



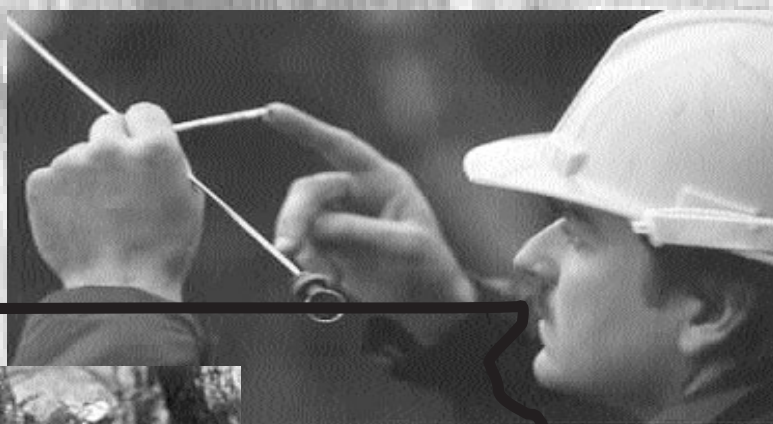
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South Dakota's Forest Resources in 2003

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South Dakota's Forest Resources in 2003

The North Central Research Station's Forest Inventory and Analysis (NCFIA) program began fieldwork for the fifth forest inventory of South Dakota's 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 in all five panels. Once all panels have been measured, each will be remeasured approximately every 5 years. For example, in South Dakota, the field plots measured in 2003 will be remeasured in 2008.

In 2003, NCFIA continued the annual inventory effort with the third panel of the fifth forest inventory. This fifth inventory of South Dakota's forest resources will be completed in 2005. However, because each year's sample is a systematic sample of the State's forests and because timely information is needed about South Dakota's forest resources, estimates have been prepared from data gathered during the first 3 years of the inventory. Data presented in this report represent 60 percent of the field plots (or three panels) for a complete inventory and are a combination of the first year's panel from 2001, the second year's panel from 2002, and the third year's panel from 2003. Earlier reports for the 2001 panel (Leatherberry and Haugan 2003) and the 2002 panel (Piva *et al.* 2003) have also been published. Results presented are estimates based on sampling techniques; estimates were compiled assuming the 2001, 2002, and 2003 data represent one sample. As additional panels are completed, the precision of the estimates will increase and additional data will be released.

Reports of previous inventories of South Dakota are dated 1935, 1962, 1984, and 1996. As a result of our ongoing efforts to improve the efficiency and reliability of the inventory, several changes in procedures and definitions have occurred since the last South Dakota inventory in 1996 (Leatherberry *et al.* 2000). The most important change is the border-to-border inventory of forest resources in South Dakota. Before 1996, both the NCFIA and the Interior West FIA (IWFIA) (formerly the Intermountain FIA program) in Ogden, UT, inventoried South Dakota's forest resources. NCFIA inventoried that portion of the State east of the 103rd meridian. IWFIA inventoried western South Dakota (west of the 103rd meridian), including the Black Hills National Forest (BHNF). In 1996, NCFIA inventoried all of South Dakota except for the BHNF, which was inventoried by IWFIA in 1999 (DeBlander 2002). The portion of the Custer National Forest that is in South Dakota was inventoried again by IWFIA in 1997 (DeBlander 2001).

Because different designs and methods have been employed in various South Dakota inventories, a comparison of the 2003 data with data from earlier inventories should be interpreted with caution. Where comparisons are made with data from past inventories, they are done only to suggest the direction of change. For this report, the information for South Dakota's 1996 inventory is a combination of the 1996 inventory by NCFIA of all lands outside the BHNF and the 1999 inventory by IWFIA of the BHNF. The combined information was obtained from the Forest Inventory Mapmaker Web site located at: <http://www.ncrs2.fs.fed.us/4801/FIADB/index.htm>.

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RESULTS

Area

In 2003, there were an estimated 1.6 million acres of forest land in South Dakota, accounting for almost 4 percent of the State's total land area. Forest land is land that is at least 10 percent stocked by forest trees of any size, or formerly having had such tree cover, and not currently developed for nonforest use. 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. Seventy-one percent, or 1.2 million acres, of the forest land in the State was publicly owned (table 1). The majority of the public land in the State is west of the Missouri River.

There are three major areas of natural forests in South Dakota (Ball and Erickson 1998). The Black Hills forest is the largest area of

forest land in the State. This forested area is composed primarily of ponderosa pine, but also includes quaking aspen, Black Hills spruce (a variety of white spruce), paper birch, and bur oak. The second largest area of forest land is the flood plain forest along the Missouri River. American elm and green ash are the major species found in these forests. Bur oak forests found along the upper terraces and draws of rivers, and in the northern Black Hills account for the third largest area of forest land in the State. Other forested areas in South Dakota are the cottonwood forests scattered along the rivers and streams throughout the State and the maple and basswood forests of the upland forests on the eastern side of the State.

Timberland accounted for 91 percent, or 1.5 million acres, of the forest land in South Dakota in 2003. Timberland is forest land that is producing, or is capable of producing, 20 cubic feet of wood per acre per year under

