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Iowa's Forest Resources in 2001

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Iowa's Forest Resources in 2001

The North Central Research Station's Forest Inventory and Analysis (NCFIA) program began fieldwork for the fourth forest inventory of Iowa's forest resources in 1999. 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 Iowa, the field plots measured in 2000 will be remeasured in 2005.

In 2001, NCFIA continued the annual inventory effort with the third panel of the fourth Iowa forest inventory. Reports of previous inventories of Iowa are dated 1954, 1974, and 1990. This fourth inventory of Iowa's forest resources will be completed in 2003. However, because each year's sample is a systematic sample of the State's forest and because timely information is needed about Iowa'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 1999, the second year's panel from 2000, and the third year's panel from 2001. Earlier reports for the 1999 panel (Boykin 2002) and the combined 1999 and 2000 panels (Boykin 2003) have also been published. The results presented are estimates based on sampling techniques; estimates were compiled assuming the 1999, 2000, and 2001 data represent one sample. As additional annual inventories 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 Iowa inventory in 1990 (Leatherberry *et al.* 1992). While these changes will have little 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 directly compare portions of the 2001 data with those published for earlier inventories.

RESULTS

Area

There are 36 million acres of land in Iowa. Forest land totals 2.6 million acres, or about 7 percent, of the State's total land area (table 1). Forest land has three components: 1) Timberland¹—forest land that is not restricted from harvesting by statute, administrative regulation, or designation and is capable of growing trees at

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 owner decisions that consider economic, environment, and social factors.*

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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 (conservation areas etc.); and 3) Other forest land—land that is not capable of growing trees at a rate of 20 cubic feet per acre per year.

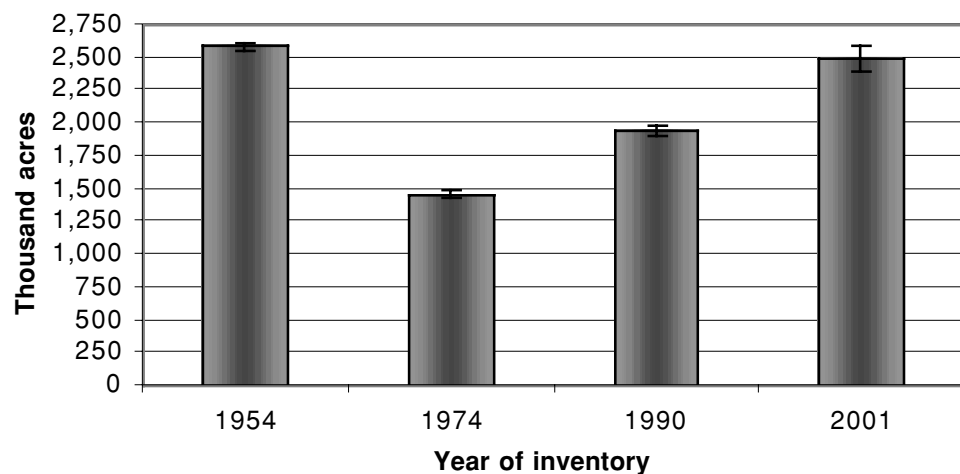
Timberland area totals 2.5 million acres, accounting for 96 percent of forest land area in Iowa (table 2). Timberland area in Iowa has continued to increase since 1974 (fig. 1). The rebound in timberland was initiated by a decline in the farm economy in the 1970s and 1980s when pasturelands and marginal agricultural lands reverted to timberland. Also, the establishment of trees along riparian areas, and initiatives such as the Conservation Reserve Program, contributed to the increase in Iowa's timberland area. In 2001, the amount of timberland area in Iowa nearly equaled what was present in 1954, recovering most of the acreage loss over the past 50 years (fig. 1).

In Iowa, individuals and corporations as private owners hold nearly 2.3 million acres of timberland, or 91 percent of the timberland area in the State (table 2). Private owners hold timberland for a variety of reasons. The remaining 9 percent of the timberland area in Iowa that is publicly owned provides a number of societal benefits, including recreation opportunities, wildlife habitat, watershed protections, timber, and non-timber products.

Hardwood forests predominate in Iowa—about 97 percent of all timberland area supports mostly hardwoods (table 2). Few acres of timberland in Iowa support forest plantations. Some hardwoods have been planted, mostly high valued species such as black walnut.

