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North Dakota's Forest Resources in 2002

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North Dakota's Forest Resources in 2002

The North Central Research Station's Forest Inventory and Analysis (NCFIA) program began fieldwork for the fourth forest inventory of North Dakota forest resources in 2001. This inventory initiated the new annual inventory system in which one-fifth of the field plots (considered one panel) in the State are measured each year. A complete inventory consists of measuring and compiling the data for all plots (or five panels). Once all panels have been measured, each will be remeasured approximately every 5 years. For example, in North Dakota, the field plots measured in 2001 will be remeasured in 2006.

In 2002, NCFIA continued the annual inventory effort with the second panel of the fourth forest inventory. This fourth inventory of North Dakota's forest resources will be completed in 2005. However, because each year's sample is a systematic sample of the State's forest and because timely information is needed about North Dakota's forest resources, estimates have been prepared from data gathered during the first 2 years of the inventory. Data presented in this report represent 40 percent of the field plots (or two panels) for a complete inventory and are a combination of the first year's panel from 2001 and the second year's panel from 2002. An earlier report for the 2001 panel (Haugen 2003) has also been published. Results presented are estimates based on sampling; estimates were compiled assuming that the 2001 and 2002 data represent one sample. As additional annual inventories are completed, the precision of the estimates will increase and additional data will be released.

Reports of previous inventories of North Dakota are dated 1954, 1980, and 1994. Data from new inventories are often compared with data from earlier inventories to determine trends in forest resources. However, for the comparisons to be valid, the procedures used in the two inventories must be similar. As a result of our ongoing efforts to improve the efficiency and reliability of the inventory, several changes in procedures and definitions have been made since the last North Dakota inventory in 1994 (Haugen *et al.* 1999) (See appendix). Some of these changes make it inappropriate to directly compare portions of the 2002 data with those published for 1994.

RESULTS

Area

The first Euro-American settlers in North Dakota found about 700 thousand acres of forest land (Jakes and Smith 1982). Most of this was in the Turtle Mountains, Killdeer Mountains, Pembina Hills, the Devils Lake area, and along major rivers and their tributaries (Haugen *et al.* 1999). North Dakota is one of the few States where forests occur within the geographic limits of both eastern and western forest types of the United States (Warner and Chase 1956). Over the years, the area of forest land in North Dakota declined to a low of 518 thousand acres in 1980. However, in 2002 the area of forest land totaled more than 824 thousand acres (table 1)—an increase of 22 percent from the 1994 total of 673 thousand acres. However, the increase may be due to a definitional change.

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Previously, forest lands that were being grazed or used as windbreaks were classed as nonforest with trees; now such lands are classed as forest land if they meet the definitional standards for size, width, and stocking.

Over three-fourths of the forest land in North Dakota is held in private ownership, and most of those acres are in hardwood forest type groups (table 1). Forest landowners include farmers, ranchers, business people, and retirees (Haugen *et al.* 1999). Almost all the acreage in the softwood forest type group is held in public ownership. There are three components to forest land: 1) Timberland[1]—forest land that is not restricted from harvesting by statute, administrative regulation, or designation and is capable of growing trees at a rate of 20 cubic feet per acre per year; 2) Reserved forest land—land that is restricted from harvesting by statute, administrative regulation, or designation (national parks, etc.); and 3) Other forest land—low productivity forest land that is not capable of growing trees at a rate of 20 cubic feet per acre per year.

In North Dakota, 84 percent of the forest land is timberland. Although timberland is predominant, the 129 thousand acres of other forest land is a significant resource. These lands, largely because of the combined effects of climate and low soil productivity, do not support rigorous tree growth. As a consequence, many sites contain trees that are of poor form, small size, or inferior quality. However, trees on other forest land are important ecologically because they enhance biodiversity where trees are scarce.

There are an estimated 695.8 thousand acres of timberland in North Dakota (table 2). Since the 1980 inventory, timberland area has increased. Timberland area increased by nearly 29 percent between 1980 and 1994, and by 57 percent between 1994 and 2002 (fig. 1).

Virtually all timberland area in North Dakota is of natural origin (table 2). Only an

[1] *Timberland may not be equivalent to the area actually available for commercial timber harvesting or other access. The actual availability of land for various uses depends upon decisions that consider economic, environmental, and social factors.*