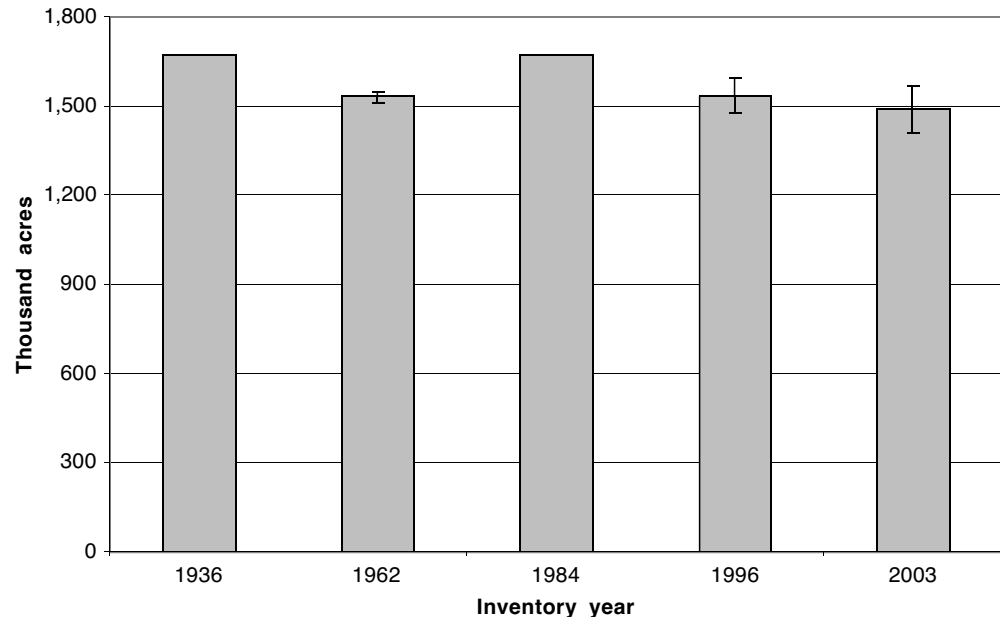


Figure 1.—Area of timberland, South Dakota, 1935-2003. (Note: The 1936 area may contain some area of forest land that is not timberland. Sample errors are not provided for the 1936 and 1984 inventories because no single statewide sample error is available for those inventories. The 1962 and 2003 estimates are for total timberland area; the sample error associated with the 1996 estimate is calculated for timber area outside of the BHNF. Sample error is represented by the vertical line at the top of each bar.)

natural conditions and is not restricted from harvest. Throughout most of the 20th century, the area of timberland in South Dakota remained relatively stable, rising and falling between 1.5 and 1.7 million acres (fig. 1). The 2003 timberland area estimate is based on a partial inventory (three panels of five), and the estimate is likely to change as more data are collected in the ensuing annual inventories.

Almost three-fourths of the timberland in the State is publicly owned (table 2). The USDA Forest Service, through the Black Hills and Custer National Forests, holds the majority of public timberland. Owners of less than 100 acres of timberland hold most of the private timberland in the State (Leatherberry *et al.* 2000). Those holdings are generally associated with farms or ranches. Native American tribal groups own an estimated 93 thousand acres of timberland held as tribal trust land within the boundaries of reservations in South Dakota (Haugen and Hansen 2002).

The ponderosa pine forest type accounted for almost 80 percent of the total timberland area

in South Dakota in 2003 (fig. 2). Overall, the softwood forest types combined accounted for 81 percent of the total timberland area in the State. The elm/ash/cottonwood forest type group occupied the second largest area of timberland, but accounted for only 7 percent of the total.

Although virtually all of the timberland area in South Dakota is of natural origin, South Dakota residents have a long history of planting trees. Most of these plantings are associated with windbreaks, shelterbelts, or farmstead plantings and do not meet the area and/or width requirements to be classified as timberland. Many of the earlier efforts to establish tree plantations failed or were later abandoned.

As South Dakota's forests mature and are affected by natural and human-caused events, they take on certain stand-size characteristics. Stand-size class is a measure of the average diameter of the dominant trees in a stand. There are four stand-size classes: sawtimber—large trees, softwoods at least 9 inches in diameter at breast height (d.b.h.)

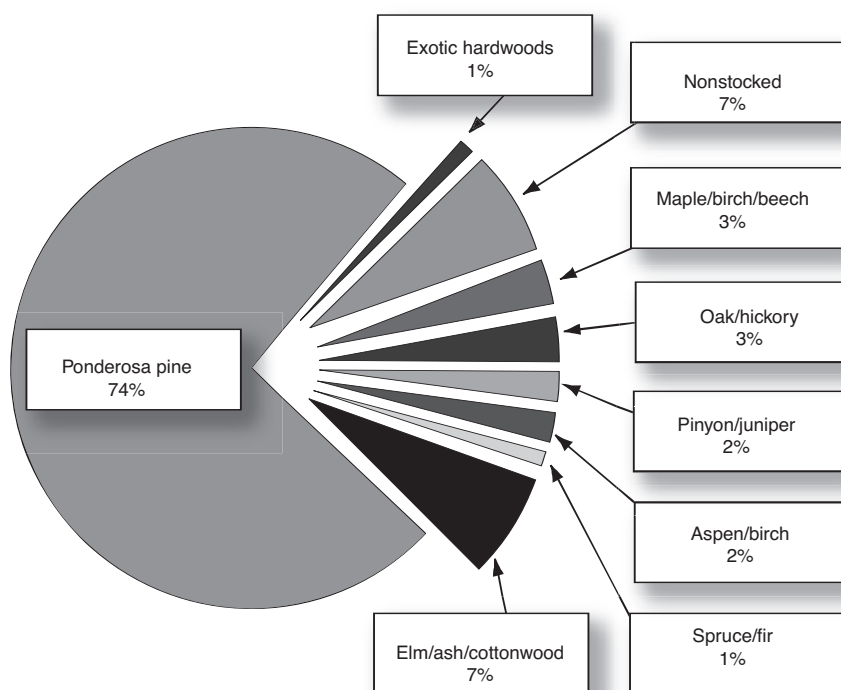


Figure 2.—Area of timberland by forest type, South Dakota, 2003.

and hardwoods at least 11 inches d.b.h.; poletimber—medium trees 5 inches d.b.h. to sawtimber size; sapling-seedling—small trees, softwoods at least 6 inches tall and hardwoods at least 1 foot tall, to poletimber size; and nonstocked stands. In 2003, sawtimber stands occupied 1 million acres of timberland, or over 70 percent of the timberland area (table 3). Poletimber-size stands accounted for 14 percent of the timberland area, followed by sapling/seedling stands on 10 percent of timberland area. Nonstocked timberland occupied 5 percent of the total timberland area. The predominance of sawtimber-size stands reflects the presence of larger diameter ponderosa pine in the Black Hills National Forest and older, large-diameter bottomland hardwood stands.