A variety of tree species are found in Iowa's timberlands. To facilitate describing forest composition, the various tree species are put into forest type groups that reflect the combination of tree species that occur on a particular site. The classification is based on the species

Figure 1.—Area of timberland, Iowa, 1954-2001. (Note: The sampling error associated with an inventory estimate is represented by the vertical line at the top of its bar.)



forming a plurality of live tree stocking on the site. The forest type group names are from the national Forest Inventory and Analysis (FIA) program's list of forest types. The national forest type group list was developed to ensure consistency in reporting across regions of the country and may not always effectively describe a particular local situation. For example, the pinyon/juniper forest type group is used to describe the forest type that contains eastern redcedar. An estimated 40.1 thousand acres of timberland in Iowa are classified in the pinyon/juniper forest type group (tables 1, 3, 6). In reality there is no pinyon or juniper in Iowa's forested areas; the pinyon/juniper is actually eastern redcedar. (See Miles *et al.* 2001 for a complete list of national FIA forest types with detailed types.) The report for the fourth panel (2002 data) will provide tables that list the national forest type groups as well as the detailed forest types.

The oak/hickory and the maple/beech/birch forest types combined occupy 68 percent of the timberland area in Iowa (table 3, fig. 2). In Iowa, the maple/beech/birch forest type does not effectively describe the hardwood forest. The detailed forest type that best describes these forests locally is hard (sugar) maple/basswood. Bottomland hardwoods—elm/ash/cottonwood—occupy 26 percent of all timberland

area. Coniferous timberlands play only a minor role in Iowa's forest; only 2 percent of the total timberland area has conifers as the dominant species.

Stand-size class is a measure of the average diameter of the dominant trees in a stand and reflects the size structure of stands. There are three stand-size classes: sawtimber, poletimber, and sapling/seedling. The area classified as sawtimber—stands with a plurality of stocking in trees more than 11.0 inches in diameter at breast height (d.b.h., 4.5 feet above ground level) for deciduous species and 9.0 inches d.b.h. for conifers—accounts for 63 percent of the timberland area in Iowa (table 3, fig. 3). Along with an expanding timberland base, the area of timberland in each stand-size class increased between 1990 and 2001. However, between 1990 and 2001, sawtimber stands as a proportion of timberland area declined from 65 to 63 percent of timberland area. Also, the proportion of timberland area in sapling/seedling stands declined slightly from 15 to 13 percent of timberland area; the proportion of timberland area in the poletimber stands and nonstocked area increased between 1990 and 2001 (fig. 3). The substantive sawtimber area is indicative of a mature forest. However, in 2001 the maple/beech/birch forest type group had a comparatively high proportion of timberland

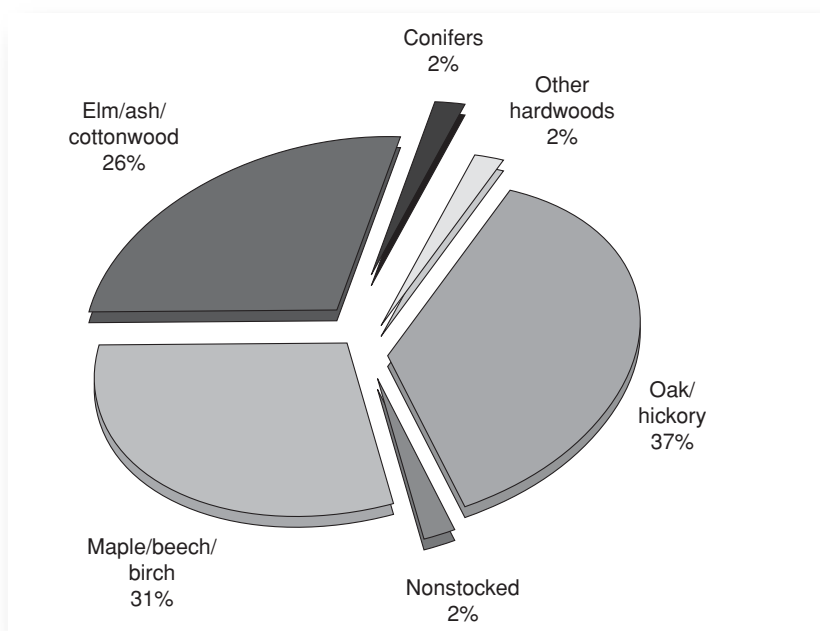


Figure 2.—Area of timberland by forest type group, Iowa, 2001.

