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**The  
Yellow-Poplar  
Leaf-Mining  
Weevil  
A Guide to  
Recognition  
and Habits  
in Alabama**

Bulletin 622  
July 1994  
Alabama Agricultural  
Experiment Station  
Auburn University  
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**FIRST PRINTING 2.5M, JULY 1994**

*Information contained herein is available to all persons  
without regard to race, color, sex, or national origin.*



# THE YELLOW-POPLAR LEAF-MINING WEEVIL

## *A Guide to Recognition and Habits in Alabama*

L.L. HYCHE<sup>1</sup>

### INTRODUCTION

The yellow-poplar leaf-mining weevil<sup>2</sup> occurs throughout much of the eastern United States from Massachusetts west to Michigan and Missouri and south to the Gulf of Mexico(1). Yellow-poplar (*Liriodendron tulipifera* L.), also known as tuliptree, is its most common host, and the weevil's range corresponds closely with the natural distribution of the tree. Magnolias (*Magnolia grandiflora* L., *M. virginiana* L.) and sassafras [*Sassafras albidum* (Nutt)] also are listed as hosts(1,2). Weevil adults and larvae feed on and destroy foliage of host trees. Historically, infestations in natural hardwood forests have been localized, and the weevil has not been considered a threat to yellow-poplar timber. However, some serious outbreaks have been recorded. During the 1960s, several outbreaks caused serious loss of foliage on yellow-poplar in the Ohio River Valley and Appalachian Mountain regions(1).

In Alabama, yellow-poplar is a valuable timber tree and a prized ornamental. Since the mid-1980s, localized infestations of the weevil have been observed periodically on yellow-poplar shade and ornamental trees in some areas of east-central Alabama(3). Infestations of greatest concern have been those occurring on young yellow-poplars transplanted into the urban and suburban landscape. Damage to foliage of these trees reduces their ornamental value and may affect survival. Consequently, research was conducted to determine the life history and habits of the yellow-poplar leaf-mining weevil on ornamental trees in the urban/suburban forest.

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<sup>2</sup>*Odontopus calceatus* (Say). Order Coleoptera, Family Curculionidae. No standardized common name has been established for *O. calceatus*. Yellow-poplar leaf-mining weevil is a name in common usage locally.



Photo 1. Adult *O. calceatus* just emerged from hibernation.



Photo 2. Eggs in midrib of yellow-poplar leaf. The end-to-end, stacked arrangement is typical.



Photo 3. Full-grown larvae in larval mine. Note conspicuous black strands of excrement extruded by larvae.

## METHODS

Studies were carried out in Auburn during 1989-91 on yellow-poplar shade trees and young ornamental yellow-poplars transplanted along a parkway. Trees were inspected daily or every other day beginning in February prior to budbreak and continuing until leaves appeared. When leaves began to appear, trees were inspected daily for evidence of emergence of overwintering adult weevils and for the start of feeding, mating, and oviposition (egg laying). Habits of egg-laying females were noted, and the oviposition site and number of eggs laid per site were recorded. Leaves containing eggs of known age were examined daily to determine time of hatch and start of larval feeding. Following egg hatch, infested leaves were examined at one- to three-day intervals to determine larval habits and development, time and site of pupation, and time of emergence of new adults. All life stages of the weevil were collected and identified, symptoms of attack and types of leaf damage were recorded, and life habits and seasonal cycle were determined.

## RESULTS

### *Life Stages*

The adult weevil (Photo 1) is described as "... 2.5 mm to 3.9 mm long and 1.4 mm to 2.4 mm wide. Most specimens are black with dark brown antennal segments, tarsi, and mouthparts. Specimens from southern areas frequently have ... tarsi and antennal segments yellow. The antennal club is usually dark brown or black(1)." (NOTE: One inch equals 25.4 mm.)

Weevils collected in east-central Alabama generally fit this description. They are shiny to dull black with light tan to yellowish tarsi (feet). The basal one-half to two-thirds of the first antennal segment and the antennal club are dark brown to black, and the segments in between are yellowish to light tan. Adults collected in Lee County were 3-4 mm long.

Eggs (Photo 2) are oblong-oval, yellowish to cream in color, and 0.6-0.7 mm long. They are laid end-to-end in a row in the midrib of the leaf.

Larvae (Photo 3) are found in mines between leaf surfaces. They are flattened, legless, and whitish with light tan head capsules. Mean length of full-grown larvae collected locally was 6 mm.