Since South Dakota's forest inventory in 1996 and the BHNF inventory in 1999, the area of sawtimber-size stands has increased by over 190 thousand acres. The area of poletimber-size stands and seedling-sapling-size stands has decreased by 78 thousand acres and 207 thousand acres, respectively (fig. 3). Ensuing panels of the fifth South Dakota inventory will provide information for more definitive

conclusions about forces driving the changes in stand-size class.

Volume

South Dakota's net volume of all live trees on forest land totaled 1.7 billion cubic feet (table 4). Almost 80 percent of this volume is from one species—ponderosa pine. All the hardwoods species combined accounted for only 17 percent of the total volume of all live trees on forest land. Net cubic and board foot volumes are based on tree measurements (d.b.h., tree class, and site index) and volume equations presented by Hahn and Hansen (1991) with cull factors based on trees measured in the Plains States.

Growing-stock trees on timberland accounted for over 90 percent (1.5 billion cubic feet) of the live tree volume on forest land. A growing-stock tree is a live tree of commercial species that meets specified standards of size, quality, and merchantability. Besides growing-stock volume, there were an additional 45 million cubic feet in live cull trees and 9 million cubic feet of salvable dead trees on timberland in

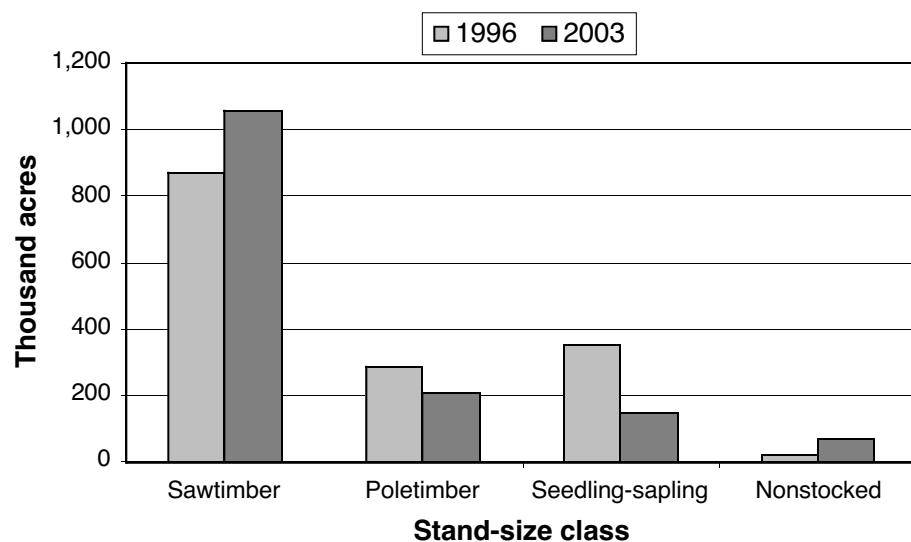


Figure 3.—Area of timberland by stand-size class, South Dakota, 1996 and 2003.

South Dakota in 2003 (table 5). Over three-fourths of the live cull volume on timberland came from hardwood species. All of the salvageable dead volume on timberland came from softwood species.

Only 2 percent of the growing-stock volume from the softwood forest type groups was made up of hardwood species (table 6). Six percent of the volume in hardwood forest types was in softwood species. The minor amount of growing-stock volume from timberland that was nonstocked came from softwood species.

Over 80 percent (1.3 billion cubic feet) of the growing-stock volume on timberland came from ponderosa pine (fig. 4 and table 7). Cottonwood and aspen combined contained the second largest volume of growing stock, but still accounted for less than 7 percent of the total volume. Between 1996 and 2003, ponderosa pine and spruce growing-stock volumes decreased in South Dakota, which may be the result of losses due to insect infestations, wildfires, and severe weather. As eastern redcedar becomes established on former rangeland and abandoned farmland, the volume of growing stock appears to be increasing.

There were 6.0 billion board feet of sawtimber in South Dakota (table 8). Sawtimber volume is the volume of wood in the saw log portion of sawtimber-size trees. More than half of the sawtimber volume came from the small diameter, sawtimber-size trees less than 15 inches d.b.h.

Biomass

All live aboveground tree biomass on timberland in South Dakota was estimated at 29.3 million dry tons in 2003 (table 9). This averages out to almost 20 dry tons of biomass per acre of timberland. Biomass is the amount of total wood and bark (excludes foliage) of trees 1.0 inch in d.b.h or larger, including all tops and limbs. The dry tons estimate of 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 uses. In 2003, 91 percent of the total biomass was in growing-stock trees, almost 6 percent came from saplings between 1.0 inches d.b.h. and 5.0 inches d.b.h., and almost 4 percent came from non-growing-stock trees (cull trees and non-commercial species). Softwood species accounted for almost 95 percent of all live aboveground tree biomass on publicly owned timberland. Eighty-five percent of the soft-

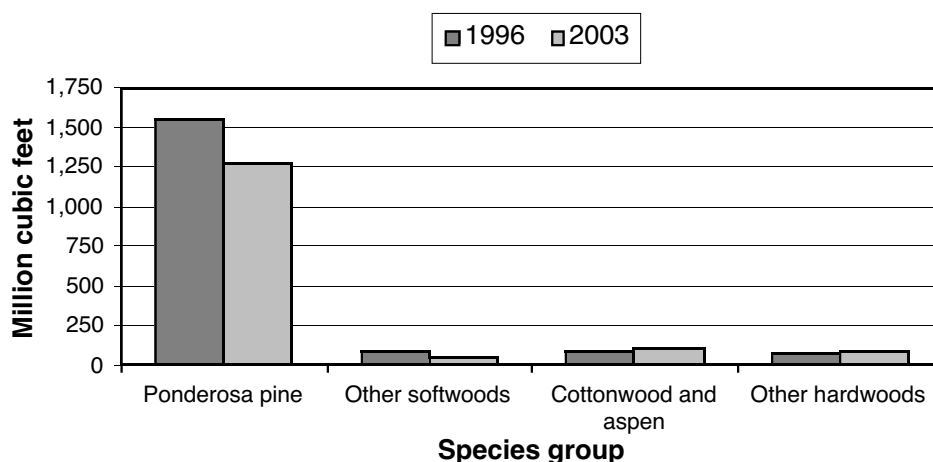


Figure 4.—Growing-stock volume on timberland by species group in South Dakota, 1996 and 2003.

wood biomass in the State is found on these public lands. Hardwood biomass, on the other hand, is mostly privately owned with more than 80 percent of the total live hardwood biomass in private ownership.