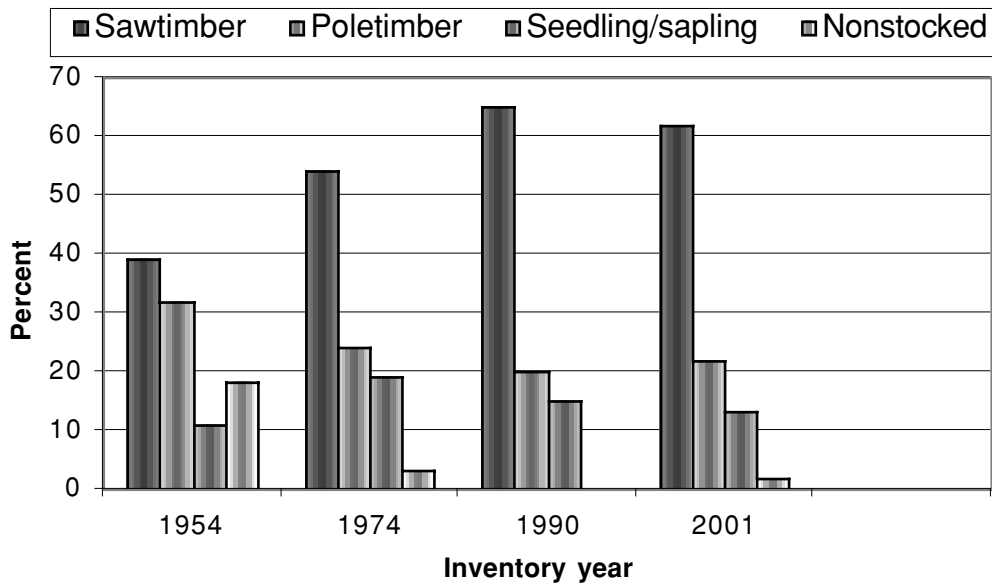


Figure 3.—Area of timberland by stand-size class, Iowa, 1954-2001.

(27 percent) in seedling/sapling stands. Species associated with the maple/beech/birch type, particularly sugar maple and basswood, are prolific seed producers and are shade tolerant. When openings are created in the forest canopy, they are likely to succeed species associated with the oak types.

Volume

Total net volume of all live trees on forest land in Iowa is 3.6 billion cubic feet, which equates to nearly 1,390 cubic feet per acre of forest land (table 4). Net volume is the amount of soundwood computed from a 1-foot stump to a 4-inch top diameter outside bark for live trees at least 5 inches d.b.h. Almost 9 (86 percent) of every 10 cubic feet of live volume are on privately owned forest land. Virtually all—99 percent—(3.6 billion cubic feet) of net volume of all live trees is contained in hardwoods, and 34 percent of this volume is in oak trees.

Growing-stock volume on timberland is a measure that has traditionally been used to ascertain wood volume useful for commercial purposes. Growing-stock volume is the amount

of solid wood on timberland in commercial trees 5.0 inches d.b.h. and over, from 1 foot above ground (stump) to a minimum 4-inch top diameter with deductions made for poor form or defect. Growing-stock volume excludes rough, rotten, and dead trees and noncommercial tree species. Iowa's growing-stock volume totals 2.7 billion cubic feet, representing 75 percent of the total live volume (table 5).

Twenty-three percent of volume of all live trees on timberland is in live cull trees—806.8 million cubic feet. Cull volume is often used for commercial purposes. For instance, rough trees are sometimes used for making pallets or for chipping. Dead trees are also used for commercial purposes—they are an important source of firewood. Salvable dead trees contain 73.7 million cubic feet of wood volume. Salvable dead trees are also important to wildlife species, such as cavity nesting birds.

Forty-two percent of growing-stock volume is in trees in the oak/hickory forest type group. When oak/hickory is combined with the elm/ash/cottonwood and the maple/beech/birch groups, 98 percent of all growing-stock volume

is accounted for (table 6). Growing-stock volume present in the softwoods amounts to less than 1 percent (11.9 million cubic feet) of Iowa's growing-stock volume. However, growing-stock volume for all softwood species amounts to 1 percent (32.7 million cubic feet) of total growing-stock volume because softwoods are sometimes present in hardwood stands (table 6).

Seventy-seven percent of all growing-stock volume is in trees that are 11 inches and larger (table 7). Twenty-five percent of the total growing-stock volume is in trees that are 21 inches d.b.h. and larger; most of this volume is oak. Also, cottonwoods have significant volume in large diameter trees. Cottonwood accounts for 28 percent of volume in trees 21 inches d.b.h. and larger.

Since 1974, growing-stock volume on Iowa's timberlands has increased with each succeeding inventory (fig. 4). The increase in growing-stock volume reflects a forest where larger trees continue to put on volume. For example, between 1990 and 2001, growing-stock volume in sawtimber-size stands increased from 1.2 to 2.1 billion cubic feet, a 70-percent increase. At the same time growing-stock volume in poletimber-size stands increased by 41 percent.

