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# Kansas's Forest Resources in 2002

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# Kansas's Forest Resources in 2002

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The North Central Research Station's Forest Inventory and Analysis (NCFIA) program began fieldwork for the fifth forest inventory of Kansas 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 Kansas, the field plots measured in 2002 will be remeasured in 2007.

In 2002, NCFIA continued the annual inventory effort with the second panel of the fifth Kansas forest inventory. Previous inventories of Kansas are dated 1936, 1965, 1981, and 1994 (Kansas State College 1939, Chase and Strickler 1968, Raile and Spencer 1984, Spencer *et al.* 1984, Leatherberry *et al.* 1999). The fifth inventory of Kansas 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 the forest resources of Kansas, estimates have been prepared from data gathered during the first 2 years of the inventory. Data presented in this report represent approximately 40 percent of the field plots (or two panels) of a complete inventory and are a combination of the first year's panel from 2001 and the second year's panel from 2002. The results presented are estimates based on sampling techniques; estimates for this report were compiled assuming that the 2001 and 2002 data represent one sample. As additional annual panels are completed, the precision of the estimates will increase and additional data will be released.

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 Kansas inventory in 1994 (Leatherberry *et al.* 1999). Although these changes will have some impact on statewide estimates of forest area, timber volume, and tree biomass, they may have significant impacts on plot classification variables such as forest type and stand-size class. Some of these changes make it inappropriate to compare directly portions of the 2001-2002 data with those published for earlier inventories. Except for oak/hickory, forest type descriptions in this report are categorized by broad groups not necessarily found in Kansas. Forest type subcategories more accurately describe the forests of the State. Under national standardization, the elm/ash/locust forest type is a component of the maple/beech/birch forest type group, eastern redcedar/hardwood is in the oak/pine forest type group, and eastern redcedar is in the pinyon/juniper forest type group.

## RESULTS

### Area

Forest land area was 2.2 million acres in 2002 (table 1). Four percent of the forest land is owned by public agencies and 96 percent is

owned by private landowners. Over 6 percent of the area is dominated by conifers and 92.8 percent is dominated by hardwoods, with the remainder classified as nonstocked. Oak-hickory forests constitute almost half of the total hardwood area. The pinyon/juniper forest type group, which is eastern redcedar, constituted 87.6 percent of all forest land dominated by conifers.

Timberland area, a subset of forest land area, has continued to increase since its low point in the 1936 inventory (fig. 1). The significant jump in forest land and timberland area since the last periodic inventory is due to many factors, including ingrowth, conversion of agricultural land to forest, and a definitional change. Previously, forest lands that were grazed or used for shelter from the wind were not classified as forest land. Since 2001, such lands have been classified as forest land if they meet standards of size, width, and stocking.

The area of timberland by forest type group was dominated by hardwoods (table 2) and particularly by the oak-hickory group (table 3[1], fig. 2). Hardwoods made up 92.6 percent of the total acreage, 78.6 percent of all public land acreage, and 93.2 percent of all private landholdings. Most forest type groups are in the sawtimber and poletimber stand-size classes, except for the pinyon/juniper (eastern redcedar) group.

Figure 3 shows the area of timberland by stand-size class over the years. The proportion of trees in the poletimber and sawtimber classes has steadily increased since the 1967 inventory.

[1] Under Forest Inventory and Analysis classifications, forest type groups are composed of several, sometimes related, forest types. For example, the oak/pine forest type group consists of the eastern redcedar/hardwood and shortleaf pine forest types. In tables 3 and 6 and figure 2, the maple/beech/birch forest type group in Kansas is primarily composed of elm/ash/locust; pinyon/juniper is entirely eastern redcedar, and oak/pine is mainly redcedar/hardwood.

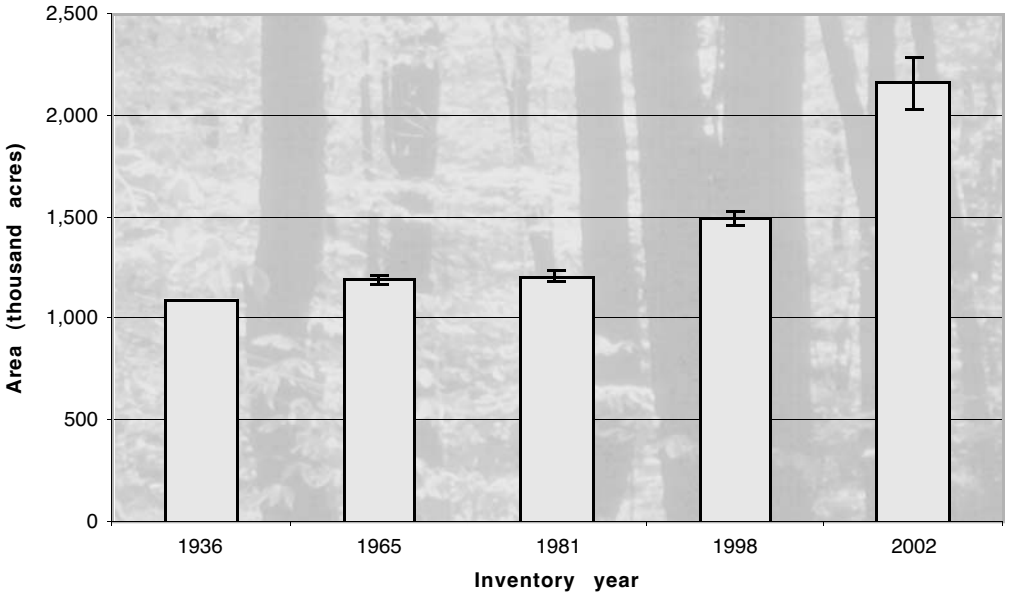


*Figure 1. — Area of timberland, Kansas, 1936-2002. (Note: The sampling error associated with an inventory estimate is represented by the vertical line at the top of its bar. No sampling error was available for the 1936 survey; timberland areas were calculated using the total forest land area for 1936 multiplied by a ratio of timberland to total forest land from 1965).*

