19 continued)

NORTHERN PINE

Species group	All components	Component: Growing stock: Bole	Growing stock: Tops and limbs	Cull: Bole	Cull: Tops and limbs	1- to 5-inch trees	Average weight per cubic foot (including bark)
	Green tons						Pounds
Softwoods							
Jack pine	12,782,651	8,638,641	1,725,203	760,537	155,477	1,502,793	46
Red pine	10,467,832	8,433,355	1,467,583	74,411	13,346	479,137	46
White pine	3,571,777	2,729,088	464,720	201,593	37,354	139,022	45
White spruce	3,489,601	2,296,019	838,336	62,891	22,251	270,104	45
Black spruce	8,817,667	2,848,656	1,244,219	285,961	134,228	4,304,603	45
Balsam fir	19,505,279	9,711,237	3,970,429	529,835	217,755	5,076,023	47
Tamarack	10,054,860	5,664,820	1,253,767	879,422	197,933	2,058,918	52
Eastern redcedar	52,528	13,231	5,457	24,565	9,275	-	43
Northern white-cedar	10,949,069	4,491,189	1,990,417	1,994,022	877,106	1,596,335	36
Other softwoods	-	-	-	-	-	-	-
Total	79,691,264	44,826,236	12,960,131	4,813,237	1,664,725	15,426,935	45
Hardwoods							
Select white oak	11,818,320	5,853,125	2,684,823	868,120	386,570	2,025,682	58
Select red oak	18,666,628	11,105,233	4,551,591	1,992,562	796,802	220,440	64
Other red oak	80,525	52,139	22,630	4,006	1,750	-	64
Select hickory	-	-	-	-	-	-	-
Other hickory	37,691	19,753	8,445	-	-	9,493	59
Basswood	13,478,120	7,863,171	3,293,156	982,050	394,720	945,023	42
Yellow birch	624,478	192,298	81,279	199,596	82,256	69,049	61
Hard maple	13,516,986	5,670,557	2,416,892	2,448,953	959,516	2,021,068	63
Soft maple	9,335,125	3,741,468	1,675,090	1,525,533	627,523	1,765,511	55
Elm	11,024,443	6,024,326	2,591,136	1,141,067	475,587	792,327	55
Black ash	18,353,756	9,098,684	4,278,522	1,029,704	483,734	3,463,112	50
White & green ash	2,124,112	1,099,241	479,460	165,289	72,362	307,760	51
Cottonwood	4,697	3,227	1,470	-	-	-	51
Willow	4,613	3,237	1,376	-	-	-	48
Hackberry	-	-	-	-	-	-	-
Balsam poplar	19,788,766	11,389,217	4,491,858	1,426,884	587,005	1,893,802	53
Bigtooth aspen	6,490,588	3,967,583	1,186,293	888,088	259,737	188,887	50
Quaking aspen	92,007,334	49,162,073	15,776,078	14,773,388	4,575,522	7,720,273	50
Paper birch	41,909,093	22,539,003	9,956,740	3,803,281	1,690,098	3,919,971	55
River birch	-	-	-	-	-	-	-
Black cherry	390,931	59,788	28,243	118,589	59,346	124,965	49
Black walnut	-	-	-	-	-	-	-
Butternut	105,334	56,768	23,486	15,939	5,882	3,259	45
Other hardwoods	270,430	78,350	35,776	86,235	37,349	32,720	46
Noncommercial spp.	896,045	-	-	165,940	84,874	645,231	50
Total	260,928,015	137,979,241	53,584,344	31,635,224	11,580,633	26,148,573	53
All species	340,619,279	182,805,477	66,544,475	36,448,461	13,245,358	41,575,508	51

(Table 19 continued on next page)

(Table 19 continued)

CENTRAL HARDWOOD

Species group	All components	Component: Growing stock: Bole	Growing stock: Tops and limbs	Cull: Bole	Cull: Tops and limbs	1- to 5-inch trees	Average weight per cubic foot (including bark)
	Green tons						Pounds
Softwoods							
Jack pine	412,278	267,542	53,290	15,251	3,049	73,146	46
Red pine	1,184,991	863,301	169,061	12,746	2,386	137,497	46
White pine	666,673	506,160	84,756	46,954	8,491	20,312	45
White spruce	135,534	90,525	30,648	5,387	1,762	7,212	45
Black spruce	433,637	151,950	69,204	9,796	3,788	198,899	45
Balsam fir	519,389	234,665	96,909	14,406	5,279	168,130	47
Tamarack	1,240,657	866,524	184,118	62,408	12,677	114,930	52
Eastern redcedar	201,939	79,385	33,519	20,143	7,288	61,604	43
Northern white-cedar	-	-	-	-	-	-	-
Other softwoods	117,033	38,129	14,983	12,664	6,364	44,893	44
Total	4,912,131	3,098,181	736,488	199,755	51,084	826,623	47
Hardwoods							
Select white oak	13,352,467	7,211,693	2,987,564	1,799,574	716,429	637,207	58
Select red oak	23,120,238	14,521,001	5,449,642	2,247,484	805,313	96,798	64
Other red oak	629,863	393,938	139,942	71,796	24,187	-	64
Select hickory	904,548	534,848	228,577	52,011	20,410	68,702	63
Other hickory	334,703	183,022	80,897	14,716	6,597	49,471	59
Basswood	8,338,995	4,958,488	1,915,553	730,940	275,520	458,494	42
Yellow birch	64,036	4,211	1,656	29,053	12,410	16,706	61
Hard maple	6,825,396	3,403,760	1,344,380	1,057,210	390,346	629,700	63
Soft maple	5,194,604	2,255,901	933,353	630,229	249,273	1,125,848	55
Elm	10,410,229	5,570,694	2,240,472	1,350,240	523,695	725,128	55
Black ash	3,795,442	1,833,093	854,682	331,322	153,382	622,963	50
White & green ash	3,073,646	1,866,346	774,207	211,001	87,246	134,846	51
Cottonwood	513,150	343,802	103,709	31,980	8,636	25,023	51
Willow	540,824	292,325	107,979	95,398	34,255	10,867	48
Hackberry	195,330	102,925	40,255	27,832	10,334	13,984	52
Balsam poplar	821,545	426,407	171,046	132,106	55,313	36,673	53
Bigtooth aspen	1,873,704	1,130,716	337,949	283,415	80,106	41,518	50
Quaking aspen	20,200,334	10,351,096	3,408,491	3,606,434	1,173,115	1,661,198	50
Paper birch	8,549,835	4,606,739	2,082,207	524,691	231,592	1,104,606	55
River birch	67,933	20,695	8,122	28,917	10,199	-	55
Black cherry	814,314	337,499	143,379	114,125	48,784	170,527	49
Black walnut	290,095	191,467	72,613	15,688	5,511	4,816	54
Butternut	599,218	212,093	86,471	211,136	80,655	8,863	45
Other hardwoods	1,273,766	398,999	182,385	377,570	155,126	159,686	46
Noncommercial spp.	1,513,009	-	-	399,899	203,809	909,301	50
Total	113,297,224	61,151,758	23,695,531	14,374,767	5,362,243	8,712,925	55
All species	118,209,355	64,249,939	24,432,019	14,574,522	5,413,327	9,539,548	54