Forest Health

Although South Dakota is mostly prairie and cropland, forests are an important component of the landscape. Currently, the primary concerns for South Dakota's forests are drought, the mountain pine beetle, and the pine engraver beetle (Ball and Harris 2003).

Drought conditions, which began in the western portions of South Dakota in 2001, were felt statewide in 2003. This increased environmental stress resulted in tree mortality attributed in part to colonization of borers such as ash bark beetles, cottonwood borer, and Zimmerman pine moth.

Extensive ponderosa pine mortality has occurred throughout the Black Hills due to the mountain pine beetle, a bark beetle. The majority of the infestations are confined to BHNF lands, but as available host trees are killed, the large beetle populations are expanding to surrounding forest ownerships. Results of annual aerial surveys estimate that over 1 million pine trees have been killed since 1998. The Beaver Park area of the northern Black Hills has been the hardest hit area with more than 100,000 trees killed, resulting in many stands becoming depleted of suitable host trees. Ground surveys in this area have found an average of 20 trees killed per acre since 2001. The majority of the infestations have been confined to national forest lands, but as available host trees are killed, more private and State lands are being infested.

Another bark beetle killing many ponderosa pines in the Black Hills and the Pine Ridge Indian Reservation is the pine engraver beetle (*Ips pini*). The population has been increasing in recent years due to the increase in suitable hosts: trees that have been injured or killed by fire, mountain pine beetle, severe snow, or hail

storms. Many of the areas that are hardest hit by *Ips* were in the wildland-urban interface. More than 120,700 ponderosa pines in 45,200 acres have died from pine engraver beetles.

A more complete discussion of forest health issues that have affected South Dakota forests since the last complete forest inventory and of current events is available at:

http://www.na.fs.fed.us/spfo/fhm/fhh/fhh-03/sd/sd_03.pdf.

SUMMARY

In summary, estimates of South Dakota's forest resources indicate timberland area has remained relatively stable at about 3 percent of the total land area. Ponderosa pine, found mostly in the Black Hills region, is the predominant forest type group. Eastern redcedar appears to be expanding in the State, but it is still a minor portion of the total area and volume. As additional data become available from ensuing annual inventories, a clearer picture of the direction of South Dakota's forests will emerge. Additional data related to the two most recent inventories of South Dakota (1980 and 1996) are available at: www.ncrs.fs.fed.us/4801/fiadb/index.htm.



APPENDIX

Inventory Methods

Since the 1996 inventory of South Dakota's forest outside the BHNF, 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. The annual inventory system began in South Dakota in 2001. At that time, the NCFIA program assumed responsibility for inventorying all forest lands in South Dakota.

With the NCFIA annual inventory system, approximately one-fifth of all field plots are measured each year. After 5 years, the entire inventory cycle will be completed. After the initial 5-year cycle, 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. While there are great advantages for an annual inventory, one difficulty is reporting on results for fewer than 5 years. With the 2001–2003 panels, only 60 percent of all field plots have been measured. Sampling error estimates for the 2003 inventory results are: area of forest land, 5.09 percent; area of timberland, 5.40 percent; number of growing-stock trees on timberland, 9.78 percent; volume of growing stock on timberland, 7.05 percent; and volume of sawtimber on timberland, 7.84 percent. These sampling error estimates are much higher than those for the last periodic inventory completed in 1996 (i.e., 3.8 percent for timberland area outside the BHNF and 4.2 percent for growing-stock volume outside the BHNF) because of the smaller

sample sizes. 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 new remote sensing technology, a new sampling design, a new field plot configuration, and additional remotely sensed and field data. The advent of remote sensing technology since the previous inventory in 1996 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 the precision of estimates. Previous inventories used manual interpretation of aerial photos to stratify the sample.

New algorithms were used in 2003 to assign forest type and stand-size class to each condition observed on a plot. These algorithms are being used nationwide by FIA to increase consistency among States. The list of recognized forest types, grouping of these forest types for reporting purposes, models 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 1996 inventory results and those published for the 2003 inventory may not be valid. For additional details about algorithms used in both inventories, please contact NCFIA.

Sampling Phases

The 2003 South Dakota survey was conducted in three phases. The first phase used classified satellite imagery to stratify the State and aerial photographs to select plots for measurement. The second phase measured the traditional FIA suite of mensurational variables,

and the third phase focused on a suite of variables related to the health of the forest.

The only land that could not be sampled was (1) private land where field personnel could not obtain permission from the owner to measure the field plot and (2) 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. There was one denied access plot in 2001, four denied access plots in 2002, and none in 2003. There were no plots that were too hazardous to establish in 2001 and 2002, and two plots in 2003.

Phase 1

The 2003 South Dakota inventory used a computer-assisted classification of 30-m Landsat Thematic Mapper satellite imagery. FIA 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 edge and nonforest edge. Forest pixels within 60 m on the forest side of a forest-nonforest boundary were classified into a forest edge stratum. Pixels within 60 m of the boundary on the nonforest side were classified into a 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. Stratification and estimation were conducted at the FIA Inventory Unit. All private land and the BHNH were stratified into one of the four strata—nonforest, nonforest edge, forest, or forest edge. The Custer National forest was stratified into one of two strata—nonforest and nonforest edge combined or forest and forest edge combined. All the other public land in South Dakota was stratified into one of three strata—nonforest, nonforest edge, or forest and forest edge combined.