Sawtimber volume is a subset of growing-stock volume. It is the volume of the saw log portion of live sawtimber measured in board feet. Sawtimber volume is generally measured with the International 1/4-inch rule. Sawtimber volume in Iowa totals 9.7 billion board feet (table 8). Virtually all sawtimber volume is in hardwood trees; only 1 percent of sawtimber volume is in softwoods. Of total sawtimber volume, 31 percent is in trees with diameters of 21 inches or greater. On an individual species basis, three species account for close to half (46 percent) of the sawtimber volume in Iowa: select white oak with 1.9 billion board feet; cottonwood and aspen with 1.3 billion board feet; and select red oak with 1.2 billion board feet.

Biomass

Live aboveground tree biomass in Iowa's timberland area was estimated to be 98.4 million dry tons in 2001 (an average of 39 dry tons per acre of timberland). All live aboveground tree biomass is estimated for growing-stock trees, non-growing-stock trees, and all live 1- to 5-inch d.b.h. trees (table 9). Sixty-nine percent of tree biomass is in growing-stock trees, with an additional 25 percent in non-growing-stock trees, and the remaining 6 percent in trees less than 5 inches

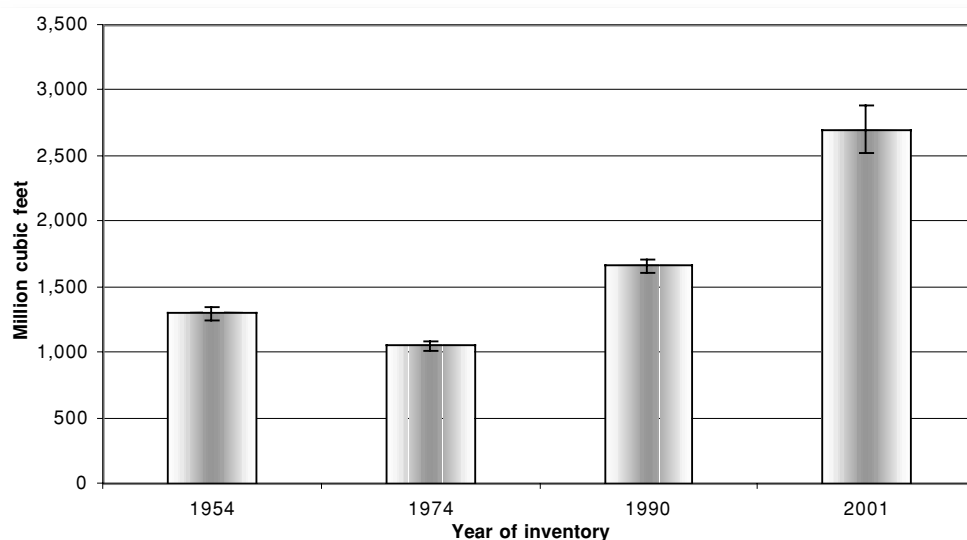


Figure 4.—Growing-stock volume on timberland, Iowa, 1954-2001. (Note: The sampling errors associated with each inventory estimate are represented by the vertical lines at the top of its bar.)

d.b.h. For both growing-stock and non-growing-stock trees, about three-fourths of total aboveground biomass is in the boles of trees. The remaining one-fourth is in stumps, tops, and limbs. Ninety-nine percent (97.4 million dry tons) of all live aboveground tree biomass is in hardwood species. Biomass estimates are increasing in importance for analyses of questions relating to carbon sequestration, wood fiber availability for fuel, and fuel loads in forest stands.

Forest Health

The information presented about pathogens and insects affecting Iowa's forest was obtained from the National Forest Health Monitoring Program (FHM) at: <http://www.na.fs.fed.us/spfo/fhm/index.htm>

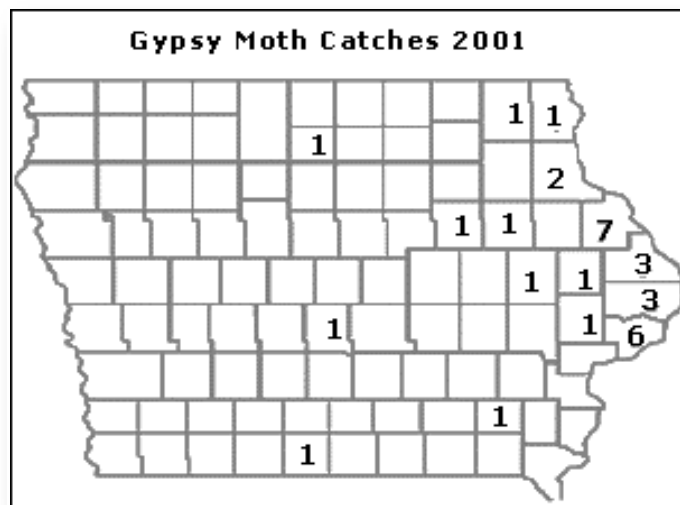
There are several forest health concerns in Iowa. Oak wilt infection has been reported in more than half of Iowa's 99 counties, mostly in the eastern and south central parts of the State. All species of oaks are susceptible to oak wilt, which is spread through root grafts and sap-feeding nitidulid beetles. Dutch elm disease caused by the fungus *Ophiostoma umli/novo-umli* has expanded throughout the State. In Iowa's forest stands, Dutch elm disease occurs in trees located along small and scattered drainages. Insects spread the disease over land from infected to healthy trees.

