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Forest Land Wildlife Habitat Resources of South-Central Ohio

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Abstract

As part of the third survey of Ohio's forest resources, measures for assessing wildlife habitat were taken in the State's 10 southern counties. This publication reports on the analysis of some of that data, describing the status of land use patterns, forest area, forest ownership, mast-producing trees, potential snag trees, and understory woody stems. Certain results of the survey are related to forest wildlife habitat quality conditions.

Foreword

The third inventory of Ohio was directed by Carl E. Mayer, research unit leader. Joseph E. Barnard was responsible for inventory design and sample selection. John R. Peters supervised the aerial-photo interpretation and data collection by field crews. He was assisted by Mark A. Cooper, III. Other field personnel were: Randy L. De Marco, Philip E. Emery, Robert C. Guth, Frederick J. Harris, Lois Schimmel, and Laurie L. Shortess.

David R. Dickson and Nancy M. Veronesi applied FINSYS (Forest INventory SYStem), a generalized data processing system, to the specific data needs of the Ohio inventory. Thomas W. Birch was instrumental in assuring that the area estimates were consistent with those from the two previous inventories. Teresa M. Bowers assisted in the inventory design by performing all calculations necessary for sampling-size determination and plot selection. She was responsbile for the coordination of keypunching and other data preparation tasks. Anne M. Malley helped prepare and balance the statistical tables in this report.

Carmela M. Hyland was responsible for administrative and secretarial services. Marie Pennestri typed this report.

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Introduction

It has become widely accepted over the past few years that habitat is the foundation of our wildlife resources. Habitat provides the cover and forage necessary for the continued success of any wildlife species.

With this awareness of the importance of habitat resources has come a concomitant recognition that these resources are altered by land management practices and possibly destroyed by drastic land use change. Congress acknowledged this situation when it passed the 1974 Forest and Rangeland Renewable Resource Planning Act and later the 1978 Forest and Rangeland Renewable Resource Research Act. These acts require, among other things, a reoccurring assessment of our Nation's forest land resources, including wildlife habitat resources.

In response to this legislative mandate, the Forest Inventory, Analysis, and Economics (FIA&E) unit of the USDA Forest Service's Northeastern Forest Experiment Station broadened its forest survey procedures to include measures useful for wildlife habitat evaluation (Barnes and Barnard 1979). This report describes the initial application of those procedures in the 10-county area of south-central Ohio (Figure 1) in 1979.

Methods

The sampling procedure for 1979 habitat survey conducted by the FIA&E unit consisted of aerial photography and new ground sample locations. Remeasurement of ground samples from earlier surveys was also taken but only for timber resources. In south-central Ohio, this required classifying 9,798 points on aerial photographs into land-use and cubic-foot volume classes, and establishing 299 new ground measurement locations as a subsample of the photo points. The data collected were initially analyzed using the FINSYS computer system developed by the Northeastern Forest Experiment Station. Subsequent estimates herein were made using either the FINSYS option for Sampling with Partial Replacement design (for those Tables from previous FIA publications) or the Statistical Package for the Social Sciences (Nie et al. 1975).

The resurvey of Ohio's forest resources emphasized timber resources as reported by Dennis and Birch (1981) in "Forest Statistics for Ohio--1979." and Dennis (1983) in "An Analysis of Ohio's Forest Resources." Birch (1982) reported separately on the attitudes and objectives of the private forest-land owners in "The Forest-Land Owners of Ohio--1979." If interested in these or other publications on the forest resources of Ohio, contact the Forest Inventory, Analysis, and Econmics Unit, USDA Forest Service, 370 Reed Road, Broomall, PA 19008 (phone 215-461-3037).

Land Area Characteristics

Forest land is the predominate land use in south-central Ohio, covering 49 percent of the land base (Table 1). These lands constitute a major wildlife habitat resource of the region, both in area and in the numbers and diversity of wildlife supported. Agricultural lands are the second largest land use in the region, occupying 34 percent of the land. However, these lands support much less wildlife than forest lands because of the high level of disturbance

South-Central Ohio

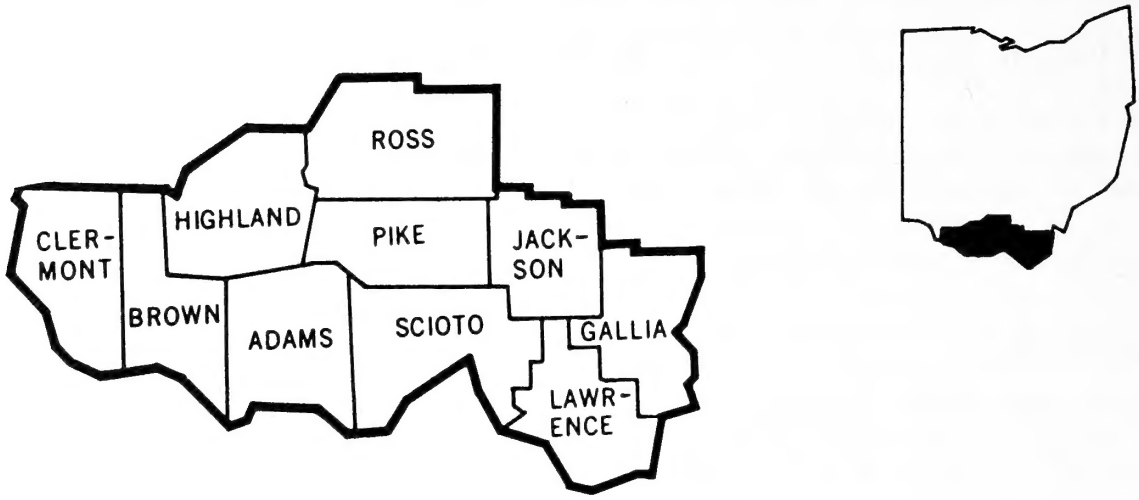

Figure 1.--Map of the 10 counties in Survey Unit 1 of Ohio and their location within the state.

associated with agricultural production. The remaining 17 percent of the region is nonforested, in urban, residential, industrial, and rights-of-way and other minor land uses. These lands, because of their high degree of disturbance, or small area, provide very little to the region's overall wildlife habitat resources.

There have been no major changes in land use in south-central Ohio over the past decade (Birch and Wharton 1982). Forest and agricultural acreage have remained stable over this period, with only a 2.6-percent increase in forest acreage and an 8.7-percent increase in total cropland acreage. An additional issue of great concern, but not addressed in this survey, is how land-management practices have changed the habitat values of these land uses. For example, the intensification of agriculture has generally reduced the value of agricultural acreage for farmland wildlife through increased field size, the removal of windrows and fence borders, and the increased use of chemicals (McCorkle and Halver 1982).

The examination of land acreage by land use provides one perspective of wildlife habitat resources. A second and possibly more informative perspective is the relational pattern formed by the placement of different land uses on the land surface. These data are used to describe the juxtaposition of contrasting land uses, that is, edge, and to estimate the degree of interspersion of these uses.

Many wildlife species benefit by a high degree of land use interspersion. These species require or prefer two or more land uses to satisfy life requirements. The greater the degree of interspersion of land uses required by the species, the greater the amount of preferred habitat that is available to them. Leopold (1933) discusses this principle in describing the land cover characteristics preferred by quail (Colinus virginianus). He describes ideal quail range as that which contains equal proportions of woodland, brushland, grassland, and cultivated

lands. The greater the degree of interspersion of these four land covers in a defined area, the greater the number of quail coveys the land could support.

Land use juxtaposition in south-central Ohio was surveyed from aerial photographs (Brooks and Scott 1983). In this application, photo edge plots were measured only for photo points that had been interpreted as forest land and subsequently selected as field measurement plots. These data show that the greatest amount of land use edge occurs between the two most common land uses, forest and agricultural/herbaceous-dominated lands (Table 2). The interspersion of these two land uses benefits a large number of wildlife, especially when compared to the juxtaposition of forest to more disturbed lands such as residential, industrial, or stripmines. The relatively high degree of forest to shrubland edge is a positive feature for many wildlife. More than 50 percent of the edge conditions tallied occurred between forest, agricultural, herbaceous, generally, pasture, and shrublands, a pattern previously cited by Leopold as favorable for quail.

More than 20 percent of all edge conditions are created by the juxtaposition of forest land with transportation rights-of-way (Table 2). This is a concern because highways are poor areas for wildlife habitat and they have significant wildlife mortality.

The low occurrence of edge associated with cultural (for example, residential, commercial, and industrial) and strip-mined land use is encouraging. Stripmines in this instance are active mines. Neither land use provides much to the wildlife habitat resource base of the region. Cultural, especially residential, land use affects not only on-site habitat values but also those of adjacent lands, mainly by disturbance of resident wildlife and by alteration of plant communities (Moran 1984, Horn 1985).

No data are available to compare the amount and distribution of edge types as reported here. Monitoring land use interspersion is valuable for trend analysis and the detection of adverse or positive patterns in land use change. Presumably, during the next Ohio forest survey, similar edge data can be used to detect changes in the amount and type of edge as it affects the quality of the region's wildlife habitat.

Many wildlife species are restricted to or prefer one land use, and a diverse land use pattern detracts from habitat quality. For these species, the area of a unit of land use affects the quality of the land for habitat. This is particularly true for many forest-dwelling birds that migrate long distances (Robbins 1979). These species prefer the conditions associated with the interior of forest lands. In south-central Ohio, nearly 75 percent of the forest land is in parcels of 50 acres or less (Table 3). This statistic should raise concern for the habitat quality of many seasonal birds of the region. Increased fragmentation of forest lands into progressively smaller parcels results in the eventual loss of many of these species from these lands. Robbins (1979) recommended 250 acres as the minimum contiguous forest area required to sustain viable breeding populations of long-migration bird species. Concomitantly, species preferring edge conditions would increase with forest fragmentation. These species are frequently nonmigratory residents or species with short migrations.