In the 1996 South Dakota inventory outside the BHNH, photointerpreters at NCFIA assembled aerial photographs into township

mosaics, and a systematic grid of 121 one-acre photo plots (each dot representing approximately 190.4 acres on the ground) was overlaid on each township mosaic. Each of these photo plots was stereoscopically examined and classified based on land use, forest type, and stand-size density. From these photo plots, a systematic sample of plots (without regard to their aerial photo classification) was selected as ground plots and further examined by survey crews to verify the classification and to take further measurements. Additional information related to the procedures for the 1996 South Dakota inventory can be found in Leatherberry *et al.* (2000). The BHNH have remeasurement ground plots that were last measured by IWFIA in 1999. Information related to the procedures for the 1999 BHNH inventory can be found in DeBlander (2002) and USDA Forest Service (1999).

The move to satellite imagery changed NCFIA's phase 1 sample from being based on one photo plot for every 190.4 acres to a sample based on a classified pixel every 0.22 acres. The increased intensity of the phase 1 sample greatly improved estimates of the area within each stratum, particularly at the county level. Also, because the classification was conducted using a computer-assisted algorithm across the entire State, biases in the photo plot sampling method that resulted from differences in photo quality, age of photography, and experience of the photointerpreter were minimized and classification was consistent across the entire State.

Phase 2

Phase 2 of the inventory consisted of the measurement of the first annual sample of field plots in South Dakota and the remeasurement of inventory plots from the 1999 BHNH inventory (DeBlander 2002). Current FIA precision standards for annual inventories require a sampling intensity of one plot for approximately every 6,000 acres. FIA has established a grid that divides the entire area of the United States into nonoverlapping

hexagons, each of which contains approximately 5,937 acres (McRoberts 1999). A grid of field plots was established by selecting one plot from each hexagon based on the following rules: (1) if an IWFA plot from the 1999 inventory of the BHNF fell within a hexagon, it was selected as the grid plot; (2) if more than one IWFA plot from the 1999 inventory of the BHNF fell within a hexagon, the plot nearest the hexagon center was selected as the grid plot; and (3) if no existing IWFA plots fell within the hexagon, and for all area outside the BHNF, a new NCFIA plot established in the hexagon was selected as the grid plot (McRoberts 1999). This grid of plots is designated the Federal base sample and is considered an equal probability sample; its measurement in South Dakota is funded by the Federal government.

The total Federal base sample of hexagonal grid plots was systematically divided into five interpenetrating, nonoverlapping 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 systematic 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 forested or straddler (nonforest/forest and forest/non-forest) by trained photointerpreters using aerial photos or digital orthophotoquads. Plots classified as nonforest were checked to ensure correct classification.

Phase 3

NCFIA has two categories of field plot measurements—phase 2 plots (standard FIA plots) and phase 3 plots (forest health plots). Both types of plot are systematically distributed both geographically and temporally. Phase 3 plots are measured with the full array of FHM vegetative and health variables (Mangold 1998) collected as well as the full suite of measures associated with phase 2 plots. Phase 3 plots must be measured

between June 1 and August 30 to accommodate the additional measurement of non-woody understory vegetation, ground cover, soils, and other variables. We anticipate that in South Dakota the complete 5-year annual inventory will include the classification of about 520 phase 3 plots, of which approximately 35 will have field measurements. On the remaining plots, referred to as phase 2 plots, only variables that can be measured throughout the entire year are collected. In South Dakota, the complete 5-year annual inventory is expected to include the classification of about 7,780 phase 2 plots. The 2001–2003 annual panel results represent field measures on 174 timberland plots, 19 other forest land plots, and 4,787 nonforest land plots.

The new national FIA plot configuration with four subplots (fig. 5) was first used for data collection in South Dakota in the BHNF in 1999 and for the rest of the State during the 2001 panel. This design was also used in the 2002 and 2003 panels and will be used in subsequent years. On forest land outside the BHNF, all plots in the annualized inventory are newly established; therefore, some remeasurement data will not be available until the sixth year of the annual inventory. These measurements 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 requires

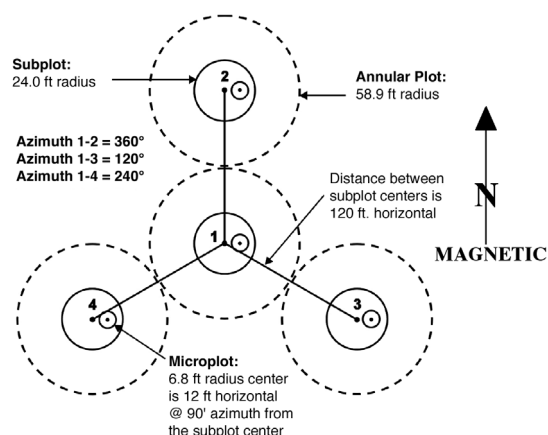


Figure 5.—Current NCFIA field plot design.

mapping forest conditions on each plot. Due to the small sample size (20 percent) each year, precision associated with change factors such as mortality will be relatively low.

Consequently, change estimates outside the BHNF may not be reported until at least the third annual panel of the second five-panel cycle of inventory has been implemented, and even then we anticipate that estimates of change will be limited in detail. When the complete second five-panel annual inventory has been completed in 2010, the full range of change variables will be available for the entire State.

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. For remeasurement plots from the 1999 inventory of the BHNF, the center of the plot is located at the same point as the center of the previous plot. Trees with diameter at breast height (diameter at 4.5 feet above ground level, commonly referred to as d.b.h.) or diameter at the root collar (for woodland species such as Rocky Mountain juniper, commonly referred to as d.r.c.) 5 inches and larger are measured on a 24-foot-radius (1/24 acre) circular subplot. All trees less than 5 inches d.b.h./d.r.c. are measured on a 6.8-foot-radius (1/300 acre) circular microplot located 12.0 feet due east of 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 changes in 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 meets or exceeds 1 acre in size.

Field plot measurements are combined with phase 1 estimates in the compilation process and table production. The number of tables generated from less than five panels of data is

limited. However, at <http://ncrs2.fs.fed.us/4801/fiadb/fim17/wcfim17.asp> other tabular data can be generated.

For additional information, contact:

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TABLE TITLES

Table 1.—Area of forest land by forest type group, forest type, and owner category, South Dakota, 2001–2003

Table 2.—Area of timberland by major forest type group, stand origin, and owner category, South Dakota, 2001–2003

Table 3.—Area of timberland by forest type group, forest type, and stand-size class, South Dakota, 2001–2003

Table 4.—Net volume of all live trees on forest land by species group, species, and owner category, South Dakota, 2001–2003

Table 5.—Net volume of all live trees and salvageable dead trees on timberland by class of timber and softwood/hardwood species category, South Dakota, 2001–2003

Table 6.—Net volume of growing stock on timberland by forest group, forest type, and softwood/hardwood species category, South Dakota, 2001–2003

Table 7.—Net volume of growing stock on timberland by species group, species, and diameter class, South Dakota, 2001–2003

Table 8.—Net volume of sawtimber on timberland by species group, species, and diameter class, South Dakota, 2001–2003

Table 9.—All live aboveground tree biomass on timberland by owner category, softwood/hardwood species category, and tree component, South Dakota, 2001–2003



TABLES

Table 1. -- Area of forest land by forest type group, forest type, and owner category, South Dakota, 2001-2003

(In thousand acres)

Forest type group/ forest type	Owner category			
	All owners	Public	Private	Unidentified owner
Softwood type groups				
Spruce / fir group				
White spruce	20.9	20.9	--	--
All forest types	20.9	20.9	--	--
Pinyon / juniper group				
Eastern redcedar	18.5	--	18.5	--
Rocky Mountain juniper	11.6	11.6	--	--
All forest types	30.1	11.6	18.5	--
Ponderosa pine group				
Ponderosa pine	1,218.4	1,019.8	198.6	--
All forest types	1,218.4	1,019.8	198.6	--
All softwood groups	1,269.4	1,052.3	217.1	--
Hardwood type groups				
Oak / hickory group				
Bur oak	42.8	6.7	36.1	--
Mixed upland hardwoods	15.5	--	15.5	--
All forest types	58.3	6.7	51.6	--
Elm / ash / cottonwood group				
Black ash / American elm / red maple	1.1	--	1.1	--
Cottonwood	51.5	--	51.5	--
Sugarberry / hackberry / elm / green ash	50.2	9.3	40.9	--
Cottonwood / willow	6.7	--	6.7	--
All forest types	109.5	9.3	100.2	--
Maple / beech / birch group				
Elm / ash / locust	51.0	5.7	45.3	--
All forest types	51.0	5.7	45.3	--
Aspen / birch group				
Aspen	27.6	15.3	12.3	--
All forest types	27.6	15.3	12.3	--
Exotic hardwoods group				
Other exotic hardwoods	7.5	--	7.5	--
All forest types	7.5	--	7.5	--
All hardwood groups	253.8	36.9	216.9	--
Nonstocked	110.1	77.7	32.4	--
All forest groups	1,633.4	1,166.9	466.4	--

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 2. -- Area of timberland by major forest type group, stand origin, and owner category, South Dakota, 2001-2003

(In thousand acres)

Major forest type group and stand origin	Owner category		
	All owners	Public	Unidentified owner
Softwood type groups			
Natural	1,213.2	1,005.4	207.9
All softwood types	1,213.2	1,005.4	207.9
Hardwood type groups			
Natural	204.3	24.6	179.7
All hardwood types	204.3	24.6	179.7
Nonstocked	73.8	68.8	5.0
All groups	1,491.4	1,098.8	392.5

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, forest type, and stand-size class, South Dakota, 2001-2003

(In thousand acres)

Forest type group/ forest type	Stand-size class			
	All stands	Sawtimber	Poletimber	Sapling- seedling
Non- stocked				
Spruce / fir group				
White spruce	20.9	12.2	8.7	--
All forest types	20.9	12.2	8.7	--
Pinyon / juniper group				
Eastern redcedar	9.2	9.2	--	--
Rocky Mountain juniper	11.6	--	--	11.6
All forest types	20.8	9.2	--	11.6
Ponderosa pine group				
Ponderosa pine	1,171.5	953.5	125.1	93.0
All forest types	1,171.5	953.5	125.1	93.0
All softwood groups	1,213.2	974.9	133.8	104.5
Hardwood type groups				
Oak / hickory group				
Bur oak	16.4	--	6.9	9.5
Mixed upland hardwoods	15.5	8.9	6.7	--
All forest types	32.0	8.9	13.6	9.5
Elm / ash / cottonwood group				
Cottonwood	49.0	39.1	9.9	--
Sugarberry / hackberry / elm / green ash	50.2	23.4	8.0	18.8
Cottonwood / willow	6.7	6.7	--	--
All forest types	105.8	69.1	17.9	18.8
Maple / beech / birch group				
Elm / ash / locust	31.5	6.0	25.5	--
All forest types	31.5	6.0	25.5	--
Aspen / birch group				
Aspen	27.6	--	12.3	15.3
All forest types	27.6	--	12.3	15.3
Exotic hardwoods group				
Other exotic hardwoods	7.5	--	7.5	--
All forest types	7.5	--	7.5	--
All hardwood groups	204.3	84.0	76.7	43.6
Nonstocked	73.8	--	--	73.8
All forest groups	1,491.4	1,058.9	210.5	148.2
				73.8

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, species, and owner category, South Dakota, 2001-2003

(In thousand cubic feet)

Species group/ species	Owner category			
	All owners	Public	Private	Unidentified owner
Softwoods				
Spruce and balsam fir				
White spruce	42,333	39,387	2,946	--
All species	42,333	39,387	2,946	--
Other eastern softwoods				
Rocky Mountain juniper	11,409	7,256	4,153	--
Eastern redcedar	6,615	--	6,615	--
Ponderosa pine	1,347,327	1,164,561	182,767	--
All species	1,365,351	1,171,816	193,535	--
Total softwoods	1,407,684	1,211,203	196,481	--
Hardwoods				
Select white oaks				
Bur oak	87,842	15,342	72,500	--
All species	87,842	15,342	72,500	--
Hard maple				
Sugar maple	1,585	--	1,585	--
All species	1,585	--	1,585	--
Ash				
Green ash	45,707	1,426	44,280	--
All species	45,707	1,426	44,280	--
Cottonwood and aspen				
Eastern cottonwood	85,882	--	85,882	--
Quaking aspen	22,142	19,717	2,426	--
All species	108,025	19,717	88,308	--
Basswood				
American basswood	749	--	749	--
All species	749	--	749	--
Other eastern soft hardwoods				
Boxelder	15,398	--	15,398	--
Paper birch	3,182	2,882	299	--
Hackberry	1,408	--	1,408	--
American elm	21,411	319	21,093	--
Siberian elm	4,248	--	4,248	--
All species	45,647	3,201	42,446	--
Eastern noncommercial hardwoods				
Eastern hophornbeam	1,751	508	1,243	--
Chokecherry	66	--	66	--
Willow	1,232	--	1,232	--
All species	3,049	508	2,540	--
Total hardwoods	292,604	40,194	252,409	--
All species groups	1,700,288	1,251,397	448,890	--

All table cells without observations in the inventory sample are indicated by --. Table value of 0 indicates 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 species category, South Dakota, 2001-2003

(In thousand cubic feet)

Class of timber	All species	Softwood species	Hardwood species
Live trees			
Growing-stock trees			
Sawtimber			
Saw log portion	1,068,211	959,283	108,929
Upper stem portion	153,215	141,174	12,042
Total	1,221,427	1,100,456	120,971
Poletimber	314,115	236,509	77,605
All growing-stock trees	1,535,541	1,336,965	198,576
Cull trees			
Rough trees ¹			
Sawtimber size	34,032	9,723	24,309
Poletimber size	9,159	571	8,587
Total	43,191	10,294	32,897
Rotten trees ¹			
Sawtimber size	1,532	704	828
Poletimber size	644	--	644
Total	2,176	704	1,472
All live cull trees	45,367	10,998	34,369
All live trees	1,580,908	1,347,963	232,945
Salvable dead trees			
Sawtimber size	4,779	4,779	--
Poletimber size	3,947	3,947	--
All salvable dead trees	8,725	8,725	--
All classes	1,589,633	1,356,689	232,945

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 type group, forest type, and softwood/hardwood species category, South Dakota, 2001-2003

(In thousand cubic feet)

Forest type group/ forest type	All species	Softwood species	Hardwood species
Spruce / fir group			
White spruce	23,036	18,596	4,440
All forest types	23,036	18,596	4,440
Pinyon / juniper group			
Eastern redcedar	4,541	4,541	--
Rocky Mountain juniper	393	393	--
All forest types	4,934	4,934	--
Ponderosa pine group			
Ponderosa pine	1,321,089	1,298,925	22,164
All forest types	1,321,089	1,298,925	22,164
All softwood groups	1,349,059	1,322,455	26,604
Hardwood type groups			
Oak / hickory group			
Bur oak	9,999	4,193	5,806
Mixed upland hardwoods	18,649	1,330	17,319
All forest types	28,648	5,522	23,125
Elm / ash / cottonwood group			
Cottonwood	75,022	--	75,022
Sugarberry / hackberry / elm / green ash	27,369	--	27,369
Cottonwood / willow	16,403	--	16,403
All forest types	118,794	--	118,794
Maple / beech / birch group			
Elm / ash / locust	19,759	1,921	17,838
All forest types	19,759	1,921	17,838
Aspen / birch group			
Aspen	11,698	3,732	7,966
All forest types	11,698	3,732	7,966
Exotic hardwoods group			
Other exotic hardwoods	4,248	--	4,248
All forest types	4,248	--	4,248
All hardwood groups	183,146	11,175	171,972
Nonstocked	3,336	3,336	--
All forest groups	1,535,541	1,336,965	198,576

All table cells without observations in the inventory sample are indicated by --. Table value of 0 indicates 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, species, and diameter class, South Dakota, 2001-2003

(In thousand cubic feet)

Species group/ species	All classes	Diameter class (inches at breast height)										29.0+
		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		
Spruce and balsam fir												
White spruce	40,974	2,421	6,673	6,255	5,644	9,232	6,747	1,702	2,301	--	--	--
All species	40,974	2,421	6,673	6,255	5,644	9,232	6,747	1,702	2,301	--	--	--
Other eastern softwoods												
Rocky Mountain juniper	6,005	1,369	2,788	1,246	602	--	--	--	--	--	--	--
Eastern redcedar	5,952	561	761	3,105	679	845	--	--	--	--	--	--
Ponderosa pine	1,284,035	66,533	155,404	223,437	211,277	208,566	144,510	122,188	65,360	86,760	--	--
All species	1,295,992	68,463	158,953	227,789	212,557	209,411	144,510	122,188	65,360	86,760	--	--
Total softwoods	1,336,965	70,884	165,626	234,044	218,201	218,643	151,257	123,890	67,661	86,760	--	--
Hardwoods												
Select white oaks												
Bur oak	35,825	7,635	8,763	5,852	6,678	3,089	--	3,807	--	--	--	--
All species	35,825	7,635	8,763	5,852	6,678	3,089	--	3,807	--	--	--	--
Hard maple												
Sugar maple	1,585	--	--	601	985	--	--	--	--	--	--	--
All species	1,585	--	--	601	985	--	--	--	--	--	--	--
Ash												
Green ash	28,833	4,358	5,857	7,710	3,547	2,249	--	--	--	5,113	--	--
All species	28,833	4,358	5,857	7,710	3,547	2,249	--	--	--	5,113	--	--
Cottonwood and aspen												
Eastern cottonwood	83,418	394	1,104	1,881	1,625	5,325	5,285	7,495	2,883	23,195	34,230	--
Quaking aspen	20,092	7,861	5,148	3,988	2,132	964	--	--	--	--	--	--
All species	103,510	8,254	6,252	5,870	3,758	6,288	5,285	7,495	2,883	23,195	34,230	--
Basswood												
American basswood	749	340	--	409	--	--	--	--	--	--	--	--
All species	749	340	--	409	--	--	--	--	--	--	--	--
Other eastern soft hardwoods												
Boxelder	6,658	--	--	--	--	--	1,459	2,082	3,117	--	--	--
Paper birch	2,809	1,573	1,236	--	--	--	--	--	--	--	--	--
Hackberry	462	--	--	462	--	--	--	--	--	--	--	--
American elm	13,897	2,187	3,660	2,339	2,949	996	1,766	--	--	--	--	--
Siberian elm	4,248	637	2,165	1,446	--	--	--	--	--	--	--	--
All species	28,073	4,397	7,060	4,247	2,949	996	3,225	2,082	3,117	--	--	--
Total hardwoods	198,576	24,984	27,932	24,689	17,916	12,623	8,510	13,384	6,000	28,308	34,230	--
All species groups	1,535,541	95,868	193,557	258,733	236,116	231,266	159,767	137,274	73,661	115,068	34,230	--

All table cells without observations in the inventory sample are indicated by --. Table value of 0 indicates 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, species, and diameter class, South Dakota, 2001-2003

(In thousand board feet)¹

Species group/ species	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+		
Spruce and balsam fir											
White spruce	132,947	25,959	23,663	38,491	28,096	7,228	9,511	--	--	--	--
All species	132,947	25,959	23,663	38,491	28,096	7,228	9,511	--	--	--	--
Other eastern softwoods											
Rocky Mountain juniper	9,010	5,979	3,031	--	--	--	--	--	--	--	--
Eastern redcedar	24,606	16,931	3,469	4,207	--	--	--	--	--	--	--
Ponderosa pine	5,232,026	1,039,246	1,012,455	1,025,656	729,319	632,325	341,436	451,588	--	--	--
All species	5,265,642	1,062,156	1,018,955	1,029,863	729,319	632,325	341,436	451,588	--	--	--
Total softwoods	5,398,589	1,088,115	1,042,618	1,068,354	757,415	639,553	350,946	451,588	--	--	--
Hardwoods											
Select white oaks											
Bur oak	64,862	--	31,637	14,650	--	18,575	--	--	--	--	--
All species	64,862	--	31,637	14,650	--	18,575	--	--	--	--	--
Hard maple											
Sugar maple	4,685	--	4,685	--	--	--	--	--	--	--	--
All species	4,685	--	4,685	--	--	--	--	--	--	--	--
Ash											
Green ash	50,741	--	14,775	9,841	--	--	--	26,124	--	--	--
All species	50,741	--	14,775	9,841	--	--	--	26,124	--	--	--
Cottonwood and aspen											
Eastern cottonwood	383,273	--	6,653	23,357	23,648	35,284	13,656	116,927	163,748	--	--
Quaking aspen	14,321	--	9,674	4,647	--	--	--	--	--	--	--
All species	397,595	--	16,327	28,004	23,648	35,284	13,656	116,927	163,748	--	--
Other eastern soft hardwoods											
Boxelder	30,423	--	--	--	6,458	9,439	14,526	--	--	--	--
American elm	25,207	--	12,817	4,467	7,923	--	--	--	--	--	--
All species	55,629	--	12,817	4,467	14,380	9,439	14,526	--	--	--	--
Total hardwoods	573,512	--	80,242	56,962	38,029	63,299	28,182	143,051	163,748	--	--
All species groups	5,972,101	1,088,115	1,122,860	1,125,315	795,444	702,852	379,128	594,639	163,748	--	--

All table cells without observations in the inventory sample are indicated by --. Table value of 0 indicates 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, South Dakota, 2001-2003

(In dry tons)

Owner category and softwood/hardwood category	All components	All live 1-5 inch trees	Tree biomass component					
			Growing-stock trees			Non-growing-stock trees		
			Total	Boles	Stumps, tops, and limbs	Total	Boles	Stumps, tops, and limbs
Public								
Softwoods	19,670,265	682,701	18,843,609	15,605,739	3,237,870	143,955	118,355	25,600
Hardwoods	1,141,504	408,628	702,125	486,801	215,324	30,751	20,124	10,627
Total	20,811,769	1,091,329	19,545,734	16,092,540	3,453,194	174,706	138,479	36,227
Private								
Softwoods	3,374,923	135,419	3,193,844	2,647,617	546,226	45,661	36,073	9,588
Hardwoods	5,131,930	434,020	3,843,157	2,775,549	1,067,608	854,754	617,371	237,383
Total	8,506,853	569,438	7,037,000	5,423,167	1,613,834	900,414	653,443	246,971
All ownerships								
Softwoods	23,045,187	818,120	22,037,452	18,253,356	3,784,096	189,615	154,428	35,188
Hardwoods	6,273,435	842,648	4,545,282	3,262,350	1,282,932	885,505	637,495	248,010
Total	29,318,622	1,660,767	26,582,735	21,515,706	5,067,028	1,075,120	791,923	283,197

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.

Piva, Ronald J.; Haugan, Douglas; Josten, Gregory J.; Brand, Gary J.

2005. **South Dakota's forest resources in 2003**. Resour. Bull. NC-247. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Research Station. 21 p.

Reports the initial results of the first three annual panels (2001-2003) of the fifth forest inventory of South Dakota. Includes information on forest area, volume, biomass, and forest health.

KEY WORDS: Annual inventory, forest land, timberland, forest type, volume, biomass, forest health, South Dakota.

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