Oak savanna was once a major vegetation type across large portions of the Midwest stretching from southern Wisconsin to western Tennessee (Cottam 1949, Bray 1960, Nuzzo 1986, Heikens and Robertson 1995). In general, savanna is a transitional community between areas of forest and grassland (Nuzzo 1986). Cottam (1949) characterized savanna as a “community consisting of an overstory of widely scattered trees with a ground cover consisting largely of prairie grasses.” In southern Illinois, these open communities were historically classified as dry-mesic savanna on fine-textured soils of the Till plains; dry-mesic sand savanna; or dry and mesic upland sites of the Ozark Hills, Shawnee Hills, and Cretaceous Hills (Anderson and Anderson 1975, Fralish 1976, Nuzzo 1986, Heikens and Robertson 1995).

Ecologists have generally attributed recurring fire and edaphic factors to the long-term maintenance of these unique ecosystems (Cottam 1949, Nuzzo 1986). Native American use of fire, coupled with lightning caused fires, is widely accepted as a contributing factor in the prehistoric development of savanna in southern Illinois (Anderson 1983). However, fire scar evidence in this region is scarce at best and few researchers have successfully constructed fire histories (Robertson and Heikens 1994).

Site characteristics, such as aspect and shallow soil, also have been suggested as factors responsible for savanna development (Anderson and Anderson 1975, Fralish and others 1991). Before settlement, savanna represented up to 18 percent of the forested landscape across southern Illinois (Anderson and Anderson 1975). However, following European settlement, cessation of fire, widespread logging, and continual grazing of the forest contributed to the near loss of savanna forests (Nuzzo 1986). Nuzzo (1986) reported that less than 0.02 percent of the original savanna vegetation existed in 1985.
Recent land-use history studies have documented past land-use history’s role in altering pre-settlement vegetation ultimately shaping modern ecosystems (Foster 1992, Orwig and Abrams 1994, Ruffner and Abrams 1998, Ruffner and Arabas 2000). These studies help identify direct environmental consequences of Euro-American land-uses across the eastern deciduous biome. Within southern Illinois, few studies have investigated the role of land-use history in shaping current forest systems (Fralish 1997). This study was designed to investigate the historical ecology of Thompson Woods, a remnant oak savanna on the campus of Southern Illinois University in Carbondale, Illinois.

Numerous reports of the 1950s-1970s discussed the open nature of this stand and its aesthetic qualities amenable to picnicking and walking for local townspeople. During the late 20th century a series of overstory disturbances removed many of the large oak trees thus beginning a serious decline in the health of the stand (Roth, personal communication). Species composition data collected in the mid-1980s indicated that the oak stand was being replaced by mixed mesophytic species and the historic savanna structure was no longer intact (Roth, unpublished data). Thus, during a graduate Historical Ecology field course in the fall of 2000, students representing several disciplines decided to document the historical ecology of the stand to better understand the historical forces responsible for maintaining the oak savanna and which modern day forces were contributing to its replacement.

STUDY AREA
Thompson Woods is located on the campus of Southern Illinois University at Carbondale in Jackson County, IL. The area has primarily Hosmer series soils characterized as moderately well-drained soils that formed in loess on upland sites (Herman 1979). The site itself is gently sloping with an intermittent tributary of Crab Orchard creek draining the woods. Historically, Thompson Woods was considered an upland oak savanna on the border between the Till plains to the north and the Shawnee Hills to the south (Anderson and Anderson 1975, Edgin and Ebinger 1997).

The area is a 4.1-hectare mixed oak-hickory woodlot composed primarily of decadent southern red oak, black oak, post oak, and shagbark hickory in the overstory (see table 1 for scientific and common names). In contrast mixed mesophytic species such as black cherry, sugar maple, American beech, and a mix of exotic vines and shrubs dominate the understory. The stand is located in the center of campus and is considered by some to be a key part of the Southern Illinois University landscape.

Over time, Thompson Woods has experienced many land-uses, but today is largely dissected by paved pathways and is used for recreation and education. Because of its importance to the University community, Thompson Woods is an ideal area for historical analysis to elucidate the effects of differing land-uses on savanna vegetation over time and to attempt an understanding of the forces needed to begin restoration of this beloved campus woodlot.

METHODS
We compiled the history of human activity on the site from a variety of sources. Pre-settlement Native American occupation was gleaned from local archaeological sources. While no major river system lies near the area reducing the likelihood of a large village, local seasonal camps existed along nearby creeks and numerous rockshelters have been utilized since Archaic periods (B. Butler, personal communication).

Post-European settlement history was investigated using local histories, archival resources, and unpublished memoirs of local businessmen (Boggess 1906, Lentz 1955, Allen 1963). To document land transfers and bills of sale, we searched deeds and tax records archived in the Jackson County Courthouse, Murphysboro, Illinois. In addition, old maps and aerial photographs of the campus provided visual evidence for vegetation change on the study site.

During October 2000, the class collected stand structure analysis data in ten 0.02 ha overstory sample plots placed every 20 m along transects through the woodlot. Overstory data included diameter at breast height (dbh = 1.37 m) by species for all trees (dbh > 8 cm). For each tree species, we calculated a relative importance value (IV) by summing the relative density (density = # tree ha⁻¹) and relative dominance (basal area = m² ha⁻¹) and dividing by two (Cottam and Curtis 1956). These importance values refer to the relative contribution of a species to the entire community (Barbour and others 1987). In addition, 44 overstory trees were cored at dbh for age determination and radial growth analysis. Nested circular plots of 20 m² and 5 m² were used to collect sapling (stems < 8 cm dbh, > 1.4 m tall) and seedling (0.2 m tall < stems < 1.4 m tall) densities within each of the overstory plots.
Individual cores (n = 44) were taken to the laboratory, dried, mounted, and sanded following methods of Phipps (1985). Cores were cross-dated using signature years and verified using the COFECHA program and ITRDLIB (Stokes and Smiley 1968). We used cores from the eight oldest southern red oak trees to construct a mean growth chronology of the site spanning 140 years. We measured annual growth increments with a Velmex measuring system and recorded the measurements with the PJK5 microcomputer program. Each time series was standardized to remove the age-related growth trend by dividing the yearly measured growth values by expected values obtained from fitting a linear regression to measured vales or the mean growth increment (Fritts and Swetnam 1989). These standardized ring-width indices were then averaged to develop the mean stand Chronology (Fritts and Swetnam 1989).

RESULTS AND DISCUSSION

The era of European settlement can be divided into two phases, the prep-railroad era and the post-railroad era.

Pre-Railroad Era (Early 1800s to 1850)

Direct historical data for the pre-railroad era is scanty. At the time of township surveys in 1806 through 1808, inhabitants in the vicinity of Carbondale were not noted. The war of 1812 brought the first wave of settlers to Illinois territory migrating from the east, and especially the south. According to Edmund Newsome in 1894, settlement in Jackson County in 1878 clustered around the Big Muddy River, the only major waterway in the county (Jackson County Historical Society 1997). In 1816, Jackson County was formed in Illinois Territory with a population of 565 inhabitants. According to S. Augustus Mitchell in his 1837 article titled A Sketch Descriptive of the Situation, settlement had rapidly continued and by 1835 the population had grown to 2,783 inhabitants (Gates 1979). In a promotional/informational pamphlet entitled Illinois in 1837, Jackson County was described as being, “mostly timbered, although it contains many prairies” (Gates 1979).

The Phelps family was the first to settle in Carbondale Township. They cultivated two or three acres of land in section 34 [south of the study area] and subsisted on wild foods gathered from the surrounding woods. As in the county at large, the first settlements were situated along small drainages. Families cleared enough land for subsistence and often, residence was temporary as people moved if crop yields were poor (Wright 1977). As reported by Marten in 1878, less than 10 acres were under cultivation in the Carbondale Township in 1831 (Jackson County Historical Society 1983). Mrs. John Alexander Floyd recalled that when the area was first settled, “there was more trees and hazel thickets than houses” (Wright 1977).

As settlement in the Carbondale Township increased, one of the major timber resources extracted from the forest was fence rails. John Allen (1963) estimated that one third of southern Illinois was encompassed by rail fences. He described the area surrounding the present day University campus as criss-crossed by rail fences. B.G. Root writing in about 1850, described some of the issues with fencing.

“Fencing is the hardest work which a new settler has to perform. Good white oak rails, laid up in fence, where it is required, are worth from $2 to $3 per hundred. To lessen the cost of fencing, it is very desirable for several friends to settle together, so that the land at first may be enclosed in one common field. 4,704 rails will fence 40 acres: 13,440 rails will fence 160 acres; 28,880 rails will fence one section, or 640 acres” (Gates 1979).

The intensity of land-use during the early settlement period in the area of Carbondale was probably greater than during Native settlement periods. The rising population of permanent farmers whose agrarian practices included fencing their fields began to have an effect on forest structure.

Railroad Era (1850 through 1939)

The town of Carbondale was founded with the sole intent of benefiting from opportunities for commerce afforded by its proximity to the Illinois Central Railroad. On 1850 September 20, the U.S. Congress granted the State of Illinois 2,595,000 acres of public lands for a railroad throughout the State (Gates 1979). This sparked the beginning of intensive use of the forests in Southern Illinois.

Daniel Brush was the driving force behind establishing a town on the railroad at a midpoint between two towns already designated as railroad stations, Makanda and De Soto. By late July 1852 the Illinois Central Railroad had established the rail line and surveyed to the Big Muddy River, in the northeast portion of the county. Daniel Brush sought an ideal town site
and described the vicinity of Carbondale as a “wilderness of forest and dense undergrowth of hazel bushes, wild grape, and running rose vines all over the surface of the ground” (Quaife 1944). However, in a landscape of hilly terrain, the site he chose was level and the railroad was persuaded that the proposed town of Carbondale would be an ideal place for a rail station.

Seizing the opportunity, in the fall of 1853, Brush dismantled a mill he owned near Thebes where the timber supply was already exhausted. He brought all the mill fixtures to Carbondale where he set up a lumber mill with two circular saws and a gristmill near the present day University central quad (Quaife 1944).

Brush described the mill and business as follows:

“I employed a good many men myself in the building of my mill and storehouse, the depot and a large woodshed for the Company [Illinois Central Railroad], and in preparations for my dwelling house, having the stone foundation laid, the cellar dug out and walled, cisterns excavated, etc.; and having the station to attend to besides, kept me busy. I kept the sawmill doing its best turning out lumber for the buildings I was erecting. I reserved the best for my dwelling house and had it nicely stacked to season and be ready when I should start the work. I had a supply of choice poplar and oak timber on my own land near the mill, while I gathered it in and cut it up as fast as my steam-propelled circular saws could do it. I purchased off farmers and others a large quantity of wood by the cord delivered at the shed for use as fuel in their engines, no coal being then burned by them. It was well for those who were clearing up land nearby as they could turn their timber into money at a paying rate” (Quaife 1944).

Brush’s mill was located in close proximity to Thompson Woods (less than 200 m) indicated as “choice poplar and oak timber” in the above list of landholdings. This “supply of ... timber on my own land near the mill” suggests that the woods were standing at the time of writing. This establishment of sawmills for lumber extraction was a common theme across the region. In a letter dated 1855, B.G. Root advertised for the Illinois Central Railroad on the desirability of settling in southern Illinois.

“Numerous saw-mills are being erected in the timber along the railroad, south of the Big Muddy River. Some are completed, and lumber yards are established at almost every station, where the pine of the North meets the poplar, cypress, black walnut, sycamore, maple and oak, from the South. There are saw-mills in the smaller portions of timber which occur at short intervals in this part of the State, but they are fully occupied in supplying the demand in their vicinity” (Gates 1979).

On July 4, 1854, the railroad track reached Carbondale from the south. The construction of the railroad north of Carbondale, an area where trees were sparse, required imported lumber and timber supplies.

Sutton (1981) reported that “crews of lumber jacks” were sent into the forests of Michigan, Wisconsin, and southern Illinois to supply the demand for cross-ties, bridge timbers, and finished lumber for buildings. Lumber was the second most important commodity, after agricultural products, shipped by the railroad. In many of the prairie regions, north of the study area, lumber for building, firewood for domestic use, and rail for fencing was in short supply. Lumbering in the southern parts of Illinois was especially encouraged to meet demand. The lumber industry developed rapidly, benefiting both the Illinois Central Railroad and those engaged in the lumber business.

In 1857 Carbondale reportedly had two steam sawmills and steam flouring mill and three brickyards (Wright 1977). In 1861, the Civil War broke out and population declined. The Illinois Central Railroad was instrumental during the war in shipping provisions and troops to the southern battlefields. The use of wood fuel in locomotives continued through the Civil War and until about 1895 when most locomotives had converted to coal (Sutton 1981).

The construction of the town buildings was also a draw on forest resources. Not only were the buildings made of lumber, but also sidewalks and streets were constructed of wood planks. In an editorial in the *New Era*, 1867 May 9, John H. Barton complained about the lack of repair of some city streets and that the situation was perilous for pedestrians. Other streets, he noted, “are kept in prime order and not a board nor a nail can be found out of place for several blocks,” while others “can only afford a few narrow, rotten boards, perhaps fastened at one end, which renders the way both more unpleasant and dangerous than the bare earth” (Quoted in Wright 1977).
By the last quarter of the 19th century, there were indications that the land had been significantly impacted by European settlement practices. With the settling of the County, large tracts of timberland had been clear-felled and game had largely been killed off and forced elsewhere in search of more sparsely populated districts.

Another indication of the degree of impact on forest resources is in the account of a murder. On 1878 June 29, Frank Chapman, a Carbondale resident who owned an interest in a large lumber mill near Vienna [south of the study area] was shot and killed while asleep in his hotel room. While the murderer was never brought to justice, one explanation asserted "operations at the mill had been declining as the timber supply was more and more depleted, and labor troubles were possibly at the bottom of the murder" (Wright 1977). Further in 1880, the Sanders' (Brush) mill was destroyed by fire and never rebuilt (Wright 1977). While the reasons for this are unclear, there were two other mills operating in town, and it may no longer have been profitable to operate a third.

In 1870, Carbondale was chosen for the location of a second teacher's training institution in Illinois. Mrs. Sanders, widow of Henry Sanders, gave 21 acres of farmland for the school. Four years later, in July 1874, the Southern Illinois Normal University was completed and dedicated. Lentz state that "[t]his beautiful building, a model of school architecture for the time, which had been erected on the site of Mrs. Sanders' strawberry patch, had, however, a most unattractive setting. Earth from the slight excavation for the first story stone basement had yet to be leveled; landscaping, tree planting, fencing, and pavement had to wait development during the months ahead. The treeless field required grading and fencing; walks must be provided and streets leading to the residential area opened up" (Lentz 1955).

In 1886, Theodore Thompson purchased land adjacent to the university, on the west half of Section 28 and northeast quarter of Section 29. The property included Thompson Woods and the area surrounding Campus Lake. It was called Thompson Lake at that time. The Thompson's were fruit growers, which suggests that the land adjoining the university was largely agricultural. In 1903 Theodore Thompson died, leaving the NW quarter of Section 28 to his wife Lavinia except for 8 acres that were reserved for homes for his four children (Wright 1977).

In fall 1902, the Ayer and Lord Tie Company began operations in Carbondale. Mr. Lord, the proprietor, "told the local people that the plant in Carbondale, when in operation, would have a capacity 25 percent larger than any other plant of similar function in the world" (Wright 1977). This suggests that some regrowth of timber had ensued since the vast cuttings of the 1850s and 1860s. In 1914, white oak from the woods was harvested for use in the stave industry (Karlovich and Niebruegge 1997).

University Campus
In 1940, Lavinia Rendleman Thompson sold her property to the Southern Illinois Normal University. The purchase contract included a restrictive clause stating that Thompson Woods was to be retained in a natural state as a "priceless feature of landscape architecture." As Thompson Woods was incorporated into the University campus it slowly became regarded as a "wilderness area." Despite this perception, over the past 60 years different management activities have been implemented. Various hardwood seedlings, predominately oak, ash, and tulip poplar have been planted. In addition, the University's physical plant has performed various other management operations. For example, in 1980, in the eastern and southern portions of the woods, underbrush was cleared and all trees less than 6 inches in diameter were felled. This resulted in the removal of half of the seedlings planted during the 1970s.

More recently, management activities have included the removal of some non-native tree species and herbiciding of vines and more competitive herbaceous species (Karlovich and Niebruegge 1997). Natural events have played a role in shaping the stand structure. In the summer of 1980, two large windstorms damaged many of the larger trees, especially the oaks and hickories. It is estimated that 30 percent of the woods' total basal area was downed during the two storms (Karlovich and Niebruegge 1997).

Current Vegetation
The Thompson Woods stand is currently dominated by black cherry and elm with minor contributions of black oak, hickory, and American beech (table 1). Relative importance values indicate that black cherry, the largest contributor to the mid-canopy classes, contributes both high basal area and density to the
stand. In contrast, the canopy dominants such as southern red oak and black oak contribute relatively low basal area and densities to the stand.

The canopy of the stand reflects fairly equitable numbers of species across canopy classes (fig. 1). However, these classes also reflect a considerable increase in the number of mixed mesophytic species recruiting into the upper canopy at the expense of the two dominant oak species, southern red and black oak. Indeed, very few oak trees occupy the mid-level canopy positions.

The current diameter distribution also suggests that most oaks exist in the larger diameter classes with only a few red oaks in the 5 to 9.9 cm range (fig. 2). These individuals reflect balled stock plantings by the University to augment poor oak regeneration in the stand. The inverse-J shaped diameter distribution reflects a typical uneven-aged stand comprised of older oak-hickories in the larger diameter classes with transitional mixed mesophytic species in the low diameter classes (Smith 1986).

**Stand Age Structure**
The dominant overstory trees were all oak species recruited following the cutting of Thompson Woods in the 1850s (fig. 3a). The age structure suggests that the original oak stand probably regenerated via advanced regeneration and/or stump sprouting following the cutting. Initial recruits included the less shade tolerant post and southern red oak, followed 30 years later by the mid-successional white oak (Abrams and others 1995, Shumway and others 2001). Indeed, the stand appears to have developed a

<table>
<thead>
<tr>
<th>Species</th>
<th>BA per ha</th>
<th>Rel. dominance per ha</th>
<th># per ha</th>
<th>Rel. density</th>
<th>IV</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Prunus serotina</em> Ehrh. (black cherry)</td>
<td>5.9</td>
<td>26.2</td>
<td>177.1</td>
<td>32.7</td>
<td>29.5</td>
</tr>
<tr>
<td><em>Ulmus L. spp.</em> (elm)</td>
<td>1.9</td>
<td>8.3</td>
<td>73.5</td>
<td>13.6</td>
<td>10.9</td>
</tr>
<tr>
<td><em>Quercus velutina</em> Lam. (black oak)</td>
<td>3.0</td>
<td>13.2</td>
<td>13.4</td>
<td>2.5</td>
<td>7.9</td>
</tr>
<tr>
<td><em>Carya L. spp.</em> (hickories)</td>
<td>2.0</td>
<td>8.7</td>
<td>33.4</td>
<td>6.2</td>
<td>7.5</td>
</tr>
<tr>
<td><em>Fagus grandifolia</em> Ehrh. (American beech)</td>
<td>2.0</td>
<td>9.0</td>
<td>20.0</td>
<td>3.7</td>
<td>6.4</td>
</tr>
<tr>
<td><em>Fraxinus americana</em> L. (white ash)</td>
<td>1.0</td>
<td>4.3</td>
<td>30.1</td>
<td>5.6</td>
<td>4.9</td>
</tr>
<tr>
<td><em>Quercus falcata</em> Michx. (southern red oak)</td>
<td>1.4</td>
<td>6.2</td>
<td>16.7</td>
<td>3.1</td>
<td>4.6</td>
</tr>
<tr>
<td><em>Acer saccharum</em> Marsh. (sugar maple)</td>
<td>1.0</td>
<td>4.4</td>
<td>13.4</td>
<td>2.5</td>
<td>3.4</td>
</tr>
<tr>
<td><em>Liriodendron tulipifera</em> L. ( tulip poplar)</td>
<td>0.7</td>
<td>3.0</td>
<td>20.0</td>
<td>3.7</td>
<td>3.4</td>
</tr>
<tr>
<td><em>Sassafras albidum</em> (Nutt.) Nees (sassafras)</td>
<td>0.4</td>
<td>1.9</td>
<td>20.0</td>
<td>3.7</td>
<td>2.8</td>
</tr>
<tr>
<td><em>Gymnocladus dioicus</em> (L.) K. Koch (Kentucky coffeetree)</td>
<td>0.9</td>
<td>4.1</td>
<td>6.7</td>
<td>1.2</td>
<td>2.6</td>
</tr>
<tr>
<td><em>Cercis canadensis</em> L. (eastern redbud)</td>
<td>0.2</td>
<td>1.1</td>
<td>20.0</td>
<td>3.7</td>
<td>2.4</td>
</tr>
<tr>
<td><em>Morus alba</em> L. (white mulberry)</td>
<td>0.3</td>
<td>1.2</td>
<td>13.4</td>
<td>2.5</td>
<td>1.8</td>
</tr>
<tr>
<td><em>Quercus palustris</em> Muenchh. (pin oak)</td>
<td>0.5</td>
<td>2.3</td>
<td>6.7</td>
<td>1.2</td>
<td>1.8</td>
</tr>
<tr>
<td><em>Acer negundo</em> L. (boxelder)</td>
<td>0.1</td>
<td>0.5</td>
<td>13.4</td>
<td>2.5</td>
<td>1.5</td>
</tr>
<tr>
<td><em>Diospiros virginiana</em> L. (persimmon)</td>
<td>0.2</td>
<td>0.9</td>
<td>10.0</td>
<td>1.9</td>
<td>1.4</td>
</tr>
<tr>
<td><em>Morus rubra</em> L. (red mulberry)</td>
<td>0.2</td>
<td>0.8</td>
<td>10.0</td>
<td>1.9</td>
<td>1.3</td>
</tr>
<tr>
<td><em>Platanus occidentalis</em> L. (American sycamore)</td>
<td>0.4</td>
<td>1.7</td>
<td>3.3</td>
<td>0.6</td>
<td>1.2</td>
</tr>
<tr>
<td><em>Prunus avium</em> (L.) L. (mazzard or bird cherry)</td>
<td>0.0</td>
<td>0.2</td>
<td>10.0</td>
<td>1.9</td>
<td>1.0</td>
</tr>
<tr>
<td><em>Maclura pomifera</em> (Raf.) Schneid. (osage-orange)</td>
<td>0.0</td>
<td>0.2</td>
<td>6.7</td>
<td>1.2</td>
<td>0.7</td>
</tr>
<tr>
<td><em>Celtis occidentalis</em> L. (hackberry)</td>
<td>0.2</td>
<td>0.7</td>
<td>3.3</td>
<td>0.6</td>
<td>0.7</td>
</tr>
<tr>
<td><em>Quercus alba</em> L. (white oak)</td>
<td>0.0</td>
<td>0.1</td>
<td>6.7</td>
<td>1.2</td>
<td>0.7</td>
</tr>
<tr>
<td><em>Liquidambar styraciflua</em> L. (sweetgum)</td>
<td>0.1</td>
<td>0.5</td>
<td>3.3</td>
<td>0.6</td>
<td>0.6</td>
</tr>
<tr>
<td><em>Juniperus virginiana</em> L. (Eastern redcedar)</td>
<td>0.1</td>
<td>0.4</td>
<td>3.3</td>
<td>0.6</td>
<td>0.5</td>
</tr>
<tr>
<td><em>Catalpa Scop. spp.</em> (catalpa)</td>
<td>0.0</td>
<td>0.1</td>
<td>3.3</td>
<td>0.6</td>
<td>0.3</td>
</tr>
<tr>
<td><em>Cornus florida</em> L. (flowering dogwood)</td>
<td>0.0</td>
<td>0.0</td>
<td>3.3</td>
<td>0.6</td>
<td>0.3</td>
</tr>
</tbody>
</table>

| Totals                                  | 22.6      | 100.0                 | 541.3    | 100.0        | 100.0|

Table 1.—Summary of current vegetation including basal area (BA) and density (#/ha). Importance values (IV) are the average of the relative dominance and density values.
savanna type structure following the initial cutting of the 1850’s, which was maintained throughout the early 1900s by burning and grazing (Ruffner and Arabas 2000).

Radial analysis coupled with the age-diameter relationships allows us to reconstruct the structure of the stand in the late 1890s (figs. 3a and 3b). Early growth of the post oak indicates high growth rates indicative of a high light environment such as would be found in a recently cut forest. Moderate fluctuations of the ring-with index indicate another canopy disturbance in the mid-1870s, perhaps selective logging or understory burning. Following this increased growth is a regeneration pulse of southern red, white, and post oak that continues into the early 1900s. Following this is a distinct stem-exclusion stage probably fostered by extensive grazing in the forest during the farm establishment period discussed above (Abrams and others 1997, Ruffner and Arabas 2000).

No major recruitment or growth releases occurred through the early 1900s until after 1950 when a significant cohort of mixed mesophytic species were established, timed with a moderate overstory disturbance (fig. 3). No significant oak regeneration has occurred in the last 100 years of the stand’s history and it appears to be transitioning towards a later successional stand comprised of black cherry, sugar maple, and beech. Similar predictions have been made for other midwestern and northeastern mixed oak-hickory forests (Lorimer 1985, Abrams 1992, Orwig and Abrams 1994, Ruffner and Abrams 1998, Shumway and others 2001).

The original savanna vegetation of Thompson Woods was essentially lost after the transfer of the parcel to the University. Cause for this shift in vegetation types is equivocal at this time but several variables may explain this. First, the “protection clause” stating that Thompson Woods was to be retained in a natural state as a “priceless feature of landscape architecture” was interpreted quite literally by the University to mean that no “active” management could be implemented to maintain the unique oak savanna structure (P. Robertson, personal communication). Second, the political and ecological mindset of the mid 1950s held fire as an enemy of the forest and thus no University groundskeeper would understand or perhaps accept the inherent need for fire in this ecosystem.

The University, however, understood its limitations to this hand’s off approach to

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**Figure 1.**—Canopy class distribution for species in Thompson Woods, Southern Illinois University campus woodlot. Abbreviations for species are QURU, Quercus rubra; FRAM, Fraxinus americana; FAGR, Fagus grandifolia; QUVE, Quercus velutina; and PRSE, Prunus serotina.

**Figure 2.**—Diameter distribution for species sampled in Thompson Woods. See figure 1 for species abbreviations.

Thompson Woods. Afterall, several times during the 1970-1990s, numerous storms battered the overstory trees and many of these individuals were felled for safety reasons. By the time of these selective fellings, oak regeneration was outcompeted by the more numerous mixed mesophytic species and these disturbances acted only to accelerate the succession of the stand (Abrams and Scott 1989, Abrams and Nowacki 1992).

Future management options include sustained planting of native oak-hickory seedlings that heretofore has met with little success. The
primary reason for the failure of these plantings appears to be the lack of adequate sunlight reaching the forest floor. With extremely shaded understory conditions, planted oak seedlings will continue to fail until large gaps are formed in the canopy (Larsen and others 1997). During the summer of 2001, numerous large canopy gaps were formed via felling of overstory sugar maple and beech trees.

While canopy openings may enhance oak survival, successful recruitment into these gaps requires the reduction of competing vegetation, i.e., advanced reproduction of sugar maple, beech, and black cherry. To accomplish this reduction of competing vegetation, a prescribed burn was conducted in October 2001 and another is scheduled for Fall 2002. Understory burns have been shown to reduce small stems of fire intolerant species such as maples, beech, and ash (Brose and Van Lear 1998).

CONCLUSIONS
An oak savanna woodland developed as a result of post-European settlement land-uses including logging, burning, and grazing during the mid 1800s. This unique savanna structure was maintained throughout the early years of the Southern Illinois University but was radically altered when the University enacted a “protection” policy eliminating natural disturbances, particularly fire, which would have helped sustain the savanna habitat.

Thompson Woods provides an important lesson for land managers in making clear the distinction between preservation and conservation. Most natural area preserves are set aside to protect unique habitats such as glade barrens, hill prairies, or oak savannas. Often, these systems require periodic fire to maintain the unique habitat qualities and within the literal translation of “preservation,” no active management is deemed the appropriate course and eventually, the set-aside preserve changes into a different system and the original unique habitat is no longer preserved, but lost. We hope the lessons of this University forest stand provide answers for those land managers responsible for maintaining such remnant forests on their properties.

LITERATURE CITED


Figure 3.—Age-diameter relationships for trees cored in Thompson Woods survey. Ring width index for five oldest southern red oak trees.