Of the 1.6 million acres of forest land in south-central Ohio, detailed habitat survey data were sampled from 1.5 million acres. These are the productive forest lands but exclude reserved lands (25,000 acres) such as parks, and national forest lands (68,000 acres).

The forest land of this region is dominated by the oak-hickory forest type group (78 percent, Table 4). The second major type group is the northern mixed

hardwood (11 percent). Conifer dominated stands cumulatively total only 7 percent of the region's forests. Working with wildlife in south-central Ohio means working with those species common in oak-hickory forests.

Sawtimber-size stands are the predominant size class (45 percent) in the region (Table 4). Smaller poletimber- and sapling/seedling-size stands are roughly equally common (22 and 28 percent, respectively). This size-class distribution is an important change from conditions reported in 1967 when small sapling/seedling-size stands were predominant (DeBald and McCay 1969). This maturation of the region's forests holds important implications for the wildlife community. Species strongly associated with young, early successional stands will necessarily decrease in abundance as their preferred habitat ages and declines in acreage.

Early successional forest land habitat resources are best described by timberland age classes (Table 5). Sapling/seedling-size timberland (Table 4) is based on a classification of the plurality stocking of sapling- and seedling-size growing-stock trees. This tree quality restriction excludes rough and rotten cull trees. Cull trees generally have large diameters; therefore, excluding them leaves a relatively high proportion of small-diameter trees. This is shown by the fact that only 14 percent of the region's forests were field classed as being less than 20 years of age, generally considered the time frame for small-diameter stands (Table 5), while 28 percent were classified as sapling seedling-size stands. When describing the old field and/or shrubland habitat of south-central Ohio, forest land acreage by age is probably more appropriate than stand size. These data show that 64 percent of the region's forest is classed as mixed ages and would probably be envisioned as sawtimber-size stands for habitat characterization.

The forest lands of south-central Ohio are mostly well-stocked stands, whether one considers all live trees or growing-stock alone. By either standard, more than 50 percent of the forests are classed as fully stocked or overstocked (Table 6). On these stands, tree growth is stagnant, mortality is high, and understory vegetation is suppressed (Spurr and Barnes 1980).

Forest management practices, if modified by wildlife considerations, would improve both the tree resource and habitat quality on overstocked forest lands. The specific silvicultural recommendations for any single forest stand depend on the forest type, stand conditions, site quality, and markets (Ohmann 1979). Even-age silvicultural systems are recommended for the oak-hickory forest type (Sander et al. 1983), the predominant type in southern Ohio. The choice between clearcutting or shelterwood methods of stand regeneration depends on the abundance of advanced regeneration (Sander et al. 1983). When regenerating an oak-hickory stand, the retention of existing or potential den trees is important, as is the composition of the future stand (Hassinger et al. 1979). It is important that the regenerating stand contain a variety of mast-producing species so the future mast resource will not suffer excessively by the failure of one species. It is also important to retain both white and black oak species to maintain a regular annual acorn crop.

Ownership Characteristics

Forest land of south-central Ohio is mostly privately owned by individuals (Table 7). Corporate forest owners are the second major landowner class.

Publicly owned forest lands are managed by the State or the USDA Forest Service. Successful habitat management for forest-dwelling species will require working with the multitude of private individuals controlling the forest-land resource.

These individuals mostly own small acreages, 9 acres or less (Table 8). There is an inverse relationship between the number of owners and acres owned that may influence habitat management programs depending on the objectives. To influence the most acres of forest-land habitat, locate and work with a few major ownerships (for example, 4 percent of the owners control 45 percent of the forest land). To influence a broad constituency, work with numerous small ownerships. Each population of owners requires a different message and medium. The few large-acreage ownerships could be contacted individually and a cooperative, integrated land management plan could be developed. The many owners of small acreages must be contacted by the mass media and be persuaded to practice proper and productive forest habitat management.

South-central Ohio private forest land owners are a diverse group, the majority identified themselves as retired, white-collar workers, or farmers (Table 9). The majority of acres are owned by retirees, farmers, or professional workers. Some 70 percent of forest-land owners live on or nearby their land (Table 10).

The motivation for owning forest land varies; the largest number of owners hold their land primarily because it is part of the farm or residence (Table 11). Owning forest land for either land investment or for timber production is a relatively minor justification for ownership. Nevertheless, more than 25 percent of the owners expect their primary benefit from ownership to be land value increase (Table 12). Another important expected primary benefit of forest-land ownership that bodes well for habitat management is esthetic enjoyment. Both of these diverse motivations should be considered when developing and marketing habitat management programs.

Timber harvest is a common and cost-effective method for managing forest-land wildlife habitat. However, in south-central Ohio, 64 percent of the private forest-land owners have not recently harvested timber from their land (Table 13). These individuals control approximately 40 percent of the privately held forest land. Reasons for not harvesting vary; some relate to the silvicultural availability of the timber resource. Other reasons are personal beliefs that could be changed through education, specifically that harvests destroy hunting opportunities and scenery.

The development of habitat management program options should consider the characteristics, motivation, and attitudes of the individuals who control the forest land. No single management plan is appropriate for all owners; rather a collection of opportunities should be made available for distribution through various media (Decker and Kelley n.d., Decker et al. n.d., Hassinger et al. 1979).

A final characteristic of private forest ownership that is important to privately owned habitat management by public agencies is the accessibility of the forest land to the public. It is debatable whether a public agency should expend public monies for the benefit of the individual who posts his or her forest land. A surprisingly low number of private forest-land owners post their lands in south-central Ohio, and these individuals control only 28 percent of the privately held forest-land resource (Table 14). Posting does not seem as serious a problem as in other states in the Northeast (Brown and Thompson 1976).

Habitat Component Characteristics

Mast production from forest trees is an important forage resource for numerous wildlife species. The most abundant mast are the nuts and soft fruit of tree and shrub species. Mast production is related to the size of the crown of the producing plant (Shaw 1971). Generally, the larger the tree diameter, the greater the potential mast production. Production is not constant for any plant, but varies annually depending

mostly on seasonal climatic factors. The number of mast-producing stems by species and diameter is a good index to potential mast production from forest trees. Exact production of mast could be estimated from these data using species specific mast-production functions, tempered by annual climatic and environmental conditions.

In south-central Ohio, white oak is the most common mast-producing species (Table 15). Other common mast-producing species are hickories as a group, and chestnut oak. More than 10 million stems, 5 inches and larger in diameter, of each of these species are estimated to be in the region. The number of large-diameter stems, and hence high-potential mast producers, is naturally less than smaller diameter stems. Other numerous mast-producing species include sassafras, black oak, and northern red oak.

The large number of mast-producing stems in this area is expected given that the dominant forest-type group is oak-hickory. These mast trees constitute an important forage resource base for the support of forest wildlife such as squirrels (Sciurus sp.), turkey (Meleagris gallopavo), and white-tailed deer (Odocoileus virginianus).

Commonly surveyed soft fruit producing tree species, in addition to sassafras, are flowering dogwood, common persimmon, and cherry (Table 15). The mast of these species are important forage for numerous wildlife of both mammal and avian species (Martin et al. 1961).

Small-diameter (less than 5 inches) woody stems--saplings, seedlings, and shrubs--are an important habitat resource. They provide forage in the form of mast and browse, and horizontal cover. The value of this resource for either forage or cover varies by species. The contribution of an individual species to the total resource can be quantified by the use of importance values (Greig-Smith 1957, Mueller-Dombois and Ellenberg 1974). For this report, we calculated the relative frequency and density of all shrubs, saplings, and seedlings encountered in south-central Ohio (Table 16). In general, species that occur in large numbers (relative density) are also widely distributed (relative frequency).

Sassafras, flowering dogwood, and elm are the most important species of the small-diameter, woody-stemmed resource (Table 16). Flowering dogwood, along with other dogwood species, is frequently mentioned as an important shrub species for Ohio wildlife (Gilfillian and Cannon 1967, Nixon et al. 1970, Stoll et al. 1980). Neither sassafras nor elm is considered highly important to wildlife, though each is considered a forage source for some wildlife species. Other shrub, sapling, and seedling species that are both distributionally important and mentioned as important to Ohio's wildlife are the maples, hawthorn, and black cherry. Many oak species are commonly seen in the understory but are of little value to wildlife until they are sufficiently mature to produce acorns.

Common mast-producing shrubs are mostly soft fruit-bearing species. The most common are common spicebush, poison ivy, and blueberry, each estimated at over 100 million stems in south-central Ohio (Table 17). Other common mast-producing shrubs include Virginia creeper, virburnums as a group, and hawthorn. Many of these species are considered important to ruffed grouse (Bonasa umbellus) and other wildlife species (Stoll et al. 1980, Gilfillian and Cannon 1967). Stems found in the understory of closed canopy forests produce less mast than open-grown stems because of the shading effect of the overtopping forest canopy (Sharp 1974). In this region, where fully and overstocked stands are the norm, the shading effect is especially severe.

The common mast-producing trees are as common as saplings but their mast potential is generally less because of their small size. Some sapling-size tree species such as flowering dogwood,

black cherry, hawthorn, and sassafras might be expected to produce mast when not severely overtopped.