Cocoons (Photo 4) are spherical, 3.5-4.5 mm (mean 4.1 mm) in diameter, reddish brown, and loosely woven. Larvae pupate in the cocoons inside larval mines. Pupae (Photo 5) are white and 3-4 mm long. They are usually visible within the loosely woven cocoons.

### *Damage and Symptoms of Attack*

Damage to foliage is caused by adults feeding on leaf surfaces, by females ovipositing in leaf midribs, and by larvae mining within leaves. In the spring, overwintering adults emerge from hibernation and feed on stipules (Photo 6) and new leaves (Photo 7, p. 6). Feeding sign on these structures signals the start of weevil activity. These adults feed on the undersurface of leaves, removing small circular to oblong patches of tissue. Feeding sites may be scattered over the leaf area but commonly are in the interior of the leaf,



Photo 4. Spherical cocoons constructed by larvae in which to pupate.



Photo 5. Typical weevil pupa.

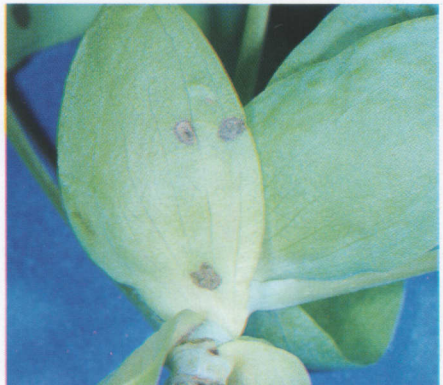


Photo 6. Adult feeding sign on stipules of yellow-poplar.

often near the midrib (Photo 7). Subsequently, leaf tissue remaining on the upper surface at feeding sites turns orange-tan (Photo 7), then brown, and disintegrates, leaving holes where feeding occurred. These damaged leaves (Photo 8, p. 6) may persist until leaf drop in fall.

Female weevils damage leaves by laying eggs in the leaf midrib (photos 9, p. 6; 17, p. 11). Midrib tissue at the oviposition site dies and turns brown (Photo 9). Weakened midribs often break, causing leaves to fold over at the oviposition site (Photo 10, p. 6). Some broken leaves may persist as such until leaf drop in the fall; others may be torn by wind action and remain on trees as ragged leaf stubs (Photo 11, p. 6).

Larvae destroy leaves by mining between leaf surfaces (photos 12A-C, p. 7). There is usually one mine per leaf, but occasionally there may be two (Photo 12B). Heavily mined leaves may die and drop. Partially mined leaves may persist as ragged leaf stubs until fall (Photo 11).

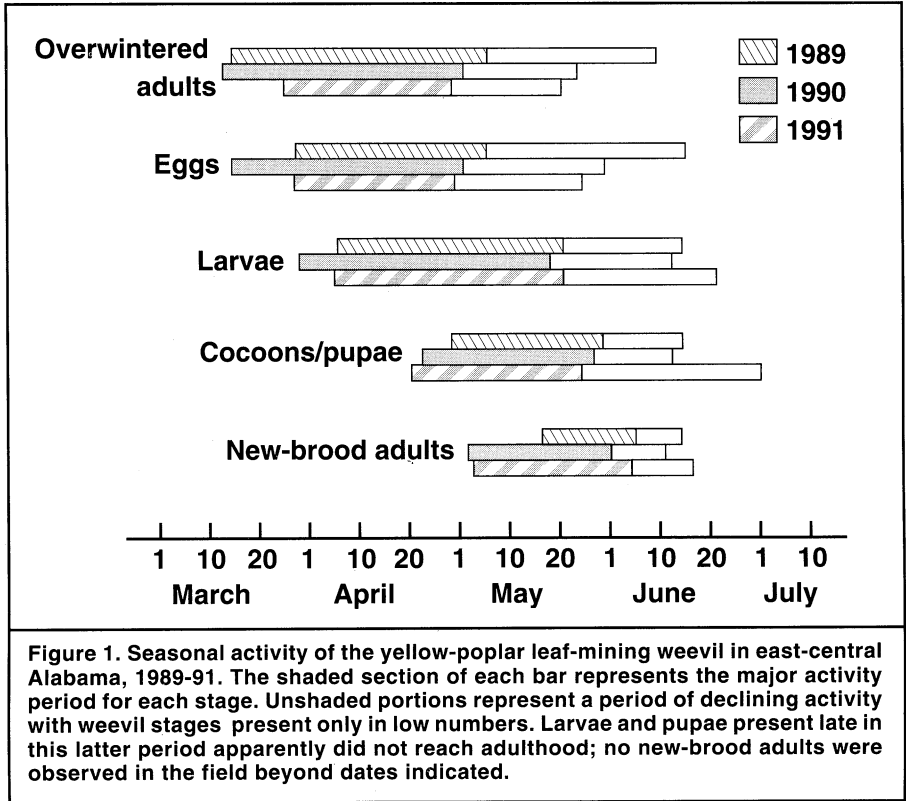
New-brood adults feed on leaf surfaces, with feeding usually beginning at or near leaf margins in the apical area of the leaf blade (Photo 13, p. 10). Feeding is primarily on the lower surface, but new adults also have been observed feeding on the upper surface. Damage by new-brood adults is more extensive than that caused by parent adults, and large areas of leaf or entire leaves may be killed (Photo 14, p. 10).