General tree decline or dieback is a problem in some forest stands. Scattered ash dieback/decline is a problem in about one-third of Iowa's counties, mostly in central and eastern Iowa. The exact cause of ash dieback/decline is not known. Oak decline is present in about two-thirds of Iowa's counties, but it is not prevalent in extreme southeastern and southwestern Iowa. The exact cause of oak decline is unknown, but, a complex of insect, disease, site, and management factors may be to blame. The problem has been most prevalent in white oak in eastern Iowa and with bur oak in western Iowa.

The gypsy moth (*Lymantria dispar*) is an exotic species that defoliates trees and shrubs. In an attempt to eradicate the moth, traps have been set across the State. In 2001, a small number of moths were trapped in 16 counties, mostly in eastern Iowa (fig. 5). The trappings indicate widespread infestation is not present currently, but, the potential exists for it.

Invasive plant species are an emerging forest health problem in Iowa. Such species can overtake native plants and threaten ecological diversity. A woodland invasive species survey is underway in Iowa to map the location and severity of garlic mustard, buckthorn, bush honeysuckle, and multiflora rose. These four plants are currently Iowa's primary woodland

Figure 5.—Number of gypsy moth catches, Iowa, 2001. (Source: USDA Forest Service, State and Private Forestry Health Protection Program.)



invaders. The invasive species survey is being conducted through the cooperative efforts of Iowa State University, Department of Forestry, and the Iowa Department of Natural Resources, Bureau of Forestry. The project is funded through a grant from the USDA Forest Service.

Summary

Iowa's forest area is expanding. Growing-stock volume is increasing as the forest continues to mature. Iowa's forest resources are reasonably healthy, but there is concern as the resource continues to age and become more susceptible to various tree maladies. Invasive insects and plant species are an emerging forest health concern in Iowa. As additional data become available from ensuing annual inventories, a more precise picture of the direction of Iowa's forests will emerge. Additional data related to the two most recent inventories of Iowa (1990 and 2001) are available at: www.ncrs.fs.fed.us/4801/fiadb/index.htm.

APPENDIX

Inventory Methods

Since the 1990 inventory of Iowa, 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 was 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. Iowa 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 1999 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 2001 through 2006. While there are great advantages for an annual inventory, one difficulty is reporting on results in the first 4 years. With the 2001 annual measurements, 60 percent of all field plots have been measured. Sampling error estimates for the 2001 inventory results are area of forest land 3.53 percent, area of timberland 3.75 percent, number of growing-stock trees on timberland 6.37 percent, volume of growing stock on timberland 6.73 percent, and volume of sawtimber on timberland 7.91 percent. These sampling error estimates are higher than those for the last periodic inventory completed in 1990 (i.e., 1.9 percent for timberland area and 3.2 percent for growing-stock volume) 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 the implementation of new remote sensing technology, the implementation of a new field plot design, and the gathering of additional remotely sensed and field data. The advent of remote sensing technology since the previous inventory in 1990 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. Inventories in Iowa before 1990 used manual interpretation of aerial photos to stratify the sample (1954, 1974, and 1990).

New algorithms were used in 1999-2001 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 1990 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 inventory results and those published for the 1990 inventory may not be valid. For additional details about algorithms used in both inventories, please contact NCFIA.

Sampling Phases

The 2001 Iowa 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 suite of mensurational variables, while 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 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 2001 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 Iowa. 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 Iowa 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 ortho-quads.

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 suite 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 Iowa the complete 5-year annual inventory will involve about 50 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 Iowa, the complete 5-year annual inventory is expected to involve about 770 phase 2 forested plots. The 1999-2001 annual inventory results represent field measures on 460 phase 2 forested plots and 27 phase 3 plots.