In addition to producing mast, saplings, seedlings, and shrubs provide a second forage resource. Young woody growth, termed browse, and the attached foliage is commonly eaten by such species as white-tailed deer, hare (Lepus americanus), and rabbits (Sylvilagus floridanus). The use of browse is not as common or critical in this region as in more northerly locations. Only an estimated 19 million stems were classed as heavily browsed in south-central Ohio, out of a resource of 5.5 billion (Table 17). It is estimated that only 6.8 percent of all sapling, seedling, and shrub stems show any browse use. Maples are the only species considered important to Ohio's deer (Nixon et al. 1970).

Vines are an important habitat component for Ohio's wildlife. Many vine species produce fruit that is a forage resource (Gilfillian and Cannon 1967). The most common vine species is poison ivy; it is estimated to occur on more than 123,000 acres of forest land. Other vine species are common greenbrier (23,000 acres), Virginia creeper (40,000 acres), grape (23,000 acres), and vine honeysuckle (7,000 acres). Each of these species produces fruit mast considered important for grouse (Stoll et al. 1980) and other wildlife species (Martin et al. 1961).

A final habitat component is the snag and cavity tree resource. We defined snags as standing dead trees; cavity trees are surveyed trees, either dead or living, with an observed cavity. For this survey, only snags and rotten live cull trees were searched for cavities.

These trees provide a valuable resource for wildlife, as a substrate for both constructing dens and cavities and for foraging for invertebrates. Standing dead trees and trees with internal disease (that is, rotten cull) have a higher probability of being used by primary cavity nesters, the woodpeckers, as the wood is more easily excavated. These cavities, and natural cavities caused by disease or injury, are used as resting or nesting sites by various bird (Scott et al. 1977) and small mammal species. These same trees are often infested with wood-dwelling insects and, therefore, provide foraging sites for insectivorous birds.

There are an estimated 10 million snags in south-central Ohio (Table 18). Of these, some 32 percent have readily observable cavities. There are slightly over 29 million rough and rotten cull trees in this area, and 12.5 percent contained observable cavities. While cavities are more readily observed in a dead tree without foliage, this factor should not solely account for cavities being over twice as common in dead trees as in live trees.

Large sawtimber-size snags commonly have cavities, approximately 68 percent (Table 18). Broken top snags had more cavities for all three size classes than snags with intact tops.

Sawtimber-size rotten cull trees are more likely to have cavities than the other two smaller size classes (Table 18). This is not unexpected as larger trees have lived longer, increasing the possibility of disease or pests and subsequently being excavated as a cavity site (DeGraaf and Shigo 1985). Also, the larger the tree, the greater the number of cavity-excavating species that may choose it as a cavity site. Number of poletimber-size snags indicates that they are the largest resource for cavity and potential cavity trees (Table 18). However, larger diameter stems are the more important snag resource because of their degree of use as cavity trees.

There are more hardwood than softwood snags; this is expected in an oak-hickory dominated region (Table 19). The most common snag species is black locust and because of its large numbers is the most common snag species found with a cavity. However, white and red pine, beech, yellow-poplar, aspen, and northern red oak snags were always

found with cavities indicating a preference by cavity-excavating birds for these species over other more numerous snag species.

Live cull trees are estimated to have cavities about 13 percent of the time (Table 18). Oaks are again the most common species in this group of trees, but they are not the species most often found with cavities (Table 19). Live cull sycamore has the highest percentage of stems with cavities (48 percent). Other species whose cull stems are frequently observed with cavities are red maple, hickory, beech, yellow-poplar, and black locust.

Comparable data for other areas are extremely limited but have been summarized by McComb and Bonney (1984). Comparisons are difficult because there is no single, commonly accepted definition of snag. The estimate of snags per acre (that is, estimated total stems divided by estimated timberland acreage) from this forest survey (6.6) is the same as that reported for a limited study on Kentucky forest land (Moriarity and McComb 1983). This estimate is less than that reported (13.3) for a West Virginia study (Carey 1983). Both comparison studies included trees down to a minimum 10-cm diameter, whereas this forest survey considered only trees 5-inches (12.7 cm) and larger.

Sampling Error

Data in this report are based on a sample of forest conditions and are therefore estimates. Accuracy of any estimate can only be ascertained by expert review, as has been done by resource professionals familiar with the habitat resources of south-central Ohio.

Precision of any estimate can be mathematically calculated and is presented here as the sampling error. Only a few error values have been calculated for this report due to the difficult and costly process involved when not using FINSYS.

Sampling error is presented as a percentage of the associated estimate. As an example, there are estimated to be 4.9 billion shrubs, saplings, and seedlings in south-central Ohio (Table 17). The calculated sampling error is 266.4 million or 5.3 percent. This means that if there are no errors in procedure, and the survey were repeated, the odds are 2 to 1 (66 percent probability) that the resulting estimate of this value would be between 4,729.6 to 5,262.4 billion stems, or 4,996.0 $\pm$ 266.4 million stems. Similarly, there is a 95 percent probability that the estimate from a repeated survey would be between 4,463.2 to 5,528.8 billion stems, or 4,996.0 $\pm$ 532.8 million stems.

Sampling error on resource estimates cited from other publications (Dennis and Birch 1981; Birch 1982) can be found in those references. Sampling error on the number of mast-producing trees (Table 15) is estimated roughly in Table 37 of Dennis and Birch (1981). In their report, national forest lands were included in the sample but cull trees were excluded. Nevertheless, sampling error estimates are appropriate for most uses of these mast-potential data. Sampling error for snags is 13.7 percent of the total 10 million trees (Table 18). Error on the estimated 7 million trees with observed cavities is 12.2 percent.

Error estimates for any value of greater detail will necessarily have a larger sampling error. This is a function, for the most part, of the decreased number of observations in the sample.

Summary

Without comparable statistics from other areas or previous regional surveys, it is difficult to evaluate the results of this habitat data. The most common forest habitats of south-central Ohio are predominantly sawtimber-size oak-hickory stands. These lands are commonly interspersed with agricultural lands and transversed by highways. They

are found in relatively small stands, less than 50 acres.

Forest stands of early successional characteristics appear to be a relatively rare resource that should be monitored in succeeding surveys. Regardless of forest classification, south-central Ohio's forests are predominantly overstocked, and as such, appropriate for forest management activities. This creates a valuable opportunity for cost-effective forest habitat improvement.

South-central Ohio forest habitat is essentially privately owned. There are a large number of owners, but each owns relatively few acres creating difficult conditions for implementing a cohesive regional habitat management program.

Characteristics of owners and their motivations and justifications for owning forest land are diverse. A program to encourage private, individual habitat-improvement activities will have to be flexible enough to appeal to the variety of owners. Fortunately, commercial forest management (that is, harvesting) is acceptable to most owners.

Posting does not appear to be a serious problem at this time. Nevertheless, it is an important factor in working with private landowners and should be monitored in future surveys.

Mast production by forest trees in south-central Ohio is an important forage resource for the region's wildlife. A large number of trees produce either hard (nuts) or soft (fruit) mast. It will be informative to compare these data with that of the next survey to evaluate the change in mast-production potential.

Saplings, seedlings, and shrubs are also an important habitat resource both for forage and cover. Eighty-seven different species of these size classes, plus vines, were recorded in south-central Ohio (Table 16). Most are relatively minor in importance, either narrowly distributed or few in number, or both. Fortunately, many of the more important (common) species are also valuable to wildlife for their forage potential, especially at maturity as forest trees.

Standing dead trees (snags) and live cull trees with cavities are important habitat resources for their actual or potential value for cavities. On a per-acre basis, there are estimated to be 4.5 trees, both live and dead, poletimber and larger, with observable cavities.

This report presents an initial picture of the forest habitat resources of south-central Ohio. The data are of some value in describing the resource base. However, without comparable data for adjacent areas or for other time periods, it is difficult to analyze the data. In reporting these data, we hope that they will stimulate discussion of the subject. User comments will enable us to develop even more useful products from the next Ohio survey. Resurvey data will enable us to identify change in the quality of wildlife habitat resources and the quantity of its component parts.

Literature Cited

Barnes, Robert T.; Barnard, Joseph E. A wildlife habitat survey as part of a multi-resource evaluation procedure. In: Forest Resource Inventories, Vol I. 1979 July 23-26; Fort Collins, CO. Fort Collins, CO: Colorado State University, Department Forestry and Wood Science; 1979: 77-89.

Birch, Thomas B. The forest land owners of Ohio - 1979. Resour. Bull. NE-74. Broomall, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station; 1982. 84 p.

Birch, Thomas W.; Wharton, Eric H. Land use change in Ohio, 1952 to 1979. Resour. Bull. NE-70. Broomall, PA: U.S. Department of Agriculture, Forest

Service, Northeastern Forest Experiment Station; 1982. 24 p.

Brooks, Robert T.; Scott, Charles T. Quantifying land-use edge from aerial photographs. Wildlife Society Bulletin. 11:389-391; 1983.

Brown, Thomas L.; Thompson, Daniel Q. Changes in posting and landowner attitudes in New York State, 1963-1973. New York Fish and Game Journal 23:101-137; 1976.

Carey, Andrew B. Cavities in trees in hardwood forests. In: Snag habitat management: Symposium Proceedings; 1983 June 7-9; Flagstaff, AZ. Gen. Tech. Rep. RM-99. Ft. Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station; 1983. 226 p.

DeBald, Paul S.; McCay, Roger E. The timber resources of the Ohio hill country. Resour. Bull. NE-14. Upper Darby, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station; 1969. 75 p.

Decker, Daniel J.; Kelley, John W. Enhancement of wildlife habitat on private lands. Ithaca, NY: Cornell University, Extension Publication; [n.d.]; Information Bulletin 181. 90 p.