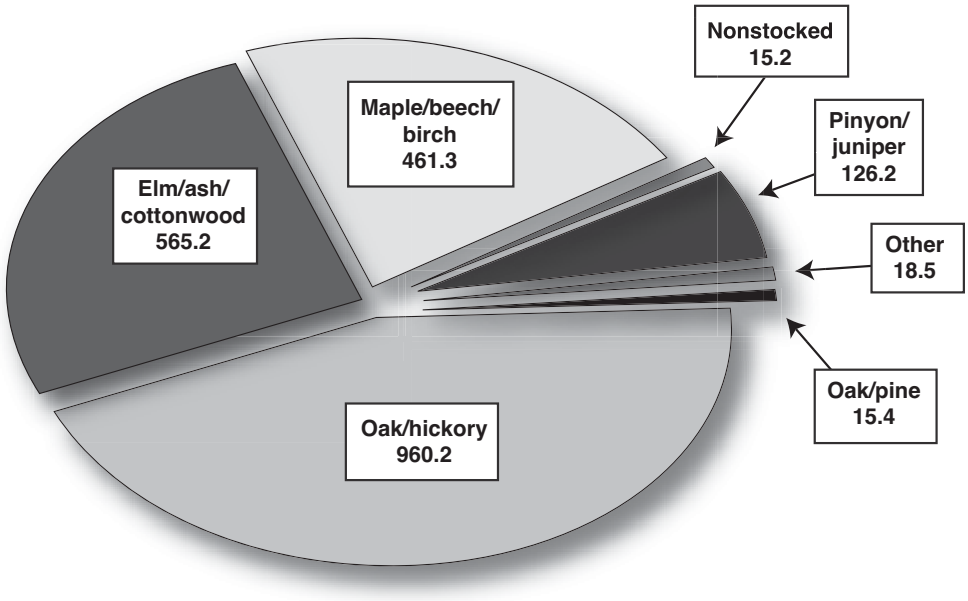


Figure 2. — *Area of timberland by forest type group, in thousands of acres, Kansas, 2001-2002.*

## Volume

The net volume of all live trees on forest land, which includes growing stock, rough trees, and rotten trees, was almost 3 billion cubic feet (table 4). Hardwoods constituted just under 2.9 billion cubic feet and softwoods were less than 100 million cubic feet of all live tree volume. Oaks were 507 million cubic feet or 17.5 percent of all hardwood live tree volume. Select oaks (red and white) were 394 million cubic feet or 77.7 percent of all oaks and 13.6 percent of all hardwood live tree volume.

Net volume of all live trees and salvable dead trees on timberland was 3.0 billion cubic feet (table 5, fig. 4). All live trees were 2.95 billion cubic feet or 97.4 percent of total live tree vol-