(Table 19 continued on next page)

(Table 19 continued)

PRAIRIE

Species group	All components	Component: Growing stock: Bole	Growing stock: Tops and limbs	Cull: Bole	Cull: Tops and limbs	1- to 5-inch trees	Average weight per cubic foot (including bark)
	Green tons						Pounds
Softwoods							
Jack pine	12,965	10,913	2,052	-	-	-	46
Red pine	19,662	16,918	2,744	-	-	-	46
White pine	-	-	-	-	-	-	-
White spruce	20,200	15,392	4,808	-	-	-	45
Black spruce	5,317	3,511	1,806	-	-	-	45
Balsam fir	12,367	4,186	2,135	-	-	6,046	47
Tamarack	18,232	9,058	1,991	-	-	7,183	52
Eastern redcedar	131,076	40,304	19,030	9,843	4,797	57,102	43
Northern white-cedar	-	-	-	-	-	-	-
Other softwoods	-	-	-	-	-	-	-
Total	219,819	100,282	34,566	9,843	4,797	70,331	45
Hardwoods							
Select white oak	4,639,924	2,718,130	1,108,169	422,090	171,856	219,679	58
Select red oak	1,180,565	759,968	277,911	106,052	36,634	-	64
Other red oak	26,746	19,540	7,206	-	-	-	64
Select hickory	3,377	-	-	2,562	815	-	63
Other hickory	28,405	19,875	8,530	-	-	-	59
Basswood	1,569,920	1,017,863	357,234	124,044	44,019	26,760	42
Yellow birch	10,631	-	-	7,180	3,451	-	61
Hard maple	696,778	395,308	148,312	94,984	34,293	23,881	63
Soft maple	241,868	98,204	35,902	84,318	23,444	-	55
Elm	2,523,123	1,282,927	476,034	390,851	145,088	228,223	55
Black ash	384,713	164,035	77,265	41,543	20,092	81,778	50
White & green ash	1,472,094	824,712	312,164	228,980	85,395	20,843	51
Cottonwood	563,410	400,684	125,389	28,945	8,392	-	51
Willow	732,216	451,215	182,008	71,909	27,084	-	48
Hackberry	133,066	67,174	25,366	28,276	10,520	1,730	52
Balsam poplar	2,136,395	1,108,240	462,575	205,959	86,899	272,722	53
Bigtooth aspen	3,476	2,563	913	-	-	-	50
Quaking aspen	10,267,479	4,770,665	1,641,099	2,006,157	675,108	1,174,450	50
Paper birch	183,329	105,239	48,440	13,944	6,461	9,245	55
River birch	-	-	-	-	-	-	-
Black cherry	152,017	52,968	23,489	27,751	12,667	35,142	49
Black walnut	76,456	45,179	17,494	10,046	3,737	-	54
Butternut	13,211	3,242	941	3,517	1,690	3,821	45
Other hardwoods	1,212,025	376,013	171,772	338,665	142,904	182,671	46
Noncommercial spp.	234,097	-	-	73,147	38,493	122,457	50
Total	28,485,321	14,683,744	5,508,213	4,310,920	1,579,042	2,403,402	52
All species	28,705,140	14,784,026	5,542,779	4,320,763	1,583,839	2,473,733	52

Hahn, Jerold T.; Smith, W. Brad.
1987. Minnesota's forest statistics, 1987: an inventory update. Gen. Tech. Rep. NC-118. St. Paul, MN: U.S. Department of Agriculture Forest Service, North Central Forest Experiment Station. 44 p.

The Minnesota 1987 inventory update, derived by using tree growth models, reports 13.5 million acres of timberland, a decline of less than 1 percent since 1977. This bulletin presents findings from the inventory update in tables detailing timber land area, volume, and biomass.

KEY WORDS: Forest area, timberland, forest inventory, land use, update.