Decker, Daniel J.; Kelley, John W.; Leamans, T. W.; Roth, R. R. Wildlife and timber from private lands: A landowner's guide to planning. Ithaca, NY: Cornell University, Extension Publication; [n.d.]; Information Bulletin 193. 56 p.

DeGraaf, Richard M.; Shigo, Alex L. Managing cavity trees for wildlife in the northeast. Gen. Tech. Rep. NE-101. Broomall, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station; 1985. 21 p.

Dennis, Donald D. An analysis of Ohio's forest resources. Resour. Bull. NE-75 Broomall, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station; 1983. 46 p.

Dennis, Donald D.; Birch, Thomas W. Forest statistics for Ohio-1979. Resour. Bull. NE-68. Broomall, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station; 1981. 79 p.

Gilfillian, Merrill C.; Cannon Allen W. Native Ohio shrubs. The Wonderful World of Ohio. 32(9):1622; 1967.

Greig-Smith, P. Quantitative plant ecology. London: Butterworths Scientific Publications; 1957. 198 p.

Hassinger, Jerry; Hoffman, Lou; Puglisi, Michael J.; Rader, Terry D.; Wingard, Robert G. Woodlands and wildlife: Making your property attractive to wildlife. University Park, PA: The Pennsylvania State University, College of Agriculture; 1979. 68 p.

Horn, David J. Breeding birds of a central Ohio woodlot in response to succession and urbanization. Ohio Journal of Science. 85:34-40; 1985.

Leopold, Aldo. Game management. New York: Charles Scribner's Sons; 1933. 481 p.

Martin, Alexander C.; Zinn, Herbert S.; Nelson, Arnold L. American wildlife and plants. New York: Dover Publications, Inc.; 1961. 500 p.

McComb, William C.; Bonney, Stephen A. Snag and cavity resources for wildlife in South Carolina and Florida: An analysis of U.S. Forest Service Forest Inventory and Analysis data. Final Report. Lexington, KY: University of Kentucky, Department of Forestry; 1984. 181 p.

McCorkle, Chester O.; Halver, John E., Co-chair. Impacts of emerging agricultural trends on fish and wildlife habitat. Washington, DC: National Academy Press; 1982. 303 p.

Moran, Mary A. Influence of adjacent land use on understory vegetation in New York forests. Urban Ecology. 8:329-340; 1984.

Moriarity, John; McComb, William C. The long-term effect of timber stand improvement on snag and cavity densities in the central Appalachians. In: Snag habitat management: Symposium Proceedings; 1983 June 7-9; Flagstaff, AZ. Gen. Tech Rep. RM-99. Ft. Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station; 1983. 226 p.

Mueller-Dombois, Dieter; Ellenberg, Heinz. Aims and methods of vegetation ecology. New York: John Wiley & Sons; 1974. 547 p.

Nie, Norman H.; Hull, C. Hadlai; Jenkins, Jean G.; Steinbrenner, Karin; Bent, Dale H. SPSS: Statistical package for the social sciences. 2d ed. New York: McGraw-Hill; 1975. 675 p.

Nixon, Charles M.; McClain, Milford W.; Russell, Kenneth R. Deer food habits and range characteristics in Ohio. Journal of Wildlife Management. 34:870-886; 1970.

Ohmann, Lewis F. Northeastern and north central forest types and their management. In: Management of north central and northeastern forests for nongame birds: Workshop Proceedings; 1979 January 23-25; Minneapolis, MN. Gen. Tech. Rep. NC-51. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station; 1979. 268 p.

Robbins, Chandler, S. Effect of forest fragmentation on bird populations. In: Management of north central and northeastern forests for nongame birds: Workshop Proceedings; 1979 January 23-25; Minneapolis, MN. Gen. Tech. Rep. NC-51. St. Paul, MN: U. S. Department of Agriculture, Forest Service, North Central Forest Experiment Station; 1979. 268 p.

Sander, Ivan L.; McGee, Charles E.; Day, Kenneth G.; Willard, Ralph G. Oak-hickory. In: Silvicultural systems for the major forest types of the United States. Agric. Handb. 445. Washington, DC: U.S. Department of Agriculture; 1983. 191 p.

Scott, Virgil E.; Evans, Keith E.; Patton, David R.; Stone, Charles P.; Singer, Arthur. Cavity nesting birds of North American forests. Agric. Handb. 511. Washington, DC: U.S. Department of Agriculture; 1977. 112 p.

Sharp, Ward M. Ecology of shrubs and vines. In: Shrubs and vines for northeastern wildlife. Gen. Tech. Rep. NE-9. Upper Darby, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station; 1974. 180 p.

Shaw, Samuel P. Wildlife and oak management. In: Oak Symposium Proceedings. 1971 August 16-20; Morgantown, WV. Upper Darby, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station; 1971. 161 p.

Stoll, Robert.; McClain, Milford W.; Nixon, Charles M.; Worley, David M. Foods of ruffed grouse in Ohio. Columbus, OH: Department Natural Resources, Division of Wildlife; 1980. 17 p.

Spurr, Stephan H.; Barnes, Burton J. Forest ecology. 3rd ed. New York: John Wiley & Sons; 1980. 687 p.

Appendix

Definition of Terms

Agricultural/herbaceous land. Land with herbaceous plant cover, both grasses and/or forks, including cropland, pasture land, and natural grass lands.

Aquatic edge. An edge condition created when a terrestrial land use abuts a lake, pond, river, or stream.

Browse. Forage resource; defined here as current twig growth of woody-stemmed, perennial plants, occurring between 1 and 8 feet in height.

Browse utilization class. Four levels of browse use; none, light (1-10 percent available), moderate (11-40 percent), and heavy (greater than 40 percent).

Cavity. A hollowed out space in a tree, either natural or faunal caused; frequently used as a nesting site or temporary refuge by many species of wildlife.

Commercial species. Tree species presently or prospectively suitable for industrial wood products. Excludes species of typically small size, poor form, or inferior quality, such as hawthorn and sumac.

County and municipal lands. Lands owned by counties and local public agencies or municipalities or leased to them for 50 years or more.

Cull tree. A live tree predominantly rotten or of rough form (see Growing-stock trees).

Cultural land. Land with human development as the major land cover; includes industrial, commercial, and residential land uses.

Diameter at breast height (d.b.h.). The diameter outside bark of a standing tree measured at 4-1/2 feet above the ground.

Farmer-owned lands. Lands owned by farm operators, whether part of the farmstead or not. Excludes land leased by farm operators from non-farm owners.

Federal lands. Lands (other than national norests) administered by Federal agencies.

Forest industry lands. Lands owned by companies or individuals operating primary wood-using plants.

Forest land. Land at least 10 percent stocked with trees of any size or that formerly had such tree cover and is not currently developed for nonforest use. The minimum area for classification of forest land is 1 acre.

Forest type. A classification of forest land based on the species forming a plurality of live-tree stocking. The many forest types in Ohio were combined into the following major forest-type groups:

a. White/red pine--forests in which white pine or red pine, singly or in combination, make up a plurality of the stocking; in Ohio common associates include yellow-poplar, red maple, oak, black walnut and black cherry.

b. Hard pine--forests in which Virginia, shortleaf, or pitch pines or eastern redcedar, singly or in combination make up a plurality of the stocking; in Ohio common associates include red maple, oak, white or red pine, white ash, black walnut, and sycamore.

c. Oak/pine--forests in which hardwoods (usually hickory or oak) make up a plurality of the stocking but where shortleaf or Virginia pine or eastern redcedar make up 25 to 50 percent of the stocking.

d. Oak/hickory--forests in which upland oaks, hickory, yellow-poplar, black locust, black walnut, sweetgum, sassafras, persimmon, or red maple (when associated with central hardwoods), singly or in combination, make up a plurality of the stocking and in which shortleaf or Virginia pines, or eastern redcedar make up less than 25 percent of the stocking; in Ohio common associates include white ash, sugar maple, and black cherry.

e. Elm/ash/red maple--forests in which elm, river birch, sycamore, willow, cottonwood, or red maple (when growing on wet sites), singly or in combination, make up a

plurality of the stocking; in Ohio common associates include white ash, sugar maple, oak, hickory, yellow-poplar, and black cherry.

f. Northern hardwoods--forests in which sugar maple, beech, yellow birch, black cherry, or red maple (when associated with northern hardwoods), singly or in combination, make up a plurality of the stocking; in Ohio common associates include white ash, hickory, yellow-poplar, white oak, and red oaks.

g. Aspen/birch--forests in which aspen is a plurality of the stocking; in Ohio common associates include red maple, black cherry, red oaks, and beech.

Growing-stock trees. Live trees of commercial species classified as sawtimber, poletimber, saplings, and seedlings; that is, all live trees of commercial species except rough and rotten trees.

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

Harvested cropland. All land from which crops were harvested or hay was cut and all land in orchards, citrus groves, vineyards, and nursery and greenhouse products.

Land area. (a) Bureau of Census: The area of dry land and land temporarily or partly covered by water, such as marshes, swamps, and river flood plains; streams, sloughs, estuaries, and canals less than 1/8 statute mile wide; and lakes, reservoirs, and ponds less than 40 acres in area. (b) Forest Inventory, Analysis, & Economics: same as (a) except that the minimum width of streams, etc., is 120 feet, and the minimum size of lakes, etc., is 1 acre.

Land use edge. A condition created by the juxtaposition of two differing land uses.

Mast. Seed produced by woody stemmed, perennial plants, generally refers to soft (fruit) and hard (nuts) mast.

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

National Forest lands. Federal lands legally designated as National Forests or purchase units and other lands administered as part of the National Forest System by the USDA Forest Service.