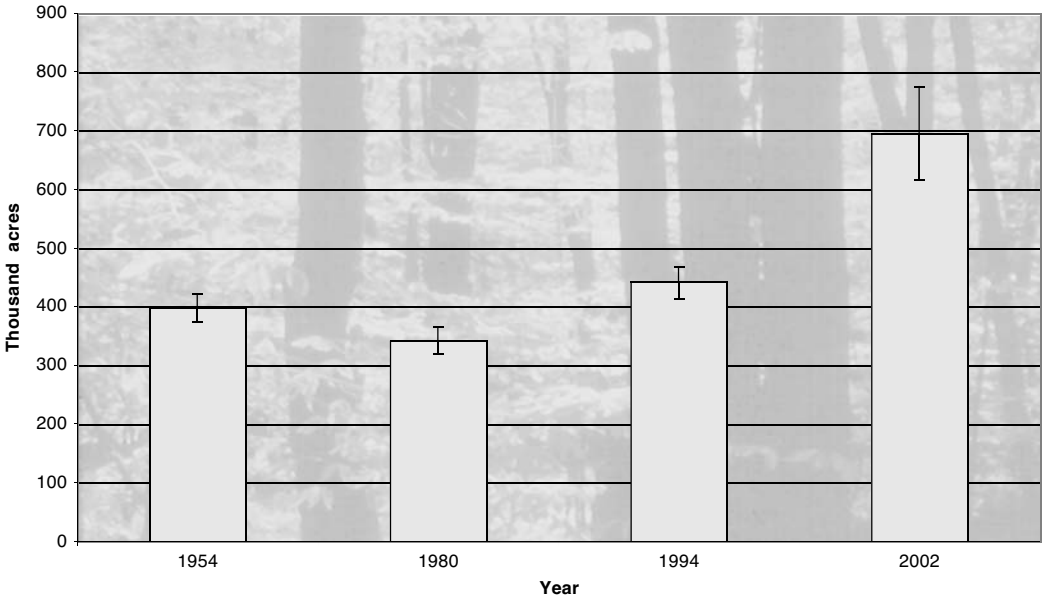

Figure 1. — Area of timberland, North Dakota, 1954-2002. (Sampling error associated with each inventory is represented by the vertical line at the top of each bar).

estimated 12.1 thousand acres of timberland area were planted. Timberland plantings should not be confused with shelter or protection plantings. Throughout the State's history, the major forestry effort in North Dakota has centered on the planting of trees for the protection of homes, livestock, soil, roads, pastures, crops, and wildlife. For example, between 1935 and 1942, nearly 35,000 acres of protection plantings were established in North Dakota. By 1954, the USDA Soil Conservation Service estimated that it had helped establishe an additional 54 thousand acres of protection plantings in North Dakota (Haugen *et al.* 1999). Together these plantings earned North Dakota the distinction of having more protection plantings than any other State in the United States.

In North Dakota, hardwoods dominate the native forests—98 percent of all timberland area is in hardwood forest types (table 3, fig. 2). The maple/beech/birch forest type occupies more than 205 thousand acres of timberland, accounting for 30 percent of the total timberland area of the State. In North Dakota, the maple/beech/birch type includes a mix of species, where elm, ash, and basswood have a significant presence. Softwoods—the pinyon/juniper forest type—occupy only an estimated 6 thousand acres, or less than 1 percent of the State's timberland area, mostly scattered in western North Dakota. A considerable area of the pinyon/juniper resource in the State—29.1 thousand acres, or 98 percent o all forest land in the type—is found on other forest lands.

On timberland, forest stands are categorized by size class. Stand-size class is a measure of the average diameter of the dominant trees in a stand. There are three stand-size classes: sawtimber—large trees, softwoods at least 9 inches in diameter at breast height (d.b.h.) and hardwoods at least 11 inches d.b.h.; poletimber—medium tree, trees 5 inches d.b.h. to sawtimber size; and sapling/seedling—small trees, trees 1 to 5 inches d.b.h.

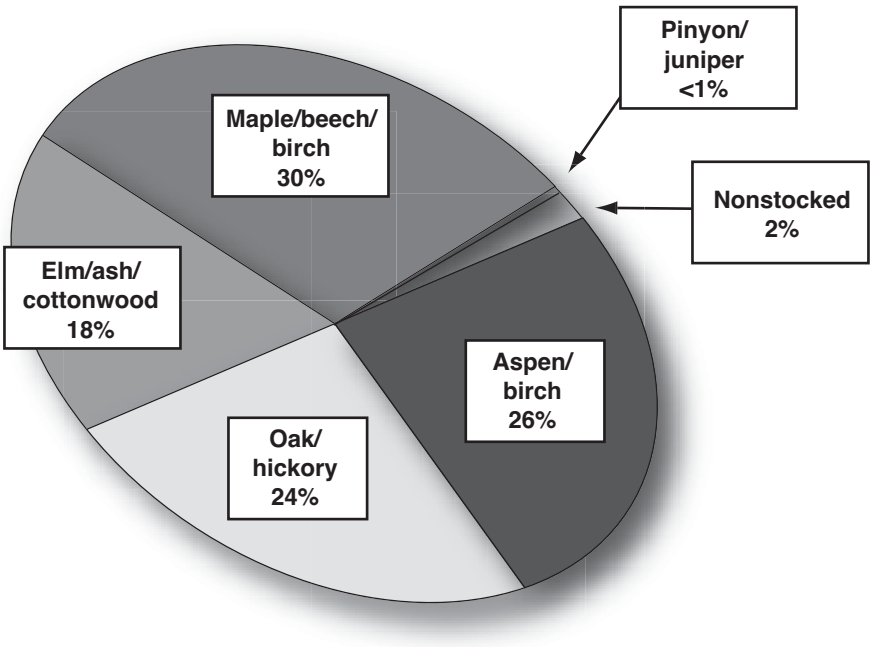

Figure 2. — *Area of timberland by forest type, North Dakota, 2002.*

Table 3 shows the distribution of timberland by stand-size class. Sawtimber-size stands make up 34 percent of timberland area, followed by poletimber-size stands at 36 percent, and sapling/seedling-size stands at 29 percent of timberland area. Nonstocked stands account for 1 percent of North Dakota's timberland area.

Between 1994 and 2002, the area of timberland in each stand-size class increased; however, the percentage of timberland area in each stand-size class did not change significantly between inventories (fig. 3).