Overall, weevil damage can result in serious reduction in the aesthetic value of shade and ornamental trees. Young transplants in urban and suburban areas may be particularly vulnerable to injury. With sufficient loss of foliage, growth may be retarded, twig and shoot die-back may occur, and form and survival of trees may be affected.

### *Life History and Seasonal Cycle*

Yellow-poplar apparently is the primary host of the yellow-poplar leaf-mining weevil in Alabama. During the course of the study, no evidence of feeding or egg-laying was found on magnolias or sassafras growing in the vicinity. The weevil overwintered as an adult hibernating in trash or litter near and around host trees. In each year of the study, overwintering adults became active only after leaves on yellow-poplar began to appear. In the Auburn vicinity, appearance of host leaves was first noted on March 1, 1989; February 27, 1990; and March 4, 1991. The seasonal cycle and primary periods of development and activity of the weevil are presented in Figure 1.

In 1989, emergence of overwintering adults was first detected March 14, two weeks after start of leaf development. Sign of feeding by adults on stipules and leaves (photos 6, 7) was first found on March 17. Mating was first observed on March 24, and the first evidence of oviposition was detected on March 26. Weevils were first found in 1990 on March 12, and in 1991 on March 24 — 14 and 20 days, respectively, after start of leaf development. Adult feeding sign was observed on these same dates, and sign of oviposition was detected two days later.



Overwintered adults were common through April into the first week of May each year. Thereafter, weevils were scarce, but a few were observed occasionally on foliage into late May in 1990 and 1991 and early June in 1989. The period of parent adult activity overlapped the start of activity of new-brood adults.

The principal period of oviposition was late March through April. Egg laying diminished noticeably in May, but some occurred as late as May 18, 1991; May 23, 1990; and June 9, 1989. Eggs were deposited in a section of the leaf midrib on the undersurface of the leaf. Commonly, there was only one group of eggs per leaf, but two groups were found on a few leaves. Midrib diameter, or some midrib characteristic indicated by diameter, was a factor in selection of sites for oviposition on yellow-poplar. Locations of oviposition sites by leaf size and midrib diameter were obtained for 82 leaves. In all cases, oviposition occurred exclusively where the midrib diameter at the base of the egg-laying site was 1.1-1.7 mm (Figure 2, p. 8). On 82% of the leaves, diameter of the midrib at the point where oviposition began was 1.3-1.5 mm. Distance from the base of the leaf blade to the site of oviposition varied with leaf size (Figure 3, p. 9). On the smallest leaves (mean length of midrib 41 mm), the mean distance from base of midrib to point of oviposition was 10 mm and diameter of the midrib was 1.35 mm. Distance to

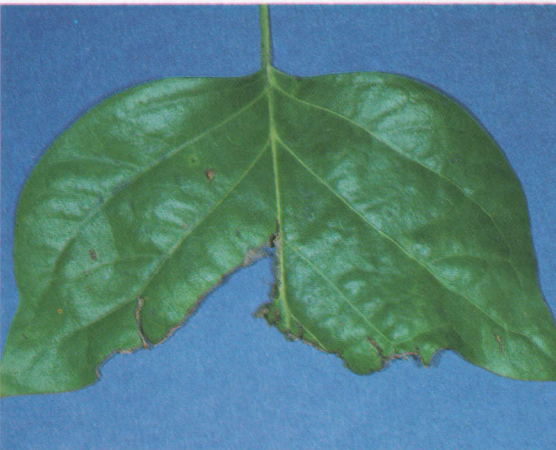


Photo 7 (top left). Newly emerged overwintering adults and typical damage caused by their feeding on the lower leaf surface.

Photo 8 (top right). Leaf in mid-summer with holes resulting from adult feeding on the undersurface in spring.