Noncommercial forest land. Productive-reserved, urban, and unproductive forest land.

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

Nonforest land. Land that has never supported forests, or land formerly forested but now in nonforest use such as cropland, pasture, residential areas, and highways.

Nonstocked areas. Commercial forest land that is stocked with less than 10 percent of minimum full stocking with growing-stock trees.

Other cropland. Includes cropland used for cover crops; legumes, soil-improvement grasses, but not harvested and not pastured; cropland on which all crops failed; cropland in summer fallow and idle cropland.

Pasture land. Includes any pasture land other than cropland and woodland pasture. Can include lands which had applied lime fertilizer, seed, improved by irrigation, drainage, or control of weeds and brush.

Pastured cropland. Includes rotation pasture and grazing land that would have been used for crops without additional improvement.

Poletimber stands. Stands stocked with at least 10 percent of minimum full stocking with growing-stock trees, with half or more of such stocking in poletimber or sawtimber trees or both, and in which the stocking of poletimber exceeds that of sawtimber.

Poletimber trees. Live trees of commercial species meeting regional specifications of soundness and form and at least 5.0 inches in d.b.h., but smaller than sawtimber trees.

Productive-reserved forest land. Forest land sufficiently productive to qualify as commercial forest land, but withdrawn from timber utilization through statute, administrative designation, or exclusive use for Christmas tree production.

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

Rough trees. (a) The same as rotten trees, except that rough trees do not meet regional specifications for freedom from defect primarily because of roughness or poor form, and (b) all live trees of noncommercial species.

Saplings. Live trees 1.0 through 4.9 inches d.b.h.

Sapling-seedling stands. Stands stocked with at least 10 percent of minimum full stocking with growing-stock trees; half or more of such stocking in saplings or seedlings or both.

Sawtimber stands. Stands stocked with at least 10 percent of minimum full stocking with growing-stock trees; half or more of such stocking in poletimber or sawtimber trees or both, and the stocking of sawtimber is at least equal to that of poletimber.

Sawtimber trees. Live trees of commercial species at least 9.0 inches d.b.h. for softwoods or 11.0 inches for hardwoods containing at least one 12-foot sawlog or two noncontiguous 8-foot sawlogs, and meeting regional specifications for freedom from defect.

Seedlings. Live trees less than 1.0 inch d.b.h. that are expected to survive.

Shrub. Woody stemmed perennial plant, generally with no well-defined main stem and less than 12 feet in height at maturity.

Shrub land. Land with shrub and/or tree cover and an obvious herbaceous understory; average canopy height of less than 25 feet and crown closure of less than 70 percent.

Softwoods. Coniferous trees, usually evergreen and having needles or scalelike leaves.

Stand. A group of forest trees growing on forest land.

Standing dead tree (snag) - woody stem greater than 5.0 inches in diameter and 10 feet in height.

Stand-size class. A classification of forest land based on the size class (that is, seedlings, saplings, poletimber, or sawtimber) of growing-stock trees in the area.

State lands. Lands owned by the State or leased to the State for 50 years or more.

Stocking. The degree of occupancy of land by trees, measured by basal area and/or number of trees in a stand compared to the basal area and/or number of trees required to fully use the growth potential of the land (or the stocking standard). In the Eastern United States this standard is 75 square feet of basal area per acre for trees 5.0 inches d.b.h. and larger, or its equivalent in numbers of trees per acre for seedlings and saplings.

Two categories of stocking are used:

All live trees--these are used to classify forest land and forest types.

Growing-stock trees--these are used to classify stand-size classes.

Stripmine. Area devoid of vegetation due to current or recent general excavation.

Timberland. Forest land producing or capable of producing crops of industrial wood (more than 20 cubic feet per acre per year) and not withdrawn from timber utilization (previously termed commercial forest land).

Transportation right-of-way. Land associated with highways and railroads.

Trees. Woody plants that have well-developed stems and are usually more than 12 feet in height at maturity.

Unproductive forest land. Forest land that is incapable of producing 20 cubic feet per acre per year of industrial wood under natural conditions because of adverse site conditions.

Urban forest land. Noncommercial forest land within urban areas that is completely surrounded by urban development (not parks), whether commercial, industrial, or residential.

Utility right-of-way. Land associated with pipeline and electric transmission lines; identified only if vegetative cover differs from adjacent land use.

Windbreak/hedgerow. Linear areas, less than 120 feet in width; with predominantly tree and/or shrub vegetation.

Commercial Tree Species of Ohio (Dennis and Birch 1981)

Scientific Name[a]	Common Name	Occurrence[b]
Softwoods		
Juniperus virginiana	eastern redcedar	c
Picea abies	Norway spruce	vr
Pinus echinata	shortleaf pine	r
P. resinosa	red pine	vr
P. regida	pitch pine	r
P. strobus	eastern white pine	r
P. sylvestris	Scotch pine	vr
P. virginiana	Virginia pine	c
Thuja occidentalis	northern white-cedar	vr
Tsuga canadensis	eastern hemlock	r
Hardwoods		
Acer nigrum	black maple	r
A. rubrum	red maple (soft)	vc
A. saccharinum	silver maple	c
A. saccharum	sugar maple (hard)	vc
Aesculus glabra	Ohio buckeye	vr
Betula alleghaniensis	yellow birch	r
B. lenta	sweet birch (black)	r
B. nigra	river birch	vr
Carya spp.	hickory	vc
Castanea dentata	American chestnut	vr
Celtis occidentalis	hackberry	r
Cornus florida	flowering dogwood	c
Diospyros virginiana	common persimmon	r
Fagus grandifolia	American beech	c
Fraxinus americana	white ash	vc
F. nigra	black ash	r
F. pennsylvanica	green ash	r
F. quadrangulata	blue ash	vr
Gleditsia triachanthos	honeylocust	r
Gymnocladus dioicus	Kentucky coffeetree	vr
Juglans cinerea	butternut	r
J. nigra	black walnut	c
Liquidambar styraciflua	sweetgum (red gum)	r
Liriodendron tulipifera	yellow-poplar (tulip tree)	vc
Magnolia spp.	magnolia spp.	vr
Magnolia acuminata	cucumber tree	vr
Nyssa sylvatica	blackgum (black tupelo)	c
Platanus occidentalis	American sycamore	c
Populus balsamifera	balsam poplar	vr
P. deltoides	eastern cottonwood	r
P. grandidentata	bigtooth aspen	c
P. tremuloides	quaking aspen	r
Prunus serotina	black cherry	vc
Quercus alba	white oak	vc
Q. bicolor	swamp white oak	c
Q. coccinea	scarlet oak	c
Q. imbricaria	shingle oak	r

Q. macrocarpa	bur oak	r
Q. muehlenbergii	chinkapin oak	r
Q. palustris	pin oak	c
Q. prinus	chestnut oak	c
Q. rubra	northern red oak	c
Q. stellata var. stellata	post oak	r
Q. velutina	black oak	c
Robinia pseudoacacia	black locust	c
Salix spp.	willow spp.	r
Sassafras albidum	sassafras	c
Tilia spp.	basswood	c
Ulmus spp.	elm	vc

[a]Names according to: Little, Elbert L., Jr. Checklist of United States trees (native and naturalized). Agric. Handb. 541. Washington, DC: U.S. Department of Agriculture; 1979. 375 p.

[b]Occurrence is based on the frequency of tally of commercial species 5.0 inches d.b.h. or larger on forest survey field plots: vr - very rare (<0.05%), r - rare (0.05 to 0.49%), c - common (0.5 to 4.9%), and vc - very common (≥5.0%).

Metric equivalents of units used in this report

1 acre = 4,046.86 square meters or 0.404686 hectares
1,000 acres = 404.686 hectares
1,000,000 acres = 404,686 hectares
1 inch = 2.54 centimeters or 0.0254 meters
1 foot = 30.48 centimeters or 0.3048 meters
Breast height = 1.4 meters above ground level
1 mile = 1.609 kilometers
1 square foot = 929.03 square centimeters or 0.0929 square meters
1 square foot per acre basal area = 0.229568 square meters per hectare

Index To Tables

Table 1.--Land area by land class, south-central Ohio, 1979

Land class	Area		
	Thousand Acres		Percent
Timberland		1,601.3	48.4
Noncommercial forest land:			
Productive reserved	24.8		0.8
Urban	0.2		(t)
Unproductive	0.5		(t)
Total noncommercial		25.5	0.8
Total forest land		1,626.8	49.2
Nonforest land:			
Agricultural lands[a]			
Cropland			
Harvested	662.1		20.0
Pastured	241.5		7.3
Other	103.1		3.1
Total cropland	1,006.7		30.4
Pastureland	128.7		3.9
Total agriculture		1,135.4	34.3
Other nonforest		545.3	16.5
Total nonforest		1,680.7	50.8
Total land area[b]		3,307.5	100

[a] Source: U.S. Department of Commerce, Bureau of the Census, 1980. 1978 Census of Agriculture, preliminary report. AC78-P-39-000. p.1.

[b] U.S. Department of Commerce, Census, County and City Data Book, 1972.

t-Trace, less than 0.5 percent.