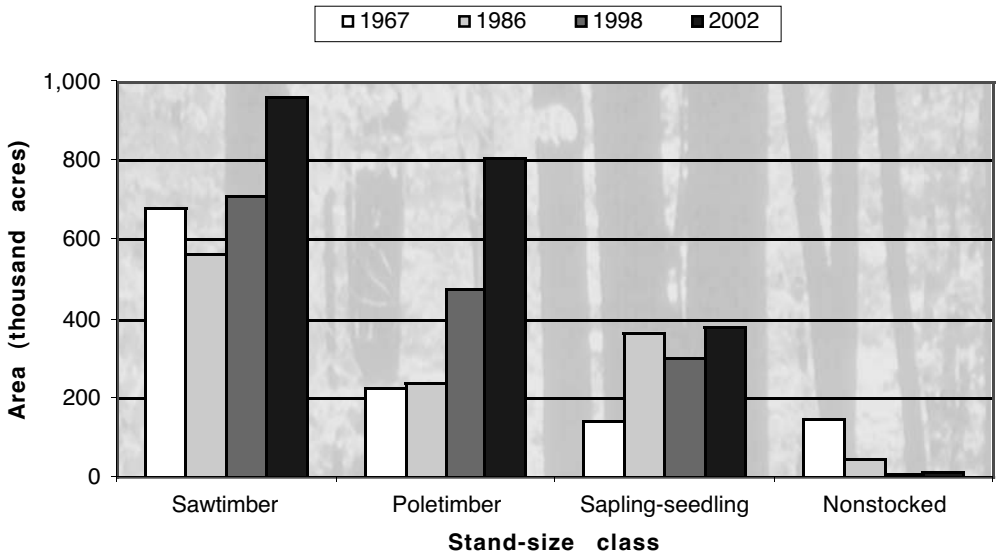


Figure 3. — *Area of timberland by stand-size class, Kansas, 1967-2002.*

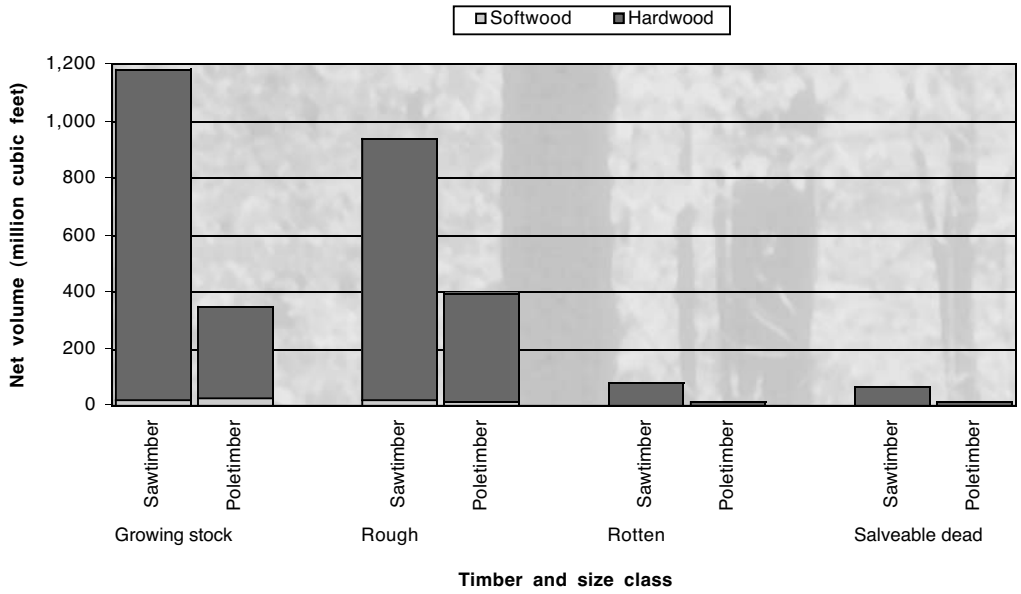


*Figure 4. — Net volume by timber class and size class, Kansas, 2001-2002.*

ume. The difference between the total for all live trees on timberland and the 2.98 billion cubic feet volume of all live tree volume on forest land (table 4) represents the 30 million cubic feet on land that is either low productivity (incapable of growth greater than 20 cubic feet per acre per year at the culmination of mean annual increment) or reserved (e.g., parks, wilderness areas). Of the 1.5 billion cubic feet of growing-stock volume, 1.18 billion cubic feet or 77 percent was sawtimber volume. The sawtimber volume percentage breakdowns for softwoods and hardwoods were 41.7 and 78.4 percent, respectively.

Cull tree volume, at 1.4 billion cubic feet, was 48.3 percent of all live trees. The softwood cull tree volume represented 39.4 percent of the total softwood live tree volume, whereas hardwood culls represented 48.5 percent of the total hardwood volume. The phototropic and decurrent growth habits of hardwoods and the poor stem form resulting from inadequate self-pruning, particularly in more open stands, might explain the disparity in the cull percentage. A large amount of volume growing in low-density stands, particularly those formerly classified as woody pastures, would also explain the high total percentage of cull trees, due to excessive branchiness of open-grown trees.

The net volume of growing stock on timberland totaled 1.5 billion cubic feet (table 6). The volume has substantially increased over the last 35 or so years (fig. 5). Almost 98 percent of that total was hardwoods and 31 million cubic feet (2 percent) was in conifers, with the remainder in the nonstocked category. In table 6, the volumes were calculated for softwoods and hardwoods for each forest type group. For example, the oak/pine group had 1.5 million cubic feet of softwoods and 372 thousand cubic feet of hardwoods (fig. 6).

Table 7 shows net volume of growing stock on timberland by species group and diameter class. The totals for softwood and hardwood volumes are 48.5 million cubic feet and 1.5 billion cubic feet, respectively. Total volume of oak growing stock on timberland was 258.4 million cubic feet, which was 17.5 percent of all hardwood volume and 16.9 percent of all growing-stock volume. Trees that were at least 19 inches in diameter constituted 46.9 percent of the net volume of hardwood growing stock.

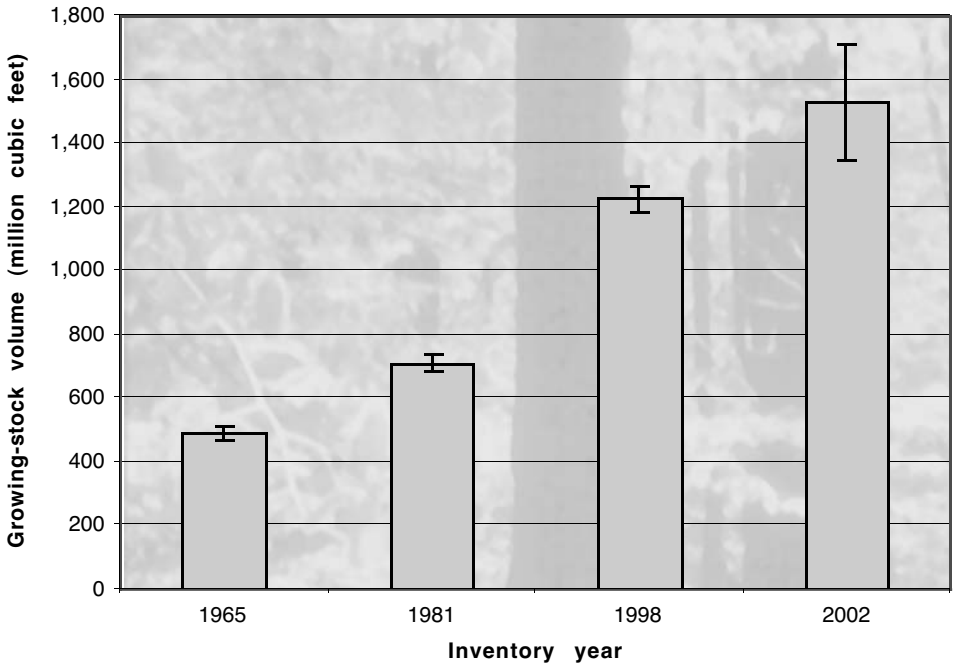


*Figure 5. — Net volume of growing stock on timberland, in millions of cubic feet, Kansas, 1965-2002.*