Volume

Historically, volume has been reported as either growing-stock or sawtimber volume. However, there is wood volume in noncommercial trees, rotten trees, and rough trees that do not qualify as growing stock. Volume from non-growing-stock trees is often used for wood fiber and fuelwood. Non-growing-stock volume is also an important ecological component of the landscape because it provides wildlife habitat, and soil and water protection. With the annualized inventory system and increased interest in FIA data from an ecological perspective, a greater focus has been placed on all live volume. There is an estimated 744 million cubic feet of all live volume on the 824 thousand acres of forest land in North Dakota (table 4) or an average of more than 903 cubic feet of all live tree volume for each forest land acre. On the 695 thousand acres of timberland, there is an estimated 705 million cubic feet of all live tree volume (table 5) or the equivalent of 1,015 cubic feet for each timberland acre in North Dakota. The difference in all live tree volume on forest land and on timberland reflects the characteristics of the land trees are growing on. Typically, trees on timberland are on the more productive sites, whereas trees on other forest land are on the less productive sites.

Growing-stock volume is the amount of solid wood on timberland in trees 5 inches d.b.h.

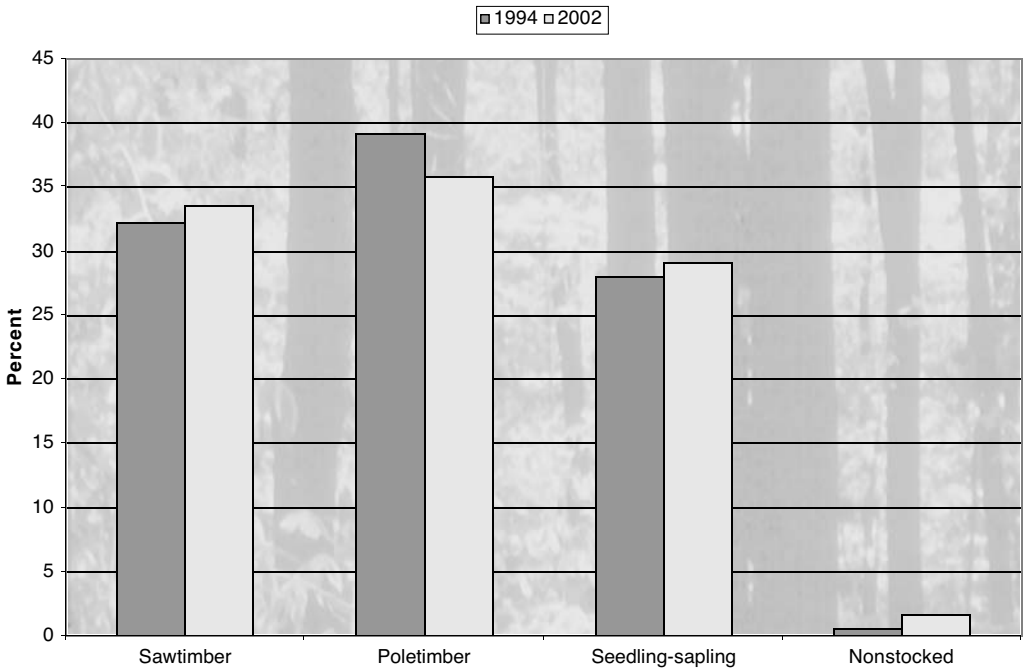

Figure 3. — *Stand-size class as a percentage of total timberland area, North Dakota, 1994 and 2002.*

and over, from 1 foot above ground to a minimum 4-inch top diameter with deductions made for poor form or defect. With increases in timberland area, growing-stock volume also has increased since the 1980s (fig. 4). The net volume of growing stock on timberland in North Dakota is estimated at 409 million cubic feet (table 6), which equates to 589 cubic feet of growing-stock volume per acre. Most of North Dakota's growing-stock volume is in hardwood species. Three hardwood species groups accounted for 95 percent of all growing-stock volume in the State: the cottonwood-aspen group—38 percent; select white oak group—37 percent; and the ash group—20 percent (table 7). Softwood growing-stock volume is estimated at 447 thousand cubic feet. The volume of sawtimber in North Dakota is estimated at 1.2 billion board feet (table 8). The select white oak, and cottonwood and aspen species groups account for 78 percent of all sawtimber volume in the State.

Biomass

Live aboveground tree biomass on timberlands in North Dakota is estimated at more than 20 million dry tons (table 9)—an average of over 29 dry tons per acre. Biomass is an important measure because it provides information that can be used for analyses related to carbon sequestration, wood fiber availability for fuel, and other subjects. More than 50 percent of the total biomass is in growing-stock trees, 11 percent is in trees less than 5.0 inches d.b.h., and the remaining 38 percent is in non-growing-stock trees. Over 99 percent of the total biomass is composed of hardwood species. Roughly 90 percent of the total biomass is on private ownerships (18 million dry tons), and the remaining amount—2 million dry tons—is on public timberlands.

Forest Health

North Dakota's forest resources (forest land, rural plantings, and urban forests) possess distinct management objectives such as stabilizing banks along rivers, protecting agricultural crops from wind, or beautifying residential areas. These unique management objectives create unique forest health concerns in North Dakota.

The following narratives highlight the most significant forest health issues observed in North Dakota in 2001 and 2002. These summaries are intended to be qualitative except when specific figures for pests or pathogens are available.