Table 2.--Land use edge for forest-associated lands as a proportion of total edge by edge class, south-central Ohio, 1979

Edge class	Proportion of total edge condition
Forest	
Forest	3.7
Shrub	11.9
Agricultural/herbaceous	35.0
Cultural	2.4
Total	53.0
Shrub	
Agricultural/herbaceous	5.0
Cultural	0.3
Total	5.3
Agricultural/herbaceous-Cultural	3.9
Rights-of-Way	
Transportation RoW	20.3
Utility RoW	4.1
Total	24.4
Windbreak/hedgerow	8.0
Strip mine	1.5
Acquatic	3.9
Total	100.0

Table 3.--Area of timberland, excluding national forest lands, by size of stand, south-central Ohio, 1979

Size of stand (acres)	Thousand acres	Percent
1 - 50	1,111.7	72.5
51 - 1000	263.7	17.2
101 - 500	51.4	3.4
500+	106.3	6.9
All stands	1,533.1	100.0

Table 4.--Area of timberland, excluding national forest lands, by forest-type group and stand-size class, south-central Ohio, 1979

Forest-type group	Stand-size class				All classes	
	Sawtimber	Poletimber	Sapling and seedling	Nonstocked		
	Thousand acres					Percent
White/red pine	-	-	-	14.7	14.7	1.0
Hard pine	19.3	13.2	41.5	-	74.0	4.8
Oak/pine	7.2	-	-	-	7.2	0.5
Oak/hickory	559.4	291.6	293.5	56.0	1,200.5	78.3
Elm/ash/red maple	17.0	14.2	44.9	-	76.1	4.9
Northern hardwoods	93.9	14.7	52.0	-	160.6	10.5
Total, all groups	696.8	333.7	431.9	70.7	1,533.1	100.0
Percent of total	45.4	21.8	28.2	4.6	100.0	

Table 5.--Area of timberland, excluding national forest lands, by stand age class, south-central Ohio, 1979

Age class (years)	Thousand acres	Percent
1 - 9	110.9	7.2
10 - 19	105.7	6.9
20 - 29	60.0	3.9
30 - 39	84.8	5.5
40 - 49	75.3	4.9
50 - 59	51.7	3.4
60 - 69	55.6	3.6
70 - 79	7.2	0.5
Mixed ages	981.9	64.1
Total, all ages	1,533.1	100.0

Table 6.--Area of timberland, excluding national forest lands, by stocking percent class, growing stock, and all live trees, south-central Ohio, 1979

Stocking class[a]	Growing-stock			All live trees		
	Thousand acres	Percent	Cumulative percent	Thousand acres	Percent	Cumulative percent
Overstocked (130%+)	141.5	9.2	9.2	316.7	20.7	20.7
Fully stocked (100%-129%)	636.4	41.5	50.7	854.5	55.7	76.4
Medium stocked (60%-99%)	554.6	36.2	86.9	256.6	16.7	93.1
Poorly stocked (0%-59%)	200.6	13.1	100.0	105.3	6.9	100.0
Total, all classes	1,533.1	100.0		1,533.1	100.0	

[a]100 percent stocking equals approximately 75 square feet of basal area per acre.

Table 7.--Area of timberland by ownership class, south-central Ohio, 1979 (Dennis and Birch 1981)

Ownership class	Thousand acres	Percent
National Forest	68.2	4.3
Other federal	-	-
State	110.4	6.9
County and Municipal	0.1	(t)
Total public	178.7	11.2
Corporate	162.3	10.1
Other private	1,260.3	78.7
Total private	1,422.6	88.8
Total, all ownerships	1,601.3	100.0

t-Trace, less than 0.5 percent.

Table 8.--Estimated number of private ownership units and acres of timberland owned by size class, south-central Ohio, 1979 (Birch 1982)

Size class (acres)	Owners			Acres		
	Thousands	Percent	Cumulative percent	Thousands	Percent	Cumulative percent
1 - 9	55.3	69	69	129.0	9	9
10 - 19	8.4	10	79	111.4	8	17
20 - 49	9.6	12	91	287.2	20	37
50 - 99	3.8	5	96	252.0	18	55
100 - 199	2.2	3	99	275.5	19	74
200 - 499	0.5	1	100	140.6	10	84
500+	0.1	(t)		226.9	16	100
Total, all classes	79.9	100		1,422.6	100	

t-Trace, less than 0.5 percent.

Table 9.--Estimated number of individual owners and acres of timberland owned by occupation, south-central Ohio, 1979 (Birch 1982)

Occupation	Owners		Acres	
	Thousands	Percent	Thousands	Percent
Professional	5.0	7	117.0	10
Executive	0.9	1	66.0	6
Retired	27.1	36	280.7	25
White collar	6.8	9	99.4	9
Skilled laborer	4.5	6	81.9	7
Unskilled laborer	1.8	2	70.2	6
Housewife	1.4	2	46.8	4
Farmer	6.5	8	233.9	20
Other	0.1	(t)	5.8	1
No answer	21.9	29	136.9	12
Total	76.0	100	1,138.6	100

t-Trace, less than 0.5 percent.

Table 10.--Estimated number of private ownership units and acres of timberland owned by distance from residence to nearest tract, south-central Ohio, 1979 (Birch 1982)

Distance from residence (miles)	Owners		Acres	
	Thousands	Percent	Thousands	Percent
0 - 1	56.8	71	947.5	67
2 - 5	11.1	14	74.4	5
6 - 15	1.3	1	93.5	6
16 - 25	0.8	1	46.8	3
26 - 50	0.6	1	23.4	2
Over 50	4.8	6	128.7	9
No answer	4.5	6	108.3	8
Total	79.9	100	1,422.6	100

Table 11.--Estimated number of private ownership units and acres of timberland owned by primary reason for owning, south central Ohio, 1979 (Birch 1982)

Primary reason for owning	Owners		Acres	
	Thousands	Percent	Thousands	Percent
Land investment	4.6	6	136.2	10
Recreational use	2.2	3	81.8	6
Timber production	2.3	3	163.0	11
Farm & domestic use	13.3	17	157.9	11
Esthetic enjoyment	2.8	3	99.4	7
Part of farm	30.3	38	391.8	27
Part of residence	14.2	18	198.9	14
Other	1.9	2	79.5	6
No answer	8.3	10	114.1	8
Total	79.9	100	1,422.6	100

Table 12.--Estimated number of private ownership units and acres of timberland owned by primary benefit expected in the next 5 years, south-central Ohio, 1979 (Birch 1982)

Primary benefit	Owners		Acres	
	Thousands	Percent	Thousands	Percent
Recreational use	4.9	6	87.7	6
Sale of timber	2.9	4	208.1	15
Land value increase	19.6	24	365.2	26
Esthetic enjoyment	23.3	29	286.6	20
Farm & domestic use	16.7	21	263.2	18
Other	0.5	1	56.9	4
No answer	12.0	15	154.9	11
Total	79.9	100	1,422.6	100

Table 13.--Estimated number of private ownership units who have not harvested timber and acres of timberland owned by reason for not harvesting, south-central Ohio, 1979 (Birch 1982)

Reason	Owners		Acres	
	Thousands	Percent	Thousands	Percent
Timber immature	7.0	14	175.4	32
Price too low	0.6	1	23.4	4
Destroy hunting	2.5	5	40.9	8
Selling the land	1.3	3	23.4	4
Ruin scenery	10.0	20	58.5	11
Distrust loggers	0.4	1	23.4	4
Opposed to harvest	7.3	14	11.7	2
Poor quality	0.7	1	35.1	6
Low volume	8.2	16	29.2	5
Insufficient area	3.5	7	23.4	4
Other	1.7	3	35.1	6
No answer	7.8	15	77.3	14
Total	51.0 (63.8 percent all owners)	100	556.8 (39.1 percent all acres)	100

Table 14.--Estimated number of private ownership units and acres of timberland owned by posting status, south-central Ohio, 1979 (Birch 1982)

Posting Status	Owners		Acres	
	Thousands	Percent	Thousands	Percent
Posted	13.6	17.0	395.3	27.8
Not posted	58.2	72.9	942.4	66.2
No answer	8.1	10.1	84.9	6.0
Total	79.9	100	1,422.6	100

Table 15.--Number of all live nut and fruit producing trees on timberland, excluding national forest lands, by species and diameter class, south-central Ohio, 1979

(In thousands of trees)

Species	Diameter class (inches at breast height)										All trees
	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+	
Hickory	6,581.1	4,888.5	2,840.0	1,800.8	882.2	778.8	300.4	119.8	101.9	5.2	18,298.7
Flowering dogwood	1,582.3	-	-	-	-	-	-	-	-	-	1,582.3
Comm. persimmon	607.3	231.3	111.6	127.7	29.4	-	-	13.5	-	-	1,120.8
American beech	685.9	481.8	389.6	271.1	161.1	-	-	29.4	147.5	13.6	2,180.0
Butternut	-	-	43.8	-	-	-	-	-	-	-	43.8
Black walnut	112.9	697.8	737.0	276.5	163.9	93.7	50.8	16.8	7.6	-	2,157.0
Osage-orange	-	-	-	-	-	-	15.6	-	-	-	15.6
Black tupelo	863.6	422.8	404.8	97.3	-	61.5	54.3	-	43.0	5.9	1,953.2
E. hophornbeam	464.6	-	-	-	-	-	-	-	-	-	464.6
Prunus sp.	192.1	-	-	-	-	-	-	-	-	-	192.1
Black cherry	1,342.0	861.1	166.8	277.7	170.1	109.8	74.9	34.3	-	7.2	3,043.9
White oak	5,851.3	4,413.2	3,261.2	1,701.4	1,981.8	1,519.2	731.8	385.3	319.3	46.7	20,211.2
Swamp white oak	140.4	-	-	-	-	-	-	-	9.1	-	149.5
Scarlet oak	665.4	278.6	248.0	299.4	303.1	219.3	126.2	57.1	68.2	5.9	2,271.2
Shingle oak	171.6	-	-	-	-	-	36.6	-	-	-	208.2
Bur oak	131.8	-	103.1	119.2	32.0	20.3	15.3	-	39.3	6.4	467.4
Chinkapin oak	145.1	154.1	155.0	83.0	55.7	67.3	51.5	-	-	-	711.7
Pin oak	1,000.5	233.6	98.8	76.8	123.3	135.4	38.2	43.8	97.8	9.4	1,857.6
Chestnut oak	2,826.8	3,696.4	2,647.5	2,272.4	1,430.7	809.5	334.8	259.1	243.1	41.5	14,561.8
Northern red oak	1,493.3	862.5	944.5	395.7	408.7	265.5	246.3	105.6	237.0	96.4	5,055.5
Post oak	189.5	295.6	97.5	36.2	-	81.8	47.9	13.0	-	-	761.5
Black oak	1,325.6	1,189.0	1,239.3	1,114.2	525.8	490.8	233.1	191.8	182.8	15.1	6,507.5
Sassafras	6,015.7	2,247.7	841.8	383.7	193.1	117.6	28.9	27.6	19.2	-	9,875.3
Total	32,388.8	20,954.0	14,330.3	9,333.1	6,460.9	4,770.5	2,386.6	1,297.1	1,515.8	253.3	93,690.4

