

# The Occurrence of Slippery Elm (*Ulmus rubra* Muhl.) Root Sprouts in Forest Understories in East-central Illinois

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## ABSTRACT

*Ulmus rubra* Muhl. (slippery elm) is the dominant woody understory species of many mesic forests of east-central Illinois. Most slippery elm seedlings and small saplings are sprouts from horizontal roots that grow in the top 5 cm of the soil. Of the specimens examined the horizontal roots were between 6 and 457 cm long, and with one to 31 sprouts. These sprouts, which were usually less than 1 m tall, ranged from one to nine years in age. The sprouts only rarely develop into larger saplings.

## INTRODUCTION

*Ulmus rubra* Muhl. (slippery elm) is a common species of deciduous forests throughout most of eastern United States (Braun 1950, Gleason and Cronquist 1991). Prior to European settlement elms were common in many Illinois forests (Kilburn 1959, Ebinger 1986, 1987, Rodgers and Anderson 1979). Presently elms, particularly slippery elm, are still common in the overstory. In the uplands of Hart Memorial Woods, Champaign County, slippery elm ranked third in importance value (IV), and dominated the smaller diameter classes (Johnson et al. 1978). Similar results were obtained for Funk Forest Natural Area, part of an extensive prairie grove in McLean County, where slippery elm ranked sixth in IV (Cox et al. 1972). Surveys in other mesic forests throughout central Illinois indicate a continued importance of slippery elm in the overstory (Bogges and Bailey 1964, McClain and Ebinger 1968, Pelz and Rolfe 1977). All of these forests are located in the southern part of the Grand Prairie Section of the Grand Prairie Division in central Illinois (Schwegman 1973).

In dry-mesic and mesic forests of central Illinois, slippery elms are among the dominant members of the understory (Adams and Anderson 1980). In some mesic forests, particularly in east-central Illinois, it is one of the three most abundant woody understory species along with *Acer saccharum* Marsh. (sugar maple) and *Fraxinus americana* L. (white ash). At Hart Memorial Woods, Champaign County, slippery elm dominated the seedling and sapling categories, accounting for about one-third of the tree seedlings (Root et al. 1971, Johnson et al. 1978). Similar results were obtained for Baber Woods Nature Preserve in Edgar County (Newman and Ebinger 1985), Sullivan Woods in Moultrie County (Baumgartner et al. 1992), Sargent Woods in Coles County (Ebinger 1968), and Walnut Point State Park in Douglas County (Ebinger et al. 1977).

While surveying the understory of some of these forests, the authors observed that many of the slippery elm seedlings and small saplings originated from a horizontal root system. The only reference found that describes slippery elm root sprout development is Curtis (1959): "The seedlings, however, have developed a very unusual ability to send out long rhizomes with erect branches at their tips. Each aerial stem may be 12 to 20 inches high. The plants may eventually form a cluster of 30 or more such stems." The present study was undertaken to determine the extent of slippery elm root sprout formation in the understory of some mesic forests in east-central Illinois.

## MATERIALS AND METHODS

During the summer of 1995 slippery elm sprouts were randomly selected from along transects in three mature forest communities in east-central Illinois (Baber Woods, Walnut Point State Park, Sullivan Woods). Soil was moved away from each sprout exposing the entire horizontal root system for removal. The root system was then laid on a piece of plastic and measured (cm). The number of sprouts along the root were counted, measured, and a small basal section of each sprout removed and aged.

In the early summer of 1996, the woody understory composition and density (stems/ha) at the Baber Woods Nature Preserve was determined using nested circular plots 1 m<sup>2</sup>, 10 m<sup>2</sup>, and 100 m<sup>2</sup> in size. This forest was divided into quadrats 50 m on a side during the original survey by McClain and Ebinger (1968). Two sets of nested quadrats were located in each of these large quadrats by blind-throwing a marker from opposite corners of the quadrat. Four additional 1 m<sup>2</sup> circular plots were located 5 m to the north, east, south and west of each center. Seedlings ( $\leq 50$  cm tall) and all shrubs were counted in the 1 m<sup>2</sup> circular plots, small saplings ( $> 50$  cm tall and  $\leq 2.5$  cm dbh) were recorded in the 10 m<sup>2</sup> circular plots, and larger saplings (2.5-10.0 dbh) were tallied in the 100 m<sup>2</sup> circular plots. Saplings were divided into 2.5 cm diameter size classes. Nomenclature follows Mohlenbrock (1986).

## RESULTS AND DISCUSSION

At Baber Woods Nature Preserve, a mesic forest located on the terminal moraine of Wisconsin glaciation in Edgar County, Illinois (T12N R13W S18), slippery elm ranked second in seedling density (7,629 stems/ha) and first in sapling density, dominating the small sapling category (Table 1). In the overstory slippery elm ranked seventh with an IV of 9.9, averaged 22.2 stems/ha, with an average diameter of 15.7 cm (Newman and Ebinger 1985). Nearly all of the seedlings and many of the small saplings (individuals to about 100 cm tall) were sprouts from horizontal root systems. More than 95% of the individuals examined were attached to a horizontal root. These horizontal roots were usually less than 10 mm in diameter and with lengths up to 457 cm (Table 2). Of the 30 examined, the horizontal roots averaged 78 cm in length, with 5.5 sprouts that were rarely longer than 100 cm. Most of the sprouts were relatively short-lived, averaged 3.6 years in age, with none exceeding nine years. No horizontal roots were found that had larger saplings attached probably because the root connection had become broken.

Similar results were obtained at Walnut Point State Park, a mesic oak-hickory forest on the uplands adjacent to the Embarrass River in Douglas County, Illinois (T14N R10E S1). Slippery elm ranked second in seedlings (3,336 stems/ha), first in saplings (6,425 stems/ha), and seventh in overstory IV, where it averaged 26.5 stems/ha with an average diameter of 15.5 cm (Ebinger et al. 1977). All of the slippery elms examined were sprouts from horizontal roots. These horizontal root systems had a average length of 125 cm with one 454 cm long (Table 2). Root sprouts averaged 5.3 per root, had an average length of 43.2 cm and varied from two to eight years in age, with an average of 4.5.

Slippery elm was also common at Sullivan Woods, a dry-mesic forest located on the relatively flat uplands of the Kaskaskia River drainage about 100 m from the Shelbyville Reservoir, Moultrie County, Illinois (T13N R5E S36). In this oak-hickory forest, slippery elm dominated the understory with 9,630 seedling/ha and 5,332 saplings/ha. In the overstory it ranked fourth in IV, averaged 33.4 stems/ha with an average diameter of 13.1 cm (Baumgartner et al. 1992). The horizontal roots of slippery elm averaged 58.6 cm in length with an average of 3.9 sprouts (Table 2). These sprouts averaged 34.6 cm in height, and averaged 1.9 years in age with none more than 4 years old. The maximum age of four years is probably due to a ground fire that occurred in the woods during the spring of 1991.

It appears that most of the seedlings and small saplings (less than 1 m tall) of slippery elm present in many east-central Illinois forests represent sprouts from extensive horizontal root systems. Although small one-year old seedlings were encountered, few seem to survive. Some of the larger saplings (2.5 cm dbh and above) probably developed from horizontal root systems, but only rarely was this observed.

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Table 1. Density (stems/ha) of the seedlings and saplings (by diameter classes) of the woody understory at Baber Woods Nature Preserve, Edgar County, Illinois in 1996.

Species	SEEDLINGS	SAPLINGS	LARGE SAPLINGS		
	≤50 cm tall stems/ha	>50 cm tall ≤2.5 cm dbh stems/ha	2.6-5.0 cm dbh stems/ha	5.1-7.5 cm dbh stems/ha	7.6-10.0 cm dbh stems/ha
<i>Acer saccharum</i>	17822	919	381	118	61
<i>Ulmus rubra</i>	7629	1605	70	23	15
<i>Carya</i> spp.	1983	32	1	2	–
<i>Prunus serotina</i>	1564	48	5	–	–
<i>Asimina triloba</i>	1032	798	34	2	–
<i>Fraxinus</i> spp.	419	32	–	2	–
<i>Ulmus americana</i>	387	16	13	4	4
Others (14)	1737	16	4	3	3
Totals	32573	3466	508	154	83

Table 2. Average horizontal root length, average number of sprouts per root, and length and age of root sprouts of slippery elm individuals in the understory of three forests in east-central Illinois. The maximum and minimum of each average is shown in parenthesis.

Site	Horizontal Root Length (cm)	Number of Root Sprouts	Root Sprout Length (cm)	Age of Root Sprouts
Baber Woods n=30 (Edgar Co.)	78.1 (6-457)	5.5 (1-31)	42.1 (6-105)	3.6 (1-9)
Walnut Point n=7 (Douglas Co.)	125.0 (15-454)	5.3 (1-13)	43.2 (11-98)	4.5 (2-8)
Sullivan Woods n=10 (Moultrie Co.)	58.6 (16-162)	3.9 (1-13)	34.6 (9-84)	1.9 (1-4)