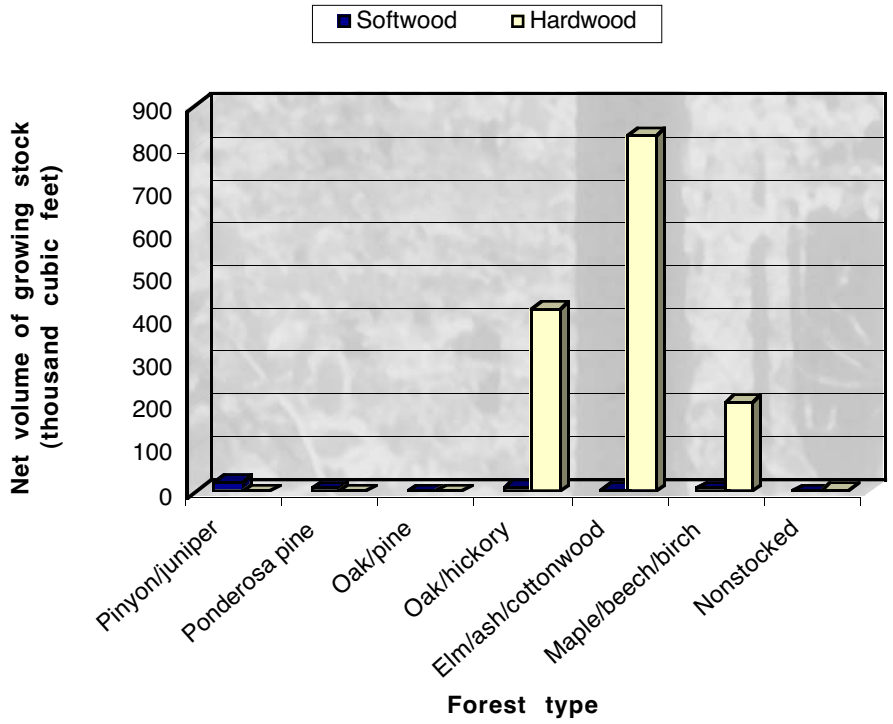


*Figure 6. — Net volume of growing stock, in thousands of cubic feet, Kansas, 2001-2002.*

The net volume of sawtimber on timberland was 5.6 billion board feet (table 8). As with many other measures of coverage and abundance in Kansas, hardwoods constituted the preponderance of the volume (98.2 percent or 5.5 billion board feet). Red and white oaks totaled 983 million board feet or 17.7 percent of the hardwood volume. Trees that were 19 or more inches in diameter were 61.1 percent of the hardwood volume (3.4 billion board feet). In 1994, the 19+ inch diameter classes constituted 50.8 percent of the total hardwood volume (Leatherberry *et al.* 1999).

## Biomass

The live aboveground biomass on timberland in Kansas totaled 76.6 million dry tons in 2002 (table 9). Over 5.4 percent of that total was in 1- to 5-inch trees, 46.9 percent was in growing-stock trees, and 47.6 percent was in non-growing-stock trees. Private landowners held 94.7 percent or 72.6 million tons; public landowners had 5.3 percent (4.1 million dry tons). Of the 35.9 million dry tons in growing-stock trees, 91.9 percent is on private land and 8.1 percent is on public land. Among non-growing-stock trees, 97.5 percent is on private land and 2.5 percent is on public land (fig. 7).

Close to 74 percent of the total biomass of the growing-stock trees was in the boles, and the remaining 26.2 percent was in stumps, tops, and limbs. Approximately the same proportions existed for the 36.5 million dry tons of non-growing-stock trees: 72.9 percent was in bolewood and 27.1 percent was in stumps, tops, and limbs.

An interesting facet of these data is the relatively small proportion of aboveground biomass in non-growing-stock softwood trees (22.3 percent of all softwood biomass) vs. non-growing-stock hardwood trees (49.1 percent of all hardwood biomass). This disparity no doubt reflects the higher proportion of hardwood volume made up of species of little or no commercial value and the higher likelihood of hardwoods having defects that result in quality degrades that lower economic value.

## Forest Health

The following information presented about pathogens and insects affecting Kansas forests was adapted from the national Forest Health Monitoring Program (FHM) at: http://www.na.fs.fed.us/spfo/fhm/fhh/fhh-02/ks/ks_02.htm.