Table 16.--Relative frequency[a] and relative density[b] of all shrub and tree seedling and sapling species tallied on Forest Inventory and Analysis plots in south-central Ohio, 1979

Scientific name[c]	Common species name	Relative		
		Frequency	Density	Sum
Juniperus sp.	Juniper	1.0	0.1	1.1
Juniperus virginiana	Eastern redcedar	19.0	2.5	21.5
Pinus echinata	Shortleaf pine	2.0	0.1	2.1
Pinus rigida	Pitch pine	0.5	(t)	0.5
Pinus strobus	Eastern white pine	4.0	0.2	4.2
Pinus sylvestris	Scotch pine	1.0	0.1	1.1
Pinus virginiana	Virginia pine	4.0	0.5	4.5
Acer negundo	Boxelder maple	4.5	0.9	5.4
Acer rubrum	Red maple	46.0	6.4	52.4
Acer saccharinum	Silver maple	1.5	0.3	1.8
Acer saccharum	Sugar maple	44.0	7.9	51.9
Aesculus sp.	Buckeye	2.0	0.1	2.1
Ailanthus sp.	Ailanthus	1.0	(t)	1.0
Betula alleghaniensis	Yellow birch	1.0	(t)	1.0
Betula lenta	Black birch	0.5	(t)	0.5
Carpinus caroliniana	American hornbeam	5.5	0.6	6.1
Carya sp.	Hickory	41.5	4.5	46.0
Castanea dentata	American chestnut	1.0	0.1	1.1
Celtis occindentalis	Hackberry	4.5	0.3	4.8
Ceris canadensis	Eastern redbud	23.5	2.6	26.1
Cornus florida	Flowering dogwood	54.0	7.6	61.6
Cataegies sp.	Hawthorn	9.0	1.5	10.5
Diospyros virginiana	Common persimmon	3.0	0.2	3.2
Fagus grandifolia	American beech	9.5	0.5	10.0
Fraxinus americana	White ash	51.0	6.2	57.2
Fraxinis ingra	Black ash	1.0	(t)	1.0
Fraxinus pennsylvanica	Green ash	1.0	(t)	1.0
Fraxinus quadrangulata	Blue ash	1.5	0.1	1.6
Gleditsia triacanthus	Honeylocust	4.0	0.2	4.2
Ilex monticola	Large leaf holly	1.0	(t)	1.0
Juglans cinerea	Butternut	0.5	(t)	0.5
Juglans nigra	Black walnut	5.0	0.4	5.4
Liriodendron tulipifera	Yellow-poplar	17.0	2.0	19.0
Maclura pomifera	Osage orange	0.5	(t)	0.5
Pyrus malus	Domestic apple	0.5	(t)	0.5
Pyrus coronaria	Crab apple	1.5	0.2	1.7
Morus sp.	Mulberrry	0.5	(t)	0.5
Morus rubra	Red mulberry	0.5	(t)	0.5
Nyssa sylvatica	Black tupelo	16.5	1.2	17.7
Ostrya virginiana	Eastern hophornbeam	4.0	0.4	4.4
Oxdendrum arboreum	Sourwood	13.0	1.0	14.0
Platanus occidentalis	American sycamore	0.5	(t)	0.5
Populus grandidentata	Bigtooth aspen	1.5	0.1	1.6
Populus tremuloides	Quaking aspen	0.5	(t)	0.5
Prunus sp.	Cherry	5.5	0.4	5.9
Prunus pensylvanica	Pin cherry	0.5	0.1	0.6
Prunus serotina	Black cherry	17.0	1.6	18.6
Prunus virginiana	Chokecherry	2.0	0.1	2.1
Quercus alba	White oak	18.0	1.2	19.2
Quercus bicolor	Swamp white oak	0.5	(t)	0.5
Quercus coccinea	Scarlet oak	3.0	0.2	3.2
Quercus imbricaria	Shingle oak	1.5	0.1	1.6

Table 16.--continued

Scientific name	Common species name	Relative		
		Frequency	Density	Sum
Quercus macrocarpa	Bur oak	2.0	0.2	2.2
Quercus michauxii	Swamp chestnut oak	0.5	(t)	0.5
Quercus palustris	Pin oak	1.0	0.1	1.1
Quercus prinus	Chestnut oak	15.5	3.4	18.9
Quercus rubra	Northern red oak	16.0	1.0	17.0
Quercus stellata	Post oak	0.5	(t)	0.5
Quercus velutina	Black oak	23.5	2.1	25.6
Robinia pseudoacacia	Black locust	6.5	0.3	6.8
Salix sp.	Willow	0.5	(t)	0.5
Sassafras albidum	Sassafras	55.5	11.0	66.5
Comptonia peregrina	Sweetfern	0.5	(t)	0.5
Corylus americana	American hazelnut	4.5	0.4	4.9
Lindera benzoin	Common spicebush	28.0	5.5	33.5
Hamamelis virginiana	Witch-hazel	4.0	0.5	4.5
Tilia americana	American basswood	1.5	0.2	1.7
Amelanchier canadensis	Serviceberry	6.0	0.6	6.6
Rubus sp.	Briers	2.5	0.4	2.9
Rosa sp.	Rose	2.5	0.8	3.3
Rhus glabra	Smooth sumac	5.5	0.9	6.4
Rhus typhina	Staghorn sumac	1.5	0.2	1.7
Rhus radicans	Poison ivy	8.5	vine[d]	vine
Kalmia latifolia	Mountain laurel	0.5	0.1	0.6
Gaylussacia sp.	Huckleberry	4.0	1.3	5.3
Ulmus sp.	Elm	51.5	9.0	60.5
Vaccinum sp.	Blueberry	7.5	2.2	9.7
Viburnum acerifolium	Maple-leaved viburnum	4.0	1.2	5.2
Viburnum dentatum	Dentate viburnum	1.0	0.1	1.1
Viburnum lentago	Sweet viburnum	1.0	0.1	1.1
Viburnum prunifolium	Blackhaw	3.0	0.4	3.4
Samaucus canadensis	Common elderberry	1.0	0.1	1.1
Smilax rotundifolia	Common greenbrier	1.5	vine	vine
Parthenocissus quinquefolia	Virginia creeper	2.5	vine	vine
Vitis sp.	Grape	1.5	vine	vine
Lonicera canadensis	American honeysuckle	1.0	0.2	1.2
Lonicera dioica	Glaucous honeysuckle	0.5	vine	vine

[a] The proportion of forested plots (n=202) on which the species was recorded.

[b] Estimated number of species stems as a proportion of the total estimated number of seedling, sapling, and shrub stems.

[c] Names according to: Little, Elbert L., Jr. Checklist of United States trees (native and naturalized). Agric. Handb. 541. Washington, DC: U. S. Department of Agriculture; 1979. 375 p. and Symonds, George W.D. The shrub identification book. New York: William Morrow and Company; 1963. 379 p.

[d] Stem counts not made for vine species so density estimates cannot be made.

t-Trace, less than 0.5 percent.

Table 17.--Number of saplings, seedlings, and shrubs on timberland, excluding national forest lands, by species and browse utilization class, south-central Ohio, 1979

(In millions)