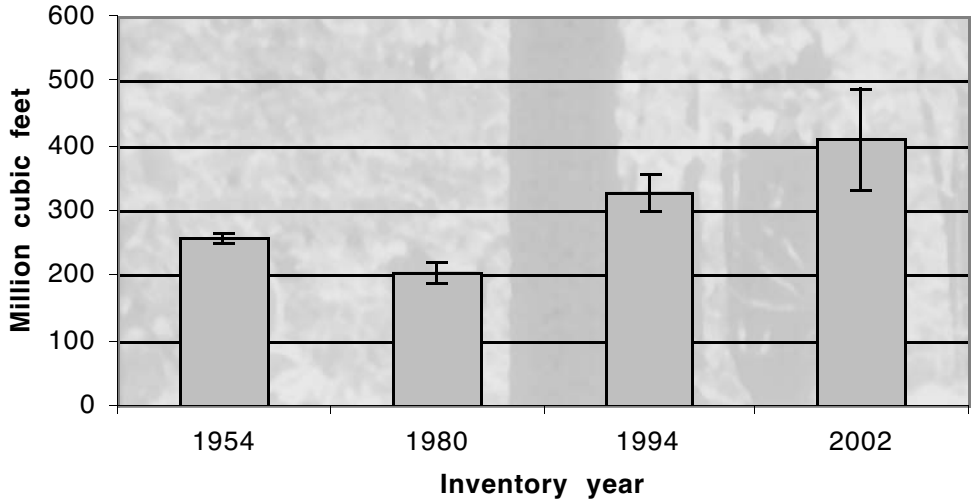

Figure 4. — Growing-stock volume, North Dakota, 1954-2002. (Sampling error associated with each inventory is represented by the vertical line at the top of each bar).

Gypsy moth (*Lymantria dispar*)—Gypsy moth detection trapping surveys are conducted each year in North Dakota. In 2001 and 2002, respectively, 403 and 365 gypsy moth detection traps were placed. These traps were distributed throughout the State to encompass major forest types and risk of gypsy moth introductions. No gypsy moths were captured in 2001 and 2002 during detection trapping efforts. Continuing trapping efforts will include new areas of potential risk as the moth continues to expand its established range.

Yellow-headed spruce sawfly (*Pikonema alaskensis*)—Every year small and medium spruce trees are lost to the yellow-headed spruce sawfly. This insect is particularly troublesome in rural plantings where spruce is often used and growing conditions favor female ovipositioning. Sawfly damage has been most significant in north central and northeast North Dakota over the past 2 years. The defoliation caused by the sawfly reduces windbreak efficiency and can predispose spruce trees to other damaging agents.

Forest tent caterpillar (*Malacosoma disstria*)—The Turtle Mountains of the North Central region of the State encompass over 125 thousand forested acres and annually experience some defoliation by the forest tent caterpillar. Defoliation by the forest tent caterpillar increased from 3 thousand acres in 2001 to 4.3 thousand acres in 2002 in this forested area. This defoliation was sporadic, variable in intensity, and limited primarily to aspen. These figures are significantly lower than those at the forest tent caterpillar peak in the late 1970s, when nearly all forested land within the Turtle Mountains experienced some defoliation. The Turtle Mountains are a popular summer recreation area in North Dakota. Defoliation and caterpillar larvae in campgrounds and State parks present a nuisance to campers. Monitoring efforts will continue in these areas of high recreation use to determine if control measures are warranted.

Dutch Elm Disease (*Ophiostoma ulmi*)—Dutch elm disease has been found in nearly all native woodlands, rural plantings, and municipalities throughout the State. This disease is of great concern because of the American elm's status as the State tree and because it is one of relatively few species that are hardy enough to be used in rural and landscape plantings. Dutch elm disease has caused substantial damage in the riparian forests of the Red, Sheyenne, and James River Valleys. The disease has greatly reduced the elm component and has shifted the species composition toward green ash and box elder in these forests. This disease has also caused significant windbreak decline as many older plantings composed of American elm have been decimated.

Sphaeropsis shoot blight (*Sphaeropsis sapinea*)—Shoot blight, caused by *Sphaeropsis sapinea*, has been observed in windbreaks of the Towner State Nursery for the past decade. Towner State Nursery annually produces 200 thousand ponderosa pine seedlings, and there is concern that this disease could reduce the supply of pine seedlings the nursery will provide in the future. There is also concern the fungus may be spread throughout the region by infected nursery stock if the blight is not suppressed or eliminated within the nursery.

Ash decline—A multitude of maladies has resulted in ash decline throughout the State. Common pests of ash include anthracnose (*Gloeosporium aridum*), ash plant bug (*Tropidosteptes amoenus*), ash fomes (*Perenniporia fraxinophila*), ash borer (*Podosesia syringae*), and ash bark beetles (*Hylesinus* sp.).

Drought—A drought characterized western North Dakota in 2001 and 2002. This condition has degraded tree defense mechanisms over time, making trees more susceptible to pests, and creating conditions conducive to pest population increases. This is particularly true for trees growing on lighter soils that have

reduced water holding capacity. Additionally, inadequate fall moisture has resulted in greater incidence of winter drying in many conifer species within the State.

Summary

In summary, North Dakota's forest land area continues to expand from the 1980s. The forest is made up of mostly hardwood trees. Wood volume has also continued to increase. The forest resources of North Dakota appear to be in general good health. However, several concerns related to forest health bear monitoring and control. For example, riparian forest health, Dutch elm disease, and cottonwood regeneration are persistent problems. As additional data become available from ensuing annual inventories and through forest health monitoring, a clearer picture of the direction of North Dakota's forests will emerge. Additional data related to the most recent three inventories of North Dakota (1980, 1994, 2002) are available at:
www.ncrs.fs.fed.us/4801/fiadb/index.htm.