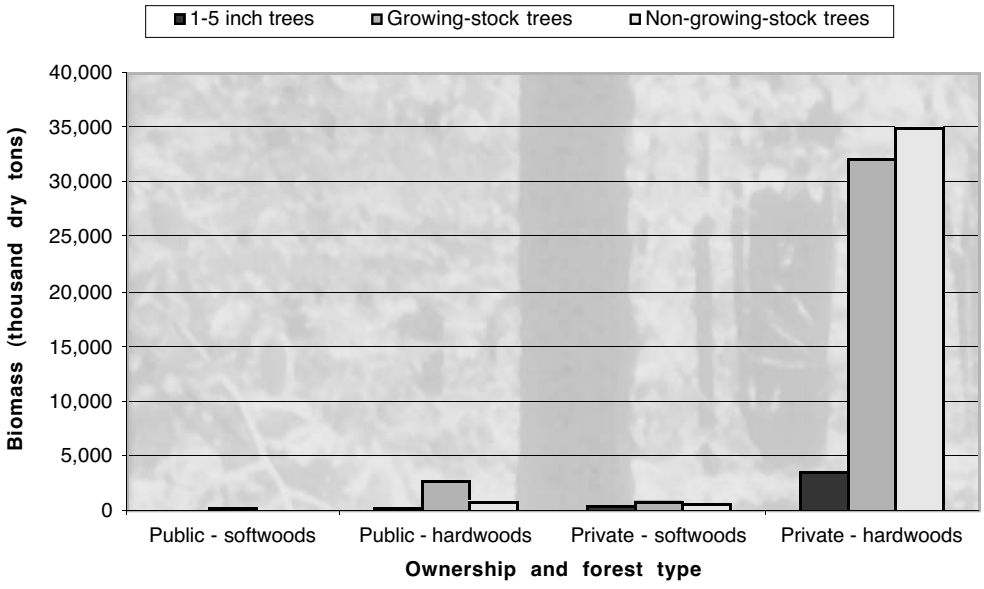


*Figure 7. — Live aboveground biomass in Kansas, 2001-2002, in dry tons, by ownership type and forest type.*

The local species of juniper—eastern redcedar and Rocky Mountain juniper—have been damaged by bagworm (*Oiketicus* spp., and *Thyridopteryx* spp.), particularly in the north central part of the State. Fall webworm, *Hyphantria cunea*, attacks cottonwood, walnut, and hickory, among other species, and was at moderate levels this past year. There was a new outbreak of pine tip moths (*Rhyacionia* spp., *Dioryctria* spp.) in southeast Kansas in 2002.

Oak wilt, caused by *Ceratocystis fagacaerum*, was a persistent problem for bur and red oak forests in the eastern part of the State. Also in the eastern part of Kansas, Russian olive canker (caused by *Phomopsis arnoldiae*, *Tubercularia* spp., *Lasiodiplodia* spp.) continues to be a grave problem. Severe drought conditions throughout Kansas continued to weaken trees and made them more vulnerable to forest health problems.

## Summary

Continuing long-term trends in Kansas, most measures of forested area and volumes show increases. Area has increased steadily since a low point in 1967, and standing volumes have continued to increase since 1950. By and large, Kansas's forests are healthy. As additional data become available from ensuing annual inventories, a more precise picture of the trends of Kansas's forests will emerge. Additional data related to the two most recent inventories of Kansas (2001 and 2002) are available at: www.ncrs.fs.fed.us/4801/fiadb/index.htm.

# APPENDIX

## Inventory Methods

Since the 1994 inventory of Kansas, 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 geographical regions, combined with national legislative mandates, resulted in NCFIA's implementation of an annual inventory system. Kansas was one of the first States in the North Central region, and 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 each 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 1999 through 2004 or for 2002 through 2006. Although there are great advantages to an annual inventory, one difficulty is reporting on results during the first 4 years. With the 2002 annual measurements, 40 percent of all field plots have been measured. Sampling error estimates for the 2002 inventory results are area of forest land 5.79 percent, area of timberland 5.96 percent, number of growing-stock trees on timberland 9.59 percent, volume of growing stock on timberland 11.80 percent, and volume of sawtimber on timberland 14.46 percent. These sampling error estimates are higher than those for the last periodic inventory completed in 1994 (i.e., 1.59 percent for timberland area and 2.18 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 future inventories, we will have greater confidence in our results because of the increased number of field plots measured.

Other significant changes between our old and new inventory methods include the implementation of new remote sensing technology, the implementation of a new field plot design, and the gathering of additional data. The advent of remote sensing technology since the previous inventory in 1994 has allowed NCFIA to use computer-assisted classifications of Multi-Resolution Land Characterization (MRLC) data and other remote sensing products to stratify the total area of the State and to improve the precision of estimates. Inventories in Kansas before 1999 used manual interpretation of aerial photos to stratify the sample (1950, 1967, 1986, and 1994 samples).

New algorithms were used in 1999-2002 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 1989 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, 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 published 2001-2002 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 Kansas survey was based on a three-phase inventory. 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 field 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.

### Phase 1

The 2002 inventory used a computer-assisted classification of 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/nonforest and nonforest/forest. 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.

### Phase 2

Phase 2 of the inventory consisted of the measurement of the annual sample of field plots in Kansas. 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 Kansas is funded by the Federal government.

The total Federal base sample of 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 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 forest by trained photointerpreters using aerial photos or digital orthoquads.

### Phase 3

NCFIA has two categories of field plot measurements—phase 2 field plots (standard FIA plots) and phase 3 plots (forest health plots)—to optimize our ability to collect data when available for measurement. Both types of plots 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 the additional measurement of non-woody understory vegetation, ground cover, soils, and other variables. We anticipate that in Kansas the complete 5-year annual inventory will involve about 220 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 Kansas, the complete 5-year annual inventory is expected to involve about 660 phase 2 forested plots. The 2001–2002 panel results represent field measures on 293 phase 2 forested plots and 22 phase 3 plots.