Species/ species group	Browse utilization class				Total stems	Percent saplings
	No use	Light use	Moderate use	Heavy use		
Eastern redcedar	119.3	6.9	-	-	126.2	28.3
Eastern white pine	11.0	-	-	-	11.0	28.2
Virginia pine	23.1	-	-	-	23.1	44.2
Other coniferous	15.8	0.8	-	-	16.6	13.9
Total coniferous	169.2	7.7	-	-	176.9	29.0
Boxelder maple	43.9	-	-	-	43.9	
Red maple	295.7	20.5	-	2.2	318.4	10.1
Sugar maple	361.3	8.8	20.4	5.0	395.5	13.4
Other maples	14.7	-	-	-	14.7	
American hornbeam	27.7	-	-	-	27.7	19.1
Hickories	220.8	0.7	-	1.5	223.0	10.9
Hackberry	17.3	-	-	-	17.3	34.1
Eastern redbud	123.2	5.7	-	-	128.9	
Flowering dogwood	362.3	8.4	5.5	1.6	377.8	21.3
Hawthorn	76.6	-	0.7	-	77.3	2.7
American beech	26.5	-	-	-	26.5	9.4
White ash	269.8	19.7	9.9	9.0	308.4	10.1
Other ash	8.2	-	-	-	8.2	18.3
Yellow-poplar	95.8	3.7	-	-	99.5	26.6
Crab apple	7.1	-	4.4	-	11.5	
Black tupelo	56.2	2.2	0.7	-	59.1	
Eastern hophornbeam	16.6	3.0	-	-	19.6	
American hazelnnut	18.4	-	-	-	18.4	
Black cherry	80.6	-	-	-	80.6	9.1
Other Prunus sp.	31.1	1.0	-	-	32.1	13.7
White oak	58.6	-	-	-	58.6	35.3
Chestnut oak	162.9	5.8	-	-	168.7	8.8
Other white oaks	15.5	-	-	-	15.5	34.2
Northern red oak	45.3	3.0	-	-	48.3	14.9
Black oak	101.6	1.4	-	-	103.0	7.4
Other red oaks	16.2	2.2	-	-	18.4	3.3
Sassafras	542.4	5.0	-	-	547.4	6.0
Common spicebush	268.6	4.2	-	-	272.8	
Witch-hazel	24.8	-	-	-	24.8	
Serviceberry	27.7	-	-	-	27.7	
Rubus sp.	15.9	2.6	-	-	18.5	
Rosa sp.	35.7	1.9	-	-	37.6	
Sumac sp.	52.8	2.0	-	-	54.8	
Huckleberry	57.4	8.7	-	-	66.1	
Elm	426.4	10.0	14.1	-	450.5	12.8
Blueberry	105.6	2.9	-	-	108.5	
Maple-leaved viburnum	46.0	-	16.1	-	62.1	
Blackhaw	17.8	-	-	-	17.8	
Other viburnum	3.6	4.9	-	-	8.5	
Other deciduous	407.3	7.2	6.6	-	421.1	30.3
Total deciduous	4,585.9	135.5	78.4	19.3	4,819.1	11.4
Total, all stems	4,755.1	143.2	78.4	19.3	4,996.0	12.1

Table 18.--Number of standing dead and live rotten cull trees on timberland, excluding national forest lands, by diameter class, condition, and presence of cavities, south central Ohio, 1979

(In thousands of trees)

Size Class	With cavities	Without cavities	Total stems	Percent with cavities
Poletimber (5.0 - 9.9)				
Dead, intact top	367.5	2,966.9	3,334.4	11.0
Dead, broken top	1,538.8	2,635.0	4,173.8	36.9
Subtotal dead	1,906.3	5,601.9	7,508.2	25.4
Live, broken top	0	425.9	425.9	0
Live, intact dead top	0	124.0	124.0	0
Live, intact live top	1,797.0	16,065.1	17,862.1	10.1
Subtotal live	1,797.0	16,615.0	18,412.0	9.8
Total poletimber	3,703.3	22,216.9	25,920.2	14.3
Small sawtimber (10.0 - 14.9)				
Dead, intact top	180.5	487.2	667.7	27.0
Dead, broken top	673.8	571.3	1,245.1	54.1
Subtotal dead	854.3	1,058.5	1,912.8	44.7
Live, broken top	25.3	173.7	199.0	12.7
Live, intact dead top	0	61.0	61.0	0
Live, intact live top	769.9	6,294.3	7,064.2	10.9
Subtotal live	795.2	6,529.0	7,324.2	10.9
Total small sawtimber	1,649.5	7,587.5	9,237.0	17.9
Large sawtimber (15.0 +)				
Dead, intact top	124.5	124.5	249.0	50.0
Dead, broken top	357.7	99.5	457.2	78.2
Subtotal dead	482.2	224.0	706.2	68.3
Live, broken top	64.8	58.6	123.4	52.5
Live, intact dead top	19.3	0	19.3	100.0
Live, intact live top	991.7	2,582.8	3,574.5	27.7
Subtotal live	1,075.8	2,641.4	3,717.2	28.9
Total large sawtimber	1,558.0	2,865.4	4,423.4	35.2
Total dead	3,242.8	6,884.4	10,127.2	32.0
Total live	3,668.0	25,785.4	29,453.4	12.5
Total	6,910.8	32,669.8	39,580.6	17.5

Table 19.--Number of standing dead and live rotten cull trees on timberland, excluding National Forest lands, by species or species group, the presence of cavities, diameter class, and live/dead, South-Central Ohio, 1979

(In thousands of trees)

Species/ species group	Without cavities						With cavities					
	Pole		Small saw		Large saw		Pole		Small saw		Large saw	
	Dead	Live	Dead	Live	Dead	Live	Dead	Live	Dead	Live	Dead	Live
Eastern redcedar	0	105.7	0	50.2	0	0	0	0	0	0	0	0
White/red pine	0	0	0	0	0	0	103.0	0	0	0	0	0
Virginia pine	88.2	450.8	123.1	335.0	19.5	37.4	0	0	0	0	19.5	0
Other softwoods	201.1	570.5	41.0	304.6	0	59.4	0	0	0	0	0	0
Total softwoods	289.3	1,127.0	164.1	689.8	19.5	96.8	103.0	.0	.0	.0	19.5	.0
Red maple	0	1,248.1	0	106.8	0	95.1	101.2	348.6	0	146.9	0	59.3
Sugar maple	131.6	1,062.8	67.6	684.2	18.5	315.8	201.1	96.1	33.0	163.8	15.2	194.7
Hickory	272.6	969.9	82.2	319.4	23.2	181.9	0	467.3	34.3	0	35.7	16.6
Beech	0	163.9	0	0	0	18.2	0	0	0	0	44.6	53.6
White ash	246.3	357.5	0	284.4	0	107.7	0	0	0	70.8	0	5.2
Black walnut	0	71.3	0	338.1	27.8	7.6	0	0	0	26.5	0	0
Yellow poplar	0	201.5	0	134.5	0	90.1	58.7	112.3	37.5	21.6	0	47.1
Sycamore	0	135.8	0	0	12.8	17.0	0	0	0	55.5	0	84.2
Aspen	0	0	0	36.7	0	5.4	96.7	0	0	0	0	2.2
Black cherry	61.2	653.4	0	106.8	0	66.5	140.5	0	0	0	0	72.3
Selected white oaks	880.1	1,819.3	49.6	1,083.1	25.9	498.8	176.4	0	187.0	29.6	70.6	52.6
Northern red oaks	0	460.4	0	315.0	0	225.5	266.5	0	39.5	33.1	25.1	66.1
Other white oaks	128.0	683.5	95.6	895.0	24.4	329.2	123.3	74.4	109.1	31.7	85.7	50.2
Other red oaks	393.1	873.5	184.2	618.8	50.8	335.1	0	0	0	68.9	36.4	110.6
Black locust	1,838.5	1,823.4	210.9	285.5	21.1	104.9	220.0	297.3	378.9	121.5	117.9	136.7
Elm	0	516.4	124.4	212.8	0	49.6	0	0	0	0	0	10.1
Other hardwoods	1,361.2	4,447.3	79.9	418.1	0	96.2	418.9	401.0	35.0	25.3	31.5	114.3
Total hardwoods	5,312.6	15,488.0	894.4	5,839.2	204.5	2,544.6	1,803.3	1,797.0	854.3	795.2	462.7	1,075.8
Total, all species	5,601.9	16,615.0	1,058.5	6,529.0	224.0	2,641.4	1,906.3	1,797.0	854.3	795.2	482.2	1,075.8

Table 19.--continued

Species/ species group	Subtotal Dead	Percent with cavities	Subtotal Live	Percent with cavities	Total	Percent with cavities
Eastern redcedar	0	-	155.9	0	155.9	0
White/red pine	103.0	100	0	-	103.0	100
Virginia pine	250.3	7.8	823.2	0	1,073.5	1.8
Other softwoods	242.1	0	934.5	0	1,176.6	0
Total softwoods	595.4	20.6	1,913.6	0	2,509.0	4.9
Red maple	101.2	100	2,004.8	27.7	2,106.0	31.2
Sugar maple	467.0	53.4	2,517.4	18.1	2,984.4	23.6
Hickory	448.0	15.6	1,955.1	24.8	2,403.1	23.1
Beech	44.6	100	235.7	22.7	280.3	35.0
White ash	246.3	0	825.6	9.2	1,071.9	7.1
Black walnut	27.8	0	443.5	6.0	471.3	5.6
Yellow-poplar	96.2	100	607.1	29.8	703.3	39.4
Sycamore	12.8	0	292.5	47.8	305.3	45.8
Aspen	96.7	100	44.3	5.0	141.0	70.1
Black cherry	201.7	69.7	899.0	8.0	1,100.7	19.3
Selected white oaks	1,389.6	31.2	3,483.4	2.4	4,873.0	10.6
Northern red oaks	331.1	100	1,100.1	9.0	1,431.2	30.1
Other white oaks	566.1	56.2	2,064.0	7.6	2,630.1	18.0
Other red oaks	664.5	5.5	2,006.9	8.9	2,671.4	8.1
Black locust	2,787.3	25.7	2,769.3	20.1	5,556.6	22.9
Elm	124.4	0	788.9	1.3	913.3	1.1
Other hardwoods	1,926.5	25.2	5,502.2	9.8	7,428.7	13.8
Total hardwoods	9,531.8	32.7	27,539.8	13.3	37,071.6	18.3
Total, all species	10,127.2	32.0	29,453.4	12.5	39,580.6	17.5

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A report on the first survey of south-central Ohio's forest land widlife habitat resource. Results are estimates derived from the sample-based 1978 forest inventory of the 10-county region. Nineteen tables describing forest area, forest ownership, and snag, mast, and browse resources are included and discussed.

Keywords: Forest survey, area, ownership, snags, mast, browse resources.

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