The new national FIA plot design (fig. 6) was first used for data collection in Iowa in 1999, the first annual inventory year. This design was also used in the 1999, 2000, and 2001 inventories and will be used in subsequent years. The national plot design requires 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, we will not report change estimates in Iowa 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 complete annual inventory is completed in 2004, 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 if a previous plot existed within the sample unit. Trees with a d.b.h. 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. 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 changes in forest type, stand-size class, land use, ownership, and density. Each condition that occurs

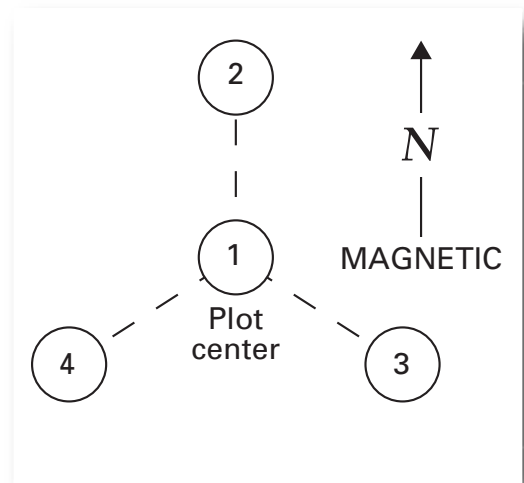


Figure 6.—Current NCFIA field plot design.

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 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. For additional information, contact:

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TABLE TITLES

Table 1.—Area of forest land by forest type group and owner category, Iowa, 1999-2001

Table 2.—Area of timberland by major forest type group, stand origin, and owner category, Iowa, 1999-2001

Table 3.—Area of timberland by forest type group and stand-size class, Iowa, 1999-2001

Table 4.—Net volume of all live trees on forest land by species group and owner category, Iowa, 1999-2001

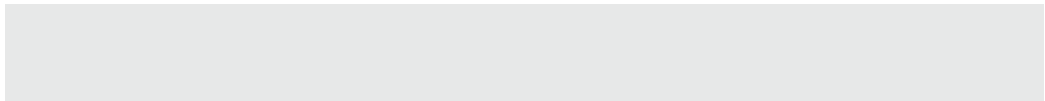
Table 5.—Net volume of all live trees and salvable dead trees on timberland by class of timber and softwood/hardwood categories, Iowa, 1999-2001

Table 6.—Net volume of growing stock on timberland by forest group and softwood/hardwood species categories, Iowa, 1999-2001

Table 7.—Net volume of growing stock on timberland by species group and diameter class, Iowa, 1999-2001

Table 8.—Net volume of sawtimber on timberland by species group and diameter class, Iowa, 1999-2001

Table 9.—All live aboveground tree biomass on timberland by owner category, softwood/hardwood species category, and tree biomass component, Iowa, 1999-2001



TABLES

Table 1. -- Area of forest land by forest type group and owner category, Iowa, 1999 - 2001

(In thousand acres)

Forest type group	Owner category		
	All owners	Public	Unidentified owner
Softwood type groups			
Pinyon / juniper group	40.1	--	40.1
All softwood types	40.1	--	40.1
Hardwood type groups			
Oak / pine group	32.8	--	32.8
Oak / hickory group	1,003.2	150.1	853.1
Oak / gum / cypress group	9.5	--	9.5
Elm / ash / cottonwood group	660.4	71.2	589.2
Maple / beech / birch group	799.3	76.6	722.7
Aspen / birch group	11.7	--	11.7
All hardwood types	2,516.9	297.9	2,219.0
Nonstocked	49.6	11.7	37.8
All forest types	2,606.6	309.7	2,296.9

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, Iowa, 1999 - 2001

(In thousand acres)

Major forest type group and stand origin	Owner category		
	All owners	Public	Private Unidentified owner
Softwood type groups			
Natural	40.1	--	40.1
All softwood types	40.1	--	40.1
Hardwood type groups			
Natural	2,396.3	218.7	2,177.5
Planted	22.5	--	22.5
All hardwood types	2,418.8	218.7	2,200.1
Nonstocked	37.8	--	37.8
All groups	2,496.8	218.7	2,278.0

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, Iowa, 1999 - 2001
(In thousand acres)

Forest type group	All stands	Stand-size class		
		Sawtimber	Poletimber	Sapling-seedling
Nonstocked				
Softwood type groups				
Pinyon / juniper group	40.1	11.7	17.2	11.2
All softwood types	40.1	11.7	17.2	11.2
Hardwood type groups				
Oak / pine group	32.8	--	9.1	23.7
Oak / hickory group	946.8	683.3	219.6	44.0
Oak / gum / cypress group	9.5	9.5	--	--
Elm / ash / cottonwood group	635.7	447.3	140.6	47.7
Maple / beech / birch group	782.3	413.3	160.7	208.3
Aspen / birch group	11.7	--	11.7	--
All hardwood types	2,418.8	1,553.4	541.7	323.7
Nonstocked	37.8	--	--	--
All forest types	2,496.8	1,565.1	558.9	334.9
Nonstocked				
All forest types	37.8	--	--	37.8

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 and owner category, Iowa, 1999 - 2001

(In thousand cubic feet)