APPENDIX

Inventory Methods

Since the 1994 inventory of North Dakota, several changes have been made in NCFIA inventory methods to improve the quality of the inventory as well as meet increasing demands for timely forest resource information. The most significant difference between inventories is the change from periodic inventories to annual inventories. Historically, NCFIA periodically inventoried each State on a cycle that averaged about 12 years. However, the need for timely and consistent data across large regions, combined with national legislative mandates, resulted in NCFIA's implementation of an annual inventory system. North Dakota was one of the first States in the North Central region, and one of the first States in the Nation, to be inventoried with this new system, beginning with the 2001 inventory.

With an annual inventory system, about one-fifth of all field plots are measured in any one year. After 5 years, an entire inventory cycle will be completed. After the first 5 years, NCFIA will report and analyze results as a moving 5-year average. For example, NCFIA will be able to generate a report based on inventory results for 2001 through 2005 or for 2002 through 2006. Although there are great advantages to an annual inventory, one difficulty is reporting on results in the first 4 years. With the 2002 inventory, only 40 percent of all field plots have been measured. Sampling error estimates for the 2002 inventory results are area of forest land 10.67 percent, area of timberland 11.37 percent, number of growing-stock trees on timberland 18.68 percent, volume of growing stock on timberland 21.66 percent, and volume of sawtimber on timberland 25.63 percent. These sampling error estimates are much higher than those for the last periodic inventory completed in 1994 (6.20 percent for timberland area and 8.80 percent for growing-stock volume) because of the smaller samples. Thus, caution should be used when drawing conclusions based on this limited data set. As we complete ensuing measurements, we will have additional confidence in our results due to the increased number of field plots measured. As each measurement year is completed, the precision of estimates will improve.

Other significant changes between inventories include the implementation of new remote sensing technology, implementation of a new field plot design, and gathering of additional remotely sensed and field data. The advent of remote sensing technology since the previous inventory has allowed NCFIA to use computer-assisted classifications of Multi-Resolution Land Characterization (MRLC) data and other available remote sensing products to stratify the total area of the State and to improve estimates. Previous inventories in North Dakota before 2001 (1954, 1980, and 1994) used manual interpretation of aerial photos to stratify the sample.

New algorithms were used in 2001 to assign forest type and stand-size class to each condition observed on a plot. These algorithms are being used nationwide by FIA to provide consistency among States and will be used to reassign the forest type and stand-size class of every plot measured in the 1994 inventory when it is updated. This will be done so that changes in forest type and stand-size class will more accurately reflect actual changes in the forest and not changes in how values are computed. The list of recognized forest types, grouping of these forest types for reporting purposes, equations used to assign stocking values to individual trees, definition of "nonstocked," and names given to the forest types changed with the new algorithms. As a result, comparisons between the published 2002 inventory results and those published for the

1994 inventory may not be valid. For additional details about algorithms used in both inventories, please contact NCFIA.

Sampling Phases

The 2002 North Dakota survey used a three-phase sample for stratification. The first phase used classified satellite imagery to stratify the State and aerial photographs to select plots for measurement. The second phase entailed measurement of the traditional FIA set of mensurational variables, and the third phase focused on a set of variables related to the health of the forest.

The only land that could not be sampled was private land where field personnel could not obtain permission from the owner to measure the plot, and plots that could not be accessed because of a hazard or danger to field personnel. The methods used in the preparation of this report make the necessary adjustments to account for sites where access was denied or hazardous. There were only 6 denied access plots in 2002 (out of 63 field plots) and 3 denied access plots in 2001 (out of 57 field plots).

Phase 1

The 2002 inventory used a computer-assisted classification of satellite imagery. NCFIA used the imagery to form two initial strata—forest and nonforest. Pixels within 60 m (2 pixel widths) of a forest/nonforest edge formed two additional strata—forest/nonforest and nonforest/forest. Forest pixels within 60 m on the forest side of a forest/nonforest boundary were classified into forest edge stratum. Pixels within 60 m of the boundary on the nonforest side were classified into nonforest edge stratum. The estimated population total for a variable is the sum across all strata of the product of each stratum's estimated area and the variable's estimated mean per unit area for the stratum. In North Dakota, final estimation of area by stratum was based on three strata—nonforest, nonforest edge, and forest plus forest edge.

Phase 2

Phase 2 of the inventory consisted of the measurement of the annual sample of field plots in North Dakota. Current FIA precision standards for annual inventories require a sampling intensity of one plot for approximately every 6,000 acres. FIA has divided the entire area of the United States into non-overlapping hexagons, each of which contains 5,937 acres (McRoberts 1999). An array of field plots was established by selecting one plot from each hexagon based on the following rules: (1) if a Forest Health Monitoring (FHM) plot (Mangold 1998) fell within a hexagon, it was selected; (2) if no FHM plot fell within a hexagon, the existing NCFIA plot from the 1990 inventory nearest the hexagon center was selected; and (3) if neither FHM nor existing NCFIA plots fell within the hexagon, a new NCFIA plot was established in the hexagon (McRoberts 1999). This array of plots is designated the Federal base sample and is considered an equal probability sample; its measurement in North Dakota is funded by the Federal government. Fieldwork for this inventory was expedited through the cooperation and assistance of the North Dakota Forest Service.

The total Federal base sample of hexagonal grid plots was systematically divided into five interpenetrating, non-overlapping subsamples or panels. Each year the plots in a single panel are measured, and panels are selected on a 5-year, rotating basis (McRoberts 1999). For estimation purposes, the measurement of each panel of plots may be considered an independent random sample of all land in a State. Field crews measure vegetation on plots forested at the time of the last inventory and on plots currently classified as forest by trained photointerpreters using aerial photos or digital orthoquads.