Photo 9 (center left). Section of leaf midrib damaged by the egg-laying female.

Photo 10 (center right). Leaf broken at oviposition site. Some broken leaves may remain on trees until fall.

Photo 11 (left). Ragged leaf stub retained on tree. Such stubs are the result of weathering which tears away portions of leaves damaged by oviposition, larval mining, or new-brood adult feeding.



the oviposition site increased progressively with increase in leaf size, with all sites located in the area where midrib diameter at the base of the site was within the 1.1- to 1.7-mm range.

In the ovipositional process(3), the female usually partially severed the midrib at a point basal to where eggs were to be deposited (photos 15, 17; p. 11). She then positioned herself on the midrib with her head toward the base of the leaf. She punctured the midrib with her snout (Photo 15), withdrew the snout, reversed her position to face the leaf apex, and deposited eggs into the puncture (Photo 16). The process was then repeated, moving toward the apex of the leaf. Egg laying killed midrib tissue. Length of the dead section of midrib measured in 84 leaves ranged from 3.5-10.5 mm, with a mean of six mm.

The number of egg punctures (Photo 17) per oviposition site varied from one to 10, with four punctures being the most common (Figure 4, p. 10). The number of eggs per puncture varied from zero to three, but 66% of the punctures contained two eggs each. When two or three eggs were present in a puncture, eggs were stacked one atop the other (Photo 2). The maximum number of eggs found at any oviposition site in this study was 19. However, one leaf examined contained 21 larvae, indicating the possible deposition of 21 eggs. Sixty-six percent of the oviposition sites contained five to nine eggs.

Egg hatch was indicated by the appearance of larval mines in leaf tissue at the edge of the oviposition site (Photo 12A). Larval mining was first observed in the field on April 5 in 1989,