Species group	Owner category		
	All owners	Public	Unidentified owner
Softwoods			
Other yellow pines	96	--	96
Eastern white and red pines	736	--	736
Other eastern softwoods	41,646	2,659	38,987
Ponderosa and Jeffrey pines	380	--	380
Total softwoods	42,859	2,659	40,200
Hardwoods			
Select white oaks	747,800	85,795	662,006
Select red oaks	311,784	76,250	235,534
Other white oaks	1,216	--	1,216
Other red oaks	164,166	9,042	155,123
Hickory	235,862	32,252	203,611
Yellow birch	--	--	--
Hard maple	124,385	28,029	96,356
Soft maple	301,591	82,944	218,647
Ash	88,309	18,337	69,972
Cottonwood and aspen	295,663	28,459	267,204
Basswood	156,052	25,324	130,728
Black walnut	249,407	17,380	232,027
Other eastern soft hardwoods	673,318	49,176	624,142
Other eastern hard hardwoods	183,925	30,644	153,281
Eastern noncommercial hardwoods	43,371	2,964	40,406
Total hardwoods	3,576,849	486,596	3,090,253
All species groups	3,619,707	489,255	3,130,453

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 salvageable dead trees on timberland by class of timber and softwood/hardwood categories, Iowa, 1999 - 2001

(In thousand cubic feet)

Class of timber	All species	Softwood species	Hardwood species
Live trees			
Growing-stock trees			
Sawtimber			
Saw log portion	1,831,319	16,863	1,814,456
Upper stem portion	247,500	2,577	244,923
Total	2,078,818	19,439	2,059,379
Poletimber	623,717	13,224	610,493
All growing-stock trees	2,702,535	32,663	2,669,872
Cull trees			
Rough trees ¹			
Sawtimber size	565,397	5,158	560,239
Poletimber size	184,776	3,902	180,874
Total	750,173	9,060	741,113
Rotten trees ¹			
Sawtimber size	50,352	--	50,352
Poletimber size	6,301	--	6,301
Total	56,653	--	56,653
All live cull trees	806,826	9,060	797,766
All live trees	3,509,361	41,723	3,467,638
Salvageable dead trees			
Sawtimber size	48,878	672	48,206
Poletimber size	24,820	1,008	23,812
All salvageable dead trees	73,698	1,680	72,018
All classes	3,583,059	43,403	3,539,656

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.

¹Includes noncommercial species.

Table 6. -- Net volume of growing stock on timberland by forest group and softwood/hardwood species categories, Iowa, 1999 - 2001

(In thousand cubic feet)

Forest type group	All species	Softwood species	Hardwood species
Softwood type groups			
Pinyon / juniper group	11,854	9,196	2,658
All softwood types	11,854	9,196	2,658
Hardwood type groups			
Oak / pine group	5,214	4,143	1,071
Oak / hickory group	1,121,933	9,147	1,112,786
Oak / gum / cypress group	13,285	--	13,285
Elm / ash / cottonwood group	799,244	437	798,807
Maple / beech / birch group	736,602	9,739	726,863
Aspen / birch group	10,934	--	10,934
All hardwood types	2,687,213	23,467	2,663,746
Nonstocked	3,468	--	3,468
All forest types	2,702,535	32,663	2,669,872

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, Iowa, 1999 - 2001

(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 yellow pines	96	96	--	--	--	--	--	--	--	--	--
Eastern white and red pines	736	--	--	--	736	--	--	--	--	--	--
Other eastern softwoods	31,450	6,504	6,243	7,817	5,724	3,375	1,787	--	--	--	--
Ponderosa and Jeffrey pines	380	158	222	--	--	--	--	--	--	--	--
Total softwoods	32,663	6,759	6,465	7,817	6,460	3,375	1,787	--	--	--	--
Hardwoods											
Select white oaks	524,776	9,923	27,353	58,408	56,448	64,113	41,156	55,774	60,415	123,507	27,680
Select red oaks	271,513	2,623	4,260	19,113	25,391	28,379	24,444	38,369	21,423	76,577	30,934
Other white oaks	1,216	--	650	566	--	--	--	--	--	--	--
Other red oaks	142,707	6,847	8,923	14,330	13,873	21,616	14,413	14,905	20,953	14,363	12,483
Hickory	196,791	22,784	34,286	39,588	30,932	32,008	11,990	9,714	--	15,488	--
Yellow birch	--	--	--	--	--	--	--	--	--	--	--
Hard maple	109,545	5,399	10,255	17,661	14,885	7,789	9,793	13,352	8,884	21,528	--
Soft maple	212,489	2,801	7,328	12,605	21,919	23,555	25,203	32,270	40,638	46,171	--
Ash	71,936	7,075	11,881	13,161	4,844	16,193	12,519	3,049	3,215	--	--
Cottonwood and aspen	293,161	1,419	7,684	10,508	9,135	23,221	12,307	22,503	19,571	99,819	86,994
Basswood	120,229	3,691	8,550	8,177	8,502	9,214	14,837	8,934	11,266	47,058	--
Black walnut	217,050	5,247	8,509	21,539	28,890	39,256	50,210	21,815	12,597	28,987	--
Other eastern soft hardwoods	415,010	45,694	63,979	60,258	53,397	54,240	46,750	35,090	22,982	32,620	--
Other eastern hard hardwoods	93,448	6,140	7,574	13,705	10,125	17,016	18,935	8,468	6,989	4,496	--
Total hardwoods	2,669,872	119,643	201,231	289,619	278,341	336,599	282,558	264,244	228,932	510,615	158,091
All species	2,702,535	126,402	207,696	297,436	284,801	339,975	284,345	264,244	228,932	510,615	158,091