Phase 3

NCFIA has two categories of field measurements—phase 2 field plots (standard FIA plots) and phase 3 plots (forest health plots) to optimize the ability to collect data when

available for measurement. Both types of plot are uniformly distributed both geographically and temporally. Phase 3 plots are measured with the full set of FHM vegetative and health variables (Mangold 1998) collected as well as the full set of measures associated with phase 2 plots. Phase 3 plots must be measured between June 1 and August 30 to accommodate measurement of non-woody understory vegetation, ground cover, and other variables. We anticipate that in North Dakota the complete 5-year annual inventory will involve about 472 phase 3 plots. On the remaining plots, referred to as phase 2 plots, only variables that can be measured throughout the entire year are collected. In North Dakota, the complete 5-year annual inventory is expected to involve about 7,150 phase 2 plots. The 2001/2002 annual inventory results represent field measures on 59 timberland, 12 other forest land, and 40 nonforest land plots.

The new national FIA 4-point cluster plot design (fig. 5) was first used for data collection during the 2001 inventory of North Dakota. This design also was used in the 2002 inventory and will be used in subsequent years. In North Dakota, because all plots in the annualized inventory are newly established, remeasurement data will not be available until the sixth year of the annual inventory. Those measurements will form the basis for change estimates between the first five-panel cycle and the second five-panel cycle for characteristics such as average annual net growth, mortality, and removals. The national plot design also requires mapping forest conditions on each plot. Because of the small sample (20 percent) each year, the precision associated with change factors such as mortality will be relatively low. Consequently, change estimates will not be reported until at least three annual inventories have been completed in the second five-panel cycle, and even then we anticipate that estimates of change will be limited in detail. When the complete second five-panel cycle of the annual inventory has been implemented in 2010, (if the anticipated 20 percent of the State is sampled each year), the full range of change variables will be available.

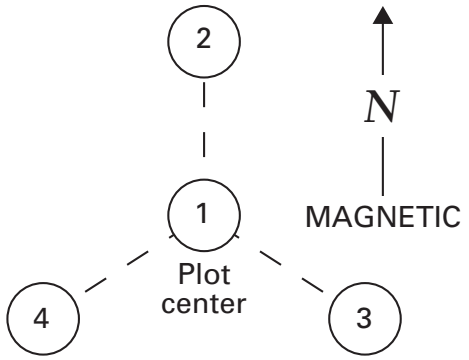

Figure 5. — *Current NCFIA field plot design.*

The overall plot layout for the new design consists of four subplots. The centers of subplots 2, 3, and 4 are located 120 feet from the center of subplot 1. The azimuths to subplots 2, 3, and 4 are 0, 120, and 240 degrees, respectively. The center of the new plot is located at the same point as the center of the previous plot if a previous plot existed within the sample unit. Trees with 5 inches d.b.h. and larger and larger are measured on a 24-foot-radius (1/24 acre) circular subplot. All trees less than 5 inches d.b.h. are measured on a 6.8-foot-radius (1/300 acre) circular microplot located at the center of each of the four subplots. Forest conditions that occur on any of the four subplots are recorded. Factors that differentiate forest conditions are forest type, stand-size class, land use, ownership, and density. Each condition that occurs anywhere on any of the subplots is identified, described, and mapped if the area of the condition is 1 acre or more.

Field plot measurements are combined with phase 1 estimates in the compilation process and table production. The number of published tables generated from less than five panels of data is limited. However, at www.ncrs.fs.fed.us/4801/fiadb/index.htm, other tabular data can be generated.

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LITERATURE CITED

Haugen, David E. 2003.
North Dakota's forest resources in 2001. Res. Note NC-387. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Research Station. 7 p.

Haugen, David E.; Piva, Ronald J.; Kingsley, Neal P.; Harsel, Robert A. 1999.
North Dakota's forest resource, 1994. Res. Pap. NC-336. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Research Station. 101 p.

Jakes, P.J.; Smith, B.W. 1982.
A second look at North Dakota's timberlands, 1980. Resour. Bull. NC-58. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. 86 p.

Mangold, R.D. 1998.
Forest health monitoring field methods guide (National 1998). Research Triangle Park, NC: U.S. Department of Agriculture, Forest Service, National Forest Health Monitoring Program. 429 p. (Revision 0, April 1998).

McRoberts, R.E. 1999.
Joint annual forest inventory and monitoring system, the North Central perspective. Journal of Forestry. 97(12): 27-31.

Warner, J.R.; Chase, C.D. 1956.
The timber resource of North Dakota. Sta. Pap. 36. St. Paul, MN: U.S. Department of Agriculture, Forest Service, Lake States Forest Experiment Station. 39 p.

TABLE TITLES

Table 1.—*Area of forest land by forest type group and owner category, North Dakota, 2001-2002*

Table 2.—*Area of timberland by major forest type group, stand origin, and owner category, North Dakota, 2001-2002*

Table 3.—*Area of timberland by forest type group and stand-size class, North Dakota, 2001-2002*

Table 4.—*Net volume of all live trees on forest land by species group and owner category, North Dakota, 2001-2002*

Table 5.—*Net volume of all live trees and salvable dead trees on timberland by class of timber and softwood/hardwood categories, North Dakota, 2001-2002*

Table 6.—*Net volume of growing stock on timberland by forest group and softwood/hardwood species categories, North Dakota, 2001-2002*

Table 7.—*Net volume of growing stock on timberland by species group and diameter class, North Dakota, 2001-2002*

Table 8.—*Net volume of sawtimber on timberland by species group and diameter class, North Dakota, 2001-2002*

Table 9.—*All live aboveground tree biomass on timberland by owner category, softwood/hardwood species category, and tree biomass component, North Dakota, 2001-2002*

TABLES

Table 1. -- Area of forest land by forest type group and owner category, North Dakota, 2001 - 2002

(In thousand acres)

Forest type group	Owner category			
	All owners	Public	Private	Unidentified owner
Softwood type groups				
Pinyon / juniper	29.7	29.1	0.6	- -
All softwood types	29.7	29.1	0.6	- -
Hardwood type groups				
Oak / hickory	219.4	25.8	193.6	- -
Elm / ash / cottonwood	143.7	65.5	78.2	- -
Maple / beech / birch	240.8	14.1	226.7	- -
Aspen / birch	179.9	28.1	151.8	- -
All hardwood types	783.8	133.5	650.3	- -
Nonstocked	11.2	- -	11.2	- -
All forest types	824.8	162.6	662.1	- -

All table cells without observations in the inventory sample are indicated by --. Table value of 0.0 indicates the acres round to less than 0.1 thousand acres. Columns and rows may not add to their total due to rounding.

Table 2. -- Area of timberland by major forest type group, stand origin, and owner category, North Dakota, 2001 - 2002

(In thousand acres)

Major forest type group and stand origin	Owner category			
	All owners	Public	Private	Unidentified owner
Softwood type groups				
Natural	0.6	- -	0.6	- -
All softwood types	0.6	- -	0.6	- -
Hardwood type groups				
Natural	671.9	85.5	586.4	- -
Planted	12.1	- -	12.1	- -
All hardwood types	684.0	85.5	598.5	- -
Nonstocked	11.2	- -	11.2	- -
All groups	695.8	85.5	610.3	- -

All table cells without observations in the inventory sample are indicated by --. Table value of 0.0 indicates the acres round to less than 0.1 thousand acres. Columns and rows may not add to their totals due to rounding.

Table 3. -- Area of timberland by forest type group and stand-size class, North Dakota, 2001 - 2002

(In thousand acres)

Forest type group	All stands	Stand-size class			
		Sawtimber	Poletimber	Sapling-seedling	Non-stocked
Softwood type groups					
Pinyon / juniper	0.6	- -	0.6	- -	- -
All softwood types	0.6	- -	0.6	- -	- -
Hardwood type groups					
Oak / hickory	170.2	29.9	97.7	42.6	- -
Elm / ash / cottonwood	128.7	91.3	10.6	26.8	- -
Maple / beech / birch	205.2	68.1	71.7	65.4	- -
Aspen / birch	179.9	44.0	68.3	67.6	- -
All hardwood types	684.0	233.3	248.4	202.4	- -
Nonstocked	11.2	- -	- -	- -	11.2
All forest types	695.8	233.3	249.0	202.4	11.2

All table cells without observations in the inventory sample are indicated by --. Table value of 0.0 indicates the acres round to less than 0.1 thousand acres. Columns and rows may not add to their totals due to rounding.

Table 4. -- Net volume of all live trees on forest land by species group and owner category, North Dakota, 2001 - 2002

(In thousand cubic feet)

Species group	Owner category			
	All owners	Public	Private	Unidentified owner
Softwoods				
Other eastern softwoods	20,126	15,044	5,083	- -
Total softwoods	20,126	15,044	5,083	- -
Hardwoods				
Select white oaks	234,096	26,007	208,089	- -
Soft maple	185	- -	185	- -
Ash	151,200	27,873	123,328	- -
Cottonwood and aspen	254,566	23,285	231,281	- -
Other eastern soft hardwoods	83,731	8,434	75,297	- -
Eastern noncommercial hardwoods	442	282	160	- -
Total hardwoods	724,220	85,880	638,340	- -
All species groups	744,346	100,924	643,422	- -

All table cells without observations in the inventory sample are indicated by --. Table value of 0 indicates that the volume rounds to less than 1 thousand cubic feet. Columns and rows may not add to their totals due to rounding.

Table 5. -- Net volume of all live trees and salvable dead trees on timberland by class of timber and softwood/hardwood categories, North Dakota, 2001 - 2002

(In thousand cubic feet)

Class of timber	All species	Softwood species	Hardwood species
Live trees			
Growing-stock trees			
Sawtimber			
Saw log portion	224,579	- -	224,579
Upper stem portion	37,758	- -	37,758
Total	262,336	- -	262,336
Poletimber	146,786	447	146,339
All growing-stock trees	409,123	447	408,675
Cull trees			
Rough trees [1]			
Sawtimber size	159,696	- -	159,696
Poletimber size	100,226	352	99,874
Total	259,921	352	259,570
Rotten trees [1]			
Sawtimber size	17,919	- -	17,919
Poletimber size	9,965	- -	9,965
Total	27,884	- -	27,884
All live cull trees	287,805	352	287,454
All live trees	696,928	799	696,129
Salvable dead trees			
Sawtimber size	5,511	- -	5,511
Poletimber size	3,226	- -	3,226
All salvable dead trees	8,737	- -	8,737
All classes	705,665	799	704,866

All table cells without observations in the inventory sample are indicated by --. Table value of 0 indicates that the volume rounds to less than 1 thousand cubic feet. Columns and rows may not add to their totals due to rounding.

[1] Includes noncommercial species.

Table 6. -- Net volume of growing stock on timberland by forest group and softwood/hardwood species categories, North Dakota, 2001 - 2002

(In thousand cubic feet)

Forest type group	All species	Softwood species	Hardwood species
Hardwood type groups			
Oak / hickory	110,178	- -	110,178
Elm / ash / cottonwood	72,789	- -	72,789
Maple / beech / birch	106,778	- -	106,778
Aspen / birch	119,378	447	118,931
All hardwood types	409,123	447	408,675
Nonstocked	- -	- -	- -
All forest types	409,123	447	408,675

All table cells without observations in the inventory sample are indicated by --. Table value of 0 indicates that the volume rounds to less than 1 thousand cubic feet. Columns and rows may not add to their totals due to rounding.

Table 7. -- Net volume of growing stock on timberland by species group and diameter class, North Dakota, 2001 - 2002

(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	21.0-28.9	29.0+
Softwoods											
Other eastern softwoods	447	--	447	--	--	--	--	--	--	--	--
Total softwoods	447	--	447	--	--	--	--	--	--	--	--
Hardwoods											
Select white oaks	152,602	15,829	8,417	17,210	10,551	10,194	4,489	23,539	21,437	28,247	12,689
Ash	81,397	11,016	10,428	10,464	10,322	12,368	23,611	3,188	--	--	--
Cottonwood and aspen	155,947	11,028	24,828	32,294	29,225	20,543	12,644	8,907	10,528	5,951	--
Other eastern soft hardwoods	18,729	1,879	741	2,205	1,359	4,330	--	--	--	8,216	--
Total hardwoods	408,675	39,753	44,414	62,172	51,456	47,435	40,744	35,634	31,965	42,413	12,689
All species	409,123	39,753	44,862	62,172	51,456	47,435	40,744	35,634	31,965	42,413	12,689

All table cells without observations in the inventory sample are indicated by --. Table value of 0 indicates that the volume rounds to less than 1 thousand cubic feet. Columns and rows may not add to their totals due to rounding.

Table 8. -- Net volume of sawtimber on timberland by species group and diameter class, North Dakota, 2001 - 2002

(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	21.0-28.9	29.0+
Hardwoods									
Select white oaks	550,500	- -	49,157	48,131	21,463	115,229	105,708	143,304	67,509
Ash	218,605	- -	42,598	53,820	107,376	14,812	- -	- -	- -
Cottonwood and aspen	432,862	- -	137,354	103,090	63,789	44,581	53,126	30,921	- -
Other eastern soft hardwoods	64,077	- -	6,094	18,918	- -	- -	- -	39,064	- -
Total hardwoods	1,266,043	- -	235,203	223,958	192,628	174,622	158,834	213,289	67,509
All species	1,266,043	- -	235,203	223,958	192,628	174,622	158,834	213,289	67,509

All table cells without observations in the inventory sample are indicated by --. Table value of 0 indicates that the volume rounds to less than 1 thousand board feet. Columns and rows may not add to their totals due to rounding.

[1] International 1/4-inch rule.

Table 9. -- All live aboveground tree biomass on timberland by owner category, softwood/hardwood species category, and tree biomass component, North Dakota, 2001 - 2002

(In dry tons)

Owner category and softwood/hardwood category	All components	Tree biomass component						
		All live 1-5 inch trees	Growing-stock trees			Non-growing-stock trees		
			Total	Boles	Stumps, tops, and limbs	Total	Boles	Stumps, tops, and limbs
Public								
Hardwoods	2,042,813	236,493	1,321,273	972,965	348,308	485,047	337,763	147,284
Total	2,042,813	236,493	1,321,273	972,965	348,308	485,047	337,763	147,284
Private								
Softwoods	17,420	- -	9,476	6,233	3,243	7,944	5,181	2,762
Hardwoods	18,118,692	1,969,710	8,896,320	6,458,090	2,438,230	7,252,661	5,240,566	2,012,096
Total	18,136,112	1,969,710	8,905,796	6,464,323	2,441,473	7,260,605	5,245,747	2,014,858
All ownerships								
Softwoods	17,420	- -	9,476	6,233	3,243	7,944	5,181	2,762
Hardwoods	20,161,505	2,206,203	10,217,593	7,431,055	2,786,538	7,737,708	5,578,329	2,159,380
Total	20,178,925	2,206,203	10,227,069	7,437,288	2,789,782	7,745,652	5,583,510	2,162,142

All table cells without observations in the inventory sample are indicated by --. Table value of 0 indicates the aboveground tree biomass rounds to less than 1 dry ton. Columns and rows may not add to their totals due to rounding.

Haugen, David; Brand, Gary; Rymal, Travis; Kangas, Michael.
2004. **North Dakota's forest resources in 2002.** Resour. Bull. NC-229. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Research Station. 21 p.

Results of the combined 2001 and 2002 annual forest inventories of North Dakota show over 824 thousand acres of forest land. There are an estimated 744 million cubic feet of all live tree volume, or approximately 902 cubic feet per acre of forest land. Timberland totals 696 million acres with an estimated 409 million cubic feet of growing-stock volume, or approximately 588 cubic feet per acre of timberland. All live aboveground tree biomass on timberland is estimated at 20 million dry tons or approximately 29 tons per acre of timberland. Known pests in North Dakota forests include yellow-headed spruce sawfly, forest tent caterpillar, ash borer, and ash bark beetles.

KEY WORDS: Annual inventory, forest land, timberland, forest type, volume, biomass, North Dakota

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