**Photo 12A.** Leaf mine initiated by first-stage larvae; usually the first visible evidence indicating hatch of eggs.



**Photo 12B.** Two larval mines from a single group of eggs; occurs only occasionally.

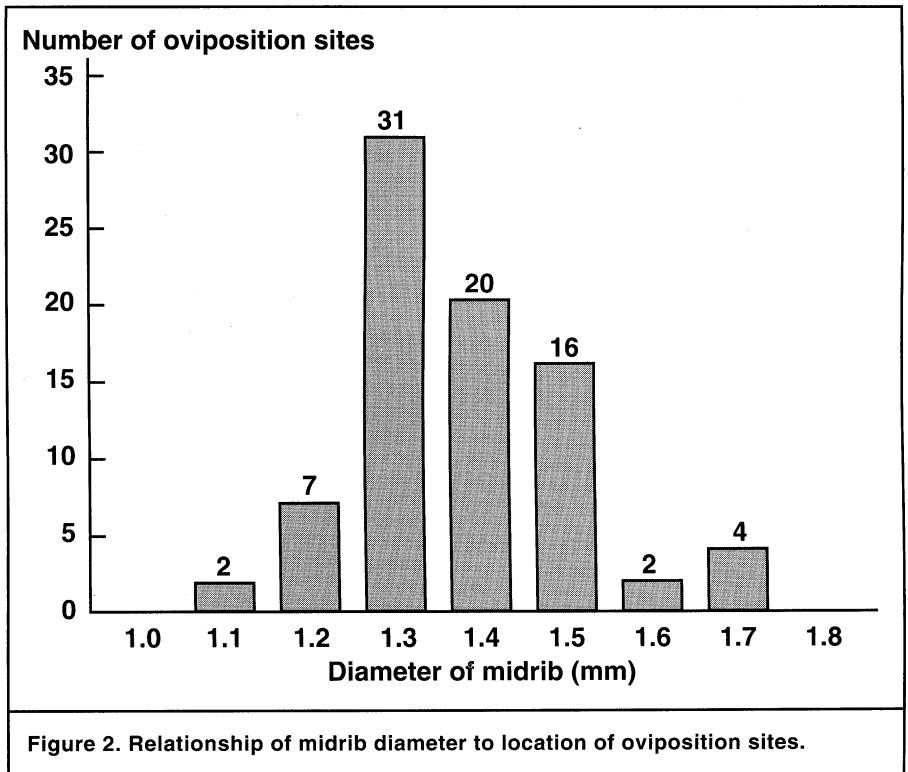


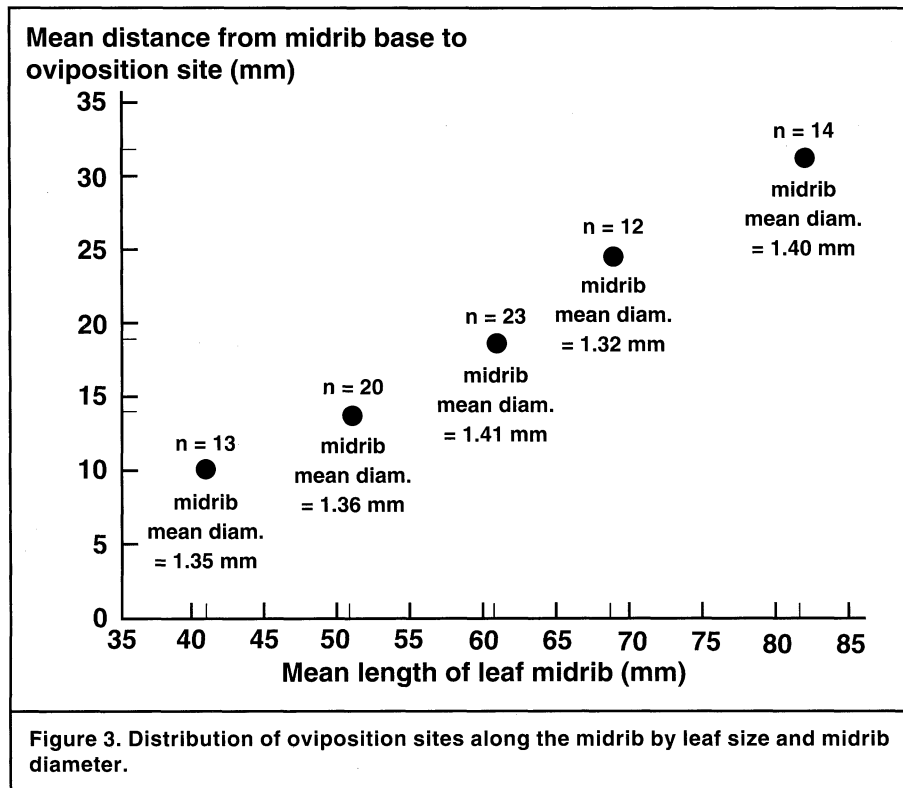
**Photo 12C.** Mined leaf typical of late-stage larvae.

10 days after first oviposition was recorded; March 29 in 1990, 15 days after first oviposition; and April 5 in 1991, 10 days after first oviposition (Figure 1). However, duration of the period from oviposition to start of larval mining varied with the season, apparently an influence of weather conditions. Actual dates of oviposition and start of larval mining were recorded for 55 individual groups of eggs laid from mid-March to mid-May. The period from oviposition to hatch varied from 4-17 days. Among 17 groups of eggs laid between March 14 and April 15, larval mines appeared in 8-17 days (mean 12.4). Among 38 egg groups laid between April 16 and May 17, mining appeared in 4-9 days (mean 6.5).

Larvae fed in groups in a common mine (Photo 3). There was usually only one mine per leaf (photos 12A, 12C), but occasionally there were two (Photo 12B). The number of larvae per leaf varied greatly, ranging from 1-21 among 120 leaves examined. Larvae mined extensively, often destroying much of the leaf area (Photo 12C). As development progressed, mines became inflated, and were partially filled with dark, continuous strands of excrement extruded by the larvae (Photo 3).

Fully grown larvae constructed spherical, reddish-brown cocoons (Photo 4) and pupated in larval mines (Photo 5). Cocoon formation was first noted April 28,





1989; April 23, 1990; and April 20, 1991. Length of the larval development period varied. Time from the first record of egg hatch to presence of the first cocoons in larval mines was 23 days in 1989; 25 days, 1990; and 15 days, 1991 (Figure 1).

The primary period of larval activity extended to about mid-May, but larvae were present in low numbers until late June. Pupae were most abundant during May, but were found as late as about the first of July in 1991. For the most part, these late-season larvae and pupae did not survive to adulthood. The reason for this was not established, but observations indicate that predation may have been a factor.

New-brood adults began to emerge during the first half of May, 28 days after hatch of the first-laid eggs in 1991; 34 days in 1990; and 41 days in 1989. New adults usually fed in groups beginning at or near leaf margins on the apical portion of the leaves or leaf lobes (Photo 13). Feeding was usually on leaves not damaged by larval mining. Damage caused by new-brood adults was much more extensive (Photo 14) than that caused by overwintered adults. The primary period of new adult activity was May to about mid-June. Subsequently, adults moved from trees to trash and duff on the ground and remained inactive until the following spring. Only one generation occurred each year.