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, Iowa, 1999 - 2001

(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									
Eastern white and red pines	3,531	--	3,531	--	--	--	--	--	--
Other eastern softwoods	97,161	43,265	29,329	16,305	8,262	--	--	--	--
Total softwoods	100,692	43,265	32,860	16,305	8,262	--	--	--	--
Hardwoods									
Select white oaks	1,949,186	--	276,724	308,550	194,308	259,342	273,962	530,441	105,858
Select red oaks	1,188,663	--	125,840	141,542	122,406	191,487	105,910	364,927	136,552
Other white oaks	--	--	--	--	--	--	--	--	--
Other red oaks	539,775	--	68,721	107,719	71,501	72,735	101,868	67,952	49,279
Hickory	489,237	--	150,879	156,171	58,347	47,866	--	75,973	--
Hard maple	356,324	--	70,858	36,812	46,568	63,630	41,662	96,795	--
Soft maple	825,117	--	95,177	103,155	110,723	141,684	177,664	196,714	--
Ash	185,610	--	22,004	74,978	58,813	14,477	15,338	--	--
Cottonwood and aspen	1,313,931	--	42,291	112,419	61,018	112,722	99,289	497,155	389,037
Basswood	489,057	--	43,029	46,386	74,222	44,171	55,218	226,030	--
Black walnut	860,881	--	139,466	191,006	240,254	102,604	58,388	129,163	--
Other eastern soft hardwoods	1,100,975	--	248,593	249,538	212,196	155,684	98,683	136,280	--
Other eastern hard hardwoods	300,915	--	46,585	77,948	86,667	38,248	31,580	19,887	--
Total hardwoods	9,599,671	--	1,330,167	1,606,225	1,337,023	1,244,651	1,059,560	2,341,318	680,726
All species	9,700,362	43,265	1,363,027	1,622,530	1,345,284	1,244,651	1,059,560	2,341,318	680,726

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.

¹International 1/4-inch rule.

Table 9. -- All live aboveground tree biomass on timberland by owner category, softwood/hardwood species category, and tree biomass component, Iowa, 1999 - 2001
(In dry tons)

Owner category and softwood/hardwood category	Tree biomass component							
	All components	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	68,504	34,248	20,855	14,664	6,191	13,401	9,251	4,150
Hardwoods	11,113,271	572,475	8,774,106	6,511,916	2,262,191	1,766,690	1,308,348	458,342
Total	11,181,775	606,723	8,794,961	6,526,580	2,268,381	1,780,091	1,317,599	462,492
Private								
Softwoods	1,001,115	125,276	674,091	482,101	191,991	201,748	141,842	59,906
Hardwoods	86,241,724	4,651,764	58,542,704	42,841,162	15,701,542	23,047,256	16,952,058	6,095,197
Total	87,242,839	4,777,040	59,216,796	43,323,262	15,893,533	23,249,004	17,093,900	6,155,103
All ownerships								
Softwoods	1,069,619	159,524	694,946	496,765	198,182	215,149	151,093	64,056
Hardwoods	97,354,995	5,224,239	67,316,810	49,353,077	17,963,733	24,813,946	18,260,406	6,553,539
Total	98,424,614	5,383,763	68,011,756	49,849,842	18,161,915	25,029,094	18,411,499	6,617,595

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.

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Results of the 2001 annual inventory of Iowa show an estimated 2.6 million acres of forest land in the State. The estimate of total all live tree volume on forest land is 3.6 billion cubic feet. Nearly 2.5 million acres of forest land in Iowa are classified as timberland. The estimate of growing-stock volume on timberland is 2.7 billion cubic feet. All live aboveground tree biomass on timberland is estimated at 98.4 million dry tons. Known pathogens and pests in Iowa's forests include oak wilt and gypsy moth.

KEY WORDS: Annual inventory, forest area, forest type, volume, biomass, Iowa

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