The new national FIA plot design (fig. 8) was first used for data collection in Kansas in 2001, the first annual panel year. This design was also used in the 2002 panels and will be used in subsequent years. The national plot design requires mapping forest conditions on each plot. Because of the small sample (20 percent) each year, precision associated with change factors such as mortality will be relatively low. Consequently, we will not report change estimates in Kansas until at least four annual panels have been measured, and even then we anticipate that estimates of change will be limited in detail. When the annual inventory has been completed in 2005, the full range of change data will be available.

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 (the plot used in the former sampling regime) if a previous plot existed within the sample unit. Trees with 5 inches d.b.h. 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 12 feet 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 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.

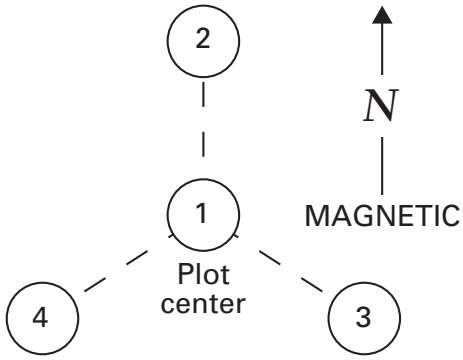


Figure 8. — *Current NCFIA field plot design.*

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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## TABLE TITLES

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

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

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

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

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

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

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

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

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

# TABLES

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

(In thousand acres)

| Forest type group | Owner category | | | |
|---|---|---|---|---|
| | All owners | Public | Private | Unidentified owner |
| **Softwood type groups** | | | | |
| Pinyon / juniper | 126.2 | - - | 126.2 | - - |
| Ponderosa pine | 18.5 | 18.5 | - - | - - |
| All softwood types | 144.7 | 18.5 | 126.2 | - - |
| **Hardwood type groups** | | | | |
| Oak / pine | 15.4 | - - | 15.4 | - - |
| Oak / hickory | 1,012.3 | 15.7 | 996.6 | - - |
| Elm / ash / cottonwood | 565.2 | 43.3 | 521.9 | - - |
| Maple / beech / birch | 476.1 | 12.7 | 463.4 | - - |
| All hardwood types | 2,069.1 | 71.8 | 1,997.3 | - - |
| Nonstocked | 15.2 | - - | 15.2 | - - |
| **All forest types** | 2,229.0 | 90.3 | 2,138.7 | - - |

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, Kansas, 2001 - 2002

(In thousand acres)

| Major forest type group and stand origin | Owner category | | | |
|---|---|---|---|---|
| | All owners | Public | Private | Unidentified owner |
| **Softwood type groups** | | | | |
| Natural | 116.9 | - - | 116.9 | - - |
| Planted | 27.8 | 18.5 | 9.3 | - - |
| All softwood types | 144.7 | 18.5 | 126.2 | - - |
| **Hardwood type groups** | | | | |
| Natural | 1,965.0 | 68.1 | 1,896.9 | - - |
| Planted | 37.2 | - - | 37.2 | - - |
| All hardwood types | 2,002.1 | 68.1 | 1,934.1 | - - |
| Nonstocked | 15.2 | - - | 15.2 | - - |
| **All groups** | 2,162.0 | 86.6 | 2,075.4 | - - |

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

(In thousand acres)

| Forest type group | All stands | Stand-size class | | | |
|---|---|---|---|---|---|
| | | Sawtimber | Poletimber | Sapling-seedling | Non-stocked |
| **Softwood type groups** | | | | | |
| Pinyon / juniper | 126.2 | 15.5 | 41.2 | 69.5 | - - |
| Ponderosa pine | 18.5 | - - | 18.5 | - - | - - |
| All softwood types | 144.7 | 15.5 | 59.7 | 69.5 | - - |
| **Hardwood type groups** | | | | | |
| Oak / pine | 15.4 | 6.4 | - - | 9.0 | - - |
| Oak / hickory | 960.2 | 363.8 | 413.5 | 182.9 | - - |
| Elm / ash / cottonwood | 565.2 | 417.4 | 94.2 | 53.6 | - - |
| Maple / beech / birch | 461.3 | 159.8 | 240.1 | 61.4 | - - |
| All hardwood types | 2,002.1 | 947.4 | 747.7 | 307.1 | - - |
| Nonstocked | 15.2 | - - | - - | - - | 15.2 |
| **All forest types** | 2,162.0 | 962.8 | 807.5 | 376.6 | 15.2 |

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, Kansas, 2001 - 2002

(In thousand cubic feet)

| Species group | Owner category | | | |
|---|---|---|---|---|
| | All owners | Public | Private | Unidentified owner |
| **Softwoods** | | | | |
| Other eastern softwoods | 69,876 | 4,451 | 65,425 | - - |
| Ponderosa and Jeffrey pines | 11,897 | 9,683 | 2,214 | - - |
| Total softwoods | 81,773 | 14,134 | 67,640 | - - |
| **Hardwoods** | | | | |
| Select white oaks | 299,490 | 669 | 298,821 | - - |
| Select red oaks | 94,811 | 5,553 | 89,258 | - - |
| Other white oaks | 81,583 | 17,094 | 64,489 | - - |
| Other red oaks | 31,486 | 270 | 31,216 | - - |
| Hickory | 95,835 | 966 | 94,869 | - - |
| Hard maple | 8,227 | - - | 8,227 | - - |
| Soft maple | 72,015 | 17,807 | 54,208 | - - |
| Ash | 239,050 | 16,751 | 222,299 | - - |
| Cottonwood and aspen | 441,127 | 60,661 | 380,466 | - - |
| Basswood | 6,701 | - - | 6,701 | - - |
| Black walnut | 178,446 | 3,034 | 175,412 | - - |
| Other eastern soft hardwoods | 862,373 | 27,786 | 834,587 | - - |
| Other eastern hard hardwoods | 288,980 | 11,285 | 277,696 | - - |
| Eastern noncommercial hardwoods | 199,601 | 1,088 | 198,513 | - - |
| Total hardwoods | 2,899,726 | 162,965 | 2,736,761 | - - |
| **All species groups** | 2,981,499 | 177,098 | 2,804,401 | - - |

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, Kansas, 2001 - 2002

(In thousand cubic feet)

| Class of timber | All species | Softwood species | Hardwood species |
|---|---|---|---|
| **Live trees** | | | |
| **Growing-stock trees** | | | |
| Sawtimber | | | |
| Saw log portion | 1,065,986 | 17,423 | 1,048,563 |
| Upper stem portion | 112,546 | 2,761 | 109,785 |
| Total | 1,178,531 | 20,183 | 1,158,348 |
| Poletimber | 347,809 | 28,274 | 319,535 |
| **All growing-stock trees** | 1,526,340 | 48,458 | 1,477,883 |
| **Cull trees** | | | |
| Rough trees [1] | | | |
| Sawtimber size | 937,888 | 20,769 | 917,120 |
| Poletimber size | 390,836 | 10,753 | 380,083 |
| Total | 1,328,724 | 31,521 | 1,297,203 |
| Rotten trees [1] | | | |
| Sawtimber size | 80,483 | - - | 80,483 |
| Poletimber size | 15,716 | - - | 15,716 |
| Total | 96,199 | - - | 96,199 |
| **All live cull trees** | 1,424,923 | 31,521 | 1,393,402 |
| **All live trees** | 2,951,264 | 79,979 | 2,871,285 |
| **Salvable dead trees** | | | |
| Sawtimber size | 62,810 | 1,224 | 61,586 |
| Poletimber size | 13,313 | 338 | 12,974 |
| **All salvable dead trees** | 76,122 | 1,562 | 74,560 |
| **All classes** | 3,027,386 | 81,541 | 2,945,845 |

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 and softwood/hardwood species categories, Kansas, 2001 - 2002

(In thousand cubic feet)

| Forest type group | All species | Softwood species | Hardwood species |
|---|---|---|---|
| **Softwood type groups** | | | |
| Pinyon / juniper | 23,684 | 21,862 | 1,823 |
| Ponderosa pine | 7,349 | 7,005 | 344 |
| All softwood types | 31,033 | 28,867 | 2,167 |
| **Hardwood type groups** | | | |
| Oak / pine | 1,848 | 1,476 | 372 |
| Oak / hickory | 436,151 | 8,782 | 427,369 |
| Elm / ash / cottonwood | 837,036 | 2,740 | 834,295 |
| Maple / beech / birch | 216,925 | 6,474 | 210,451 |
| All hardwood types | 1,491,959 | 19,472 | 1,472,487 |
| Nonstocked | 3,348 | 119 | 3,229 |
| **All forest types** | 1,526,340 | 48,458 | 1,477,883 |

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, Kansas, 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 | 43,120 | 12,746 | 12,689 | 7,208 | 8,749 | -- | 1,727 | -- | -- | -- | -- |
| Ponderosa and Jeffrey pines | 5,337 | -- | 2,838 | -- | -- | 2,499 | -- | -- | -- | -- | -- |
| Total softwoods | 48,458 | 12,746 | 15,528 | 7,208 | 8,749 | 2,499 | 1,727 | -- | -- | -- | -- |
| **Hardwoods** | | | | | | | | | | | |
| Select white oaks | 144,933 | 2,709 | 6,086 | 10,964 | 14,771 | 6,053 | 3,690 | 7,994 | 17,251 | 75,414 | -- |
| Select red oaks | 71,124 | 2,355 | 2,648 | 1,083 | 2,659 | 7,127 | 6,663 | 8,336 | 6,553 | 33,701 | -- |
| Other white oaks | 37,434 | 10,526 | 12,613 | 10,960 | 3,335 | -- | -- | -- | -- | -- | -- |
| Other red oaks | 4,917 | 1,288 | 1,232 | -- | -- | 2,396 | -- | -- | -- | -- | -- |
| Hickory | 65,976 | 9,235 | 14,787 | 4,223 | 17,059 | 13,958 | 3,005 | 3,709 | -- | -- | -- |
| Hard maple | 4,035 | 334 | 990 | -- | -- | 2,711 | -- | -- | -- | -- | -- |
| Soft maple | 59,938 | 316 | 368 | -- | -- | 1,462 | 7,525 | 8,641 | 16,818 | 7,180 | 17,628 |
| Ash | 152,618 | 8,531 | 8,455 | 20,800 | 20,376 | 19,816 | 12,306 | 22,418 | 15,275 | 24,639 | -- |
| Cottonwood and aspen | 303,853 | 346 | -- | 1,814 | 6,352 | 4,610 | 11,630 | 4,741 | 26,193 | 59,055 | 189,111 |
| Basswood | 2,567 | 222 | 701 | -- | 1,644 | -- | -- | -- | -- | -- | -- |
| Black walnut | 109,864 | 8,656 | 9,354 | 15,252 | 13,676 | 18,819 | 12,284 | 13,306 | 18,516 | -- | -- |
| Other eastern soft hardwoods | 450,132 | 32,564 | 45,085 | 42,370 | 35,822 | 42,037 | 53,371 | 40,449 | 11,222 | 70,807 | 76,405 |
| Other eastern hard hardwoods | 70,492 | 9,117 | 11,875 | 11,677 | 6,011 | -- | 4,537 | -- | 17,444 | 9,831 | -- |
| Total hardwoods | 1,477,883 | 86,198 | 114,194 | 119,143 | 121,705 | 118,989 | 115,012 | 109,596 | 129,274 | 280,628 | 283,144 |
| **All species** | 1,526,340 | 98,944 | 129,721 | 126,351 | 130,454 | 121,488 | 116,739 | 109,596 | 129,274 | 280,628 | 283,144 |

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, Kansas, 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+ |
| **Softwoods** | | | | | | | | | |
| Other eastern softwoods | 92,005 | 38,994 | 44,837 | - - | 8,174 | - - | - - | - - | - - |
| Ponderosa and Jeffrey pines | 11,496 | - - | - - | 11,496 | - - | - - | - - | - - | - - |
| Total softwoods | 103,501 | 38,994 | 44,837 | 11,496 | 8,174 | - - | - - | - - | - - |
| **Hardwoods** | | | | | | | | | |
| Select white oaks | 624,648 | - - | 70,385 | 29,214 | 18,091 | 39,115 | 84,728 | 383,116 | - - |
| Select red oaks | 331,412 | - - | 12,374 | 34,296 | 32,959 | 41,876 | 33,580 | 176,327 | - - |
| Other white oaks | 15,604 | - - | 15,604 | - - | - - | - - | - - | - - | - - |
| Other red oaks | 11,307 | - - | - - | 11,307 | - - | - - | - - | - - | - - |
| Hickory | 181,474 | - - | 80,021 | 68,087 | 14,526 | 18,840 | - - | - - | - - |
| Hard maple | 13,365 | - - | - - | 13,365 | - - | - - | - - | - - | - - |
| Soft maple | 280,543 | - - | - - | 6,227 | 33,477 | 39,544 | 78,252 | 34,044 | 88,999 |
| Ash | 529,582 | - - | 85,187 | 85,970 | 56,343 | 104,929 | 74,296 | 122,857 | - - |
| Cottonwood and aspen | 1,421,730 | - - | 28,602 | 20,296 | 55,019 | 24,124 | 133,597 | 307,600 | 852,492 |
| Basswood | 8,450 | - - | 8,450 | - - | - - | - - | - - | - - | - - |
| Black walnut | 357,253 | - - | 60,271 | 85,888 | 57,772 | 63,727 | 89,596 | - - | - - |
| Other eastern soft hardwoods | 1,602,407 | - - | 162,846 | 192,633 | 251,050 | 189,505 | 52,819 | 358,136 | 395,420 |
| Other eastern hard hardwoods | 168,932 | - - | 24,923 | - - | 20,129 | - - | 79,054 | 44,826 | - - |
| Total hardwoods | 5,546,708 | - - | 548,663 | 547,284 | 539,364 | 521,659 | 625,922 | 1,426,905 | 1,336,911 |
| **All species** | 5,650,209 | 38,994 | 593,500 | 558,780 | 547,539 | 521,659 | 625,922 | 1,426,905 | 1,336,911 |

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, Kansas, 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** | | | | | | | | |
| Softwoods | 251,774 | 1,108 | 180,621 | 140,209 | 40,412 | 70,045 | 59,737 | 10,308 |
| Hardwoods | 3,805,273 | 238,904 | 2,731,754 | 2,079,427 | 652,326 | 834,616 | 589,794 | 244,822 |
| Total | 4,057,047 | 240,012 | 2,912,375 | 2,219,636 | 692,738 | 904,661 | 649,531 | 255,130 |
| **Private** | | | | | | | | |
| Softwoods | 1,752,904 | 327,910 | 842,846 | 583,719 | 259,127 | 582,148 | 417,361 | 164,787 |
| Hardwoods | 70,776,219 | 3,585,046 | 32,191,960 | 23,720,964 | 8,470,995 | 34,999,213 | 25,514,885 | 9,484,328 |
| Total | 72,529,123 | 3,912,956 | 33,034,805 | 24,304,683 | 8,730,122 | 35,581,361 | 25,932,246 | 9,649,116 |
| **All ownerships** | | | | | | | | |
| Softwoods | 2,004,678 | 329,018 | 1,023,467 | 723,928 | 299,539 | 652,193 | 477,098 | 175,095 |
| Hardwoods | 74,581,492 | 3,823,950 | 34,923,713 | 25,800,392 | 9,123,322 | 35,833,829 | 26,104,679 | 9,729,151 |
| Total | 76,586,170 | 4,152,968 | 35,947,180 | 26,524,319 | 9,422,861 | 36,486,022 | 26,581,776 | 9,904,246 |

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.

Moser, W. Keith; Atchison, Robert L.; Brand, Gary J.
2004. **Kansas's forest resources in 2002.** Resour. Bull. NC-231. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Research Station. 21 p.

Results of the 2002 annual inventory of Kansas shows an estimated 2.2 million acres of forest land. The oak-hickory type is the most widespread forest type on the landscape, covering over 45.4 percent of all forested land. Softwoods make up approximately 6.4 percent of Kansas's forested acreage. In 2001-2002, the net volume of all live trees and salvable dead trees on timberland was 3.03 billion cubic feet.

KEY WORDS: Annual inventory, forest area, forest type, volume, biomass, Kansas.

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