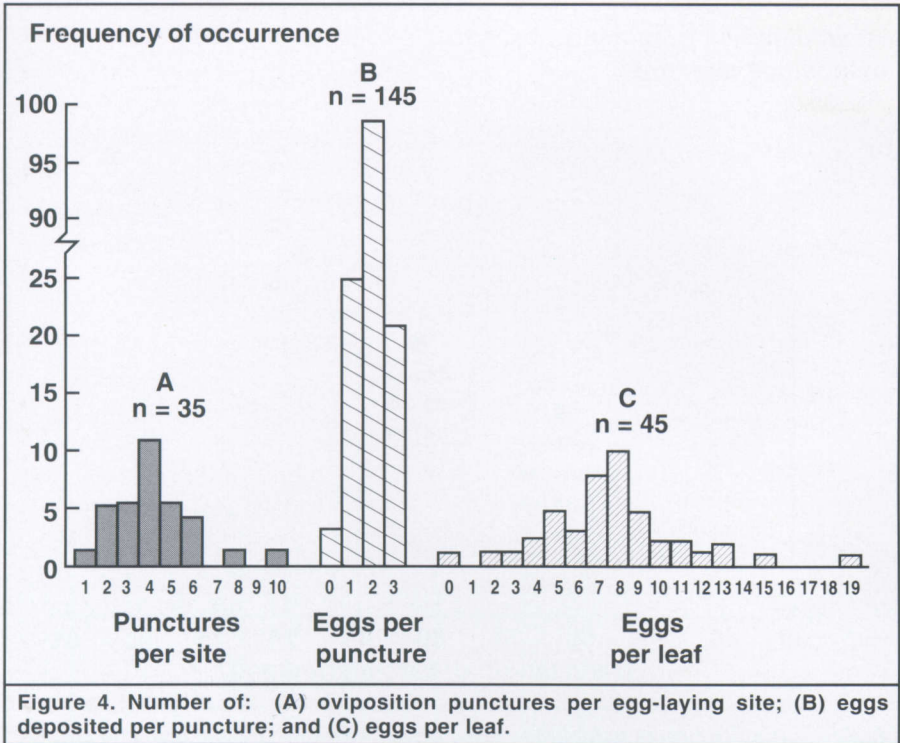


Photo 13 (above). New-brood adults and typical feeding damage.  
 Photo 14 (right). Extensive leaf damage caused by new-brood adults.



**Photo 15. Female puncturing midrib of leaf in preparation for laying eggs.**



**Photo 16. Female ovipositing in egg puncture.**



**Photo 17. Oviposition punctures in leaf midrib.**

## SUMMARY

The yellow-poplar leaf-mining weevil attacks foliage of yellow-poplar. Adults feed on the surfaces of leaves, and larvae mine between leaf surfaces. Destruction of foliage seriously reduces the aesthetic value of yellow-poplar shade and ornamental trees. Damage may affect growth, form, and survival of young trees transplanted into the urban landscape.

The weevil overwinters in the adult stage in hibernation in trash and duff around host trees. Adults emerge from hibernation in early spring, about mid-March in east-central Alabama. Overwintering weevils feed on the lower surfaces of leaves, removing small circular or oblong patches of leaf surface. Mating occurs and females lay eggs in leaf midribs on the undersurface. Most egg laying occurs from late March through April, but some oviposition continues through May. The female punctures the midrib with her snout and then turns and deposits one to three eggs (usually two) in the puncture. Normally, there are four or five punctures at each oviposition site and usually only one site per leaf. Midrib tissue dies and the leaf often breaks at the egg-laying site.

Eggs hatch and larval mines begin to appear in leaves around the first of April in the Auburn area. The primary period of larval activity extends to about mid-May. Larvae feed side by side in groups in a common mine leading away from the midrib. Extensive mining may destroy entire leaves. Full-grown larvae pupate in silken, spherical cocoons in larval mines.

New-brood adults begin to appear during the first half of May. They feed primarily on the undersurface of leaves, as did parent adults, but may also feed on the upper surface. Typically, new weevils feed in groups, with feeding commonly beginning at leaf margins in the apical portion of the leaf. Feeding by new-brood adults may be extensive, and damage to foliage may be severe. New weevils are active for about four weeks; in east-central Alabama, activity usually ceases by mid-June. Adults move to trash and duff near host trees and remain inactive until the following spring. Only one generation occurs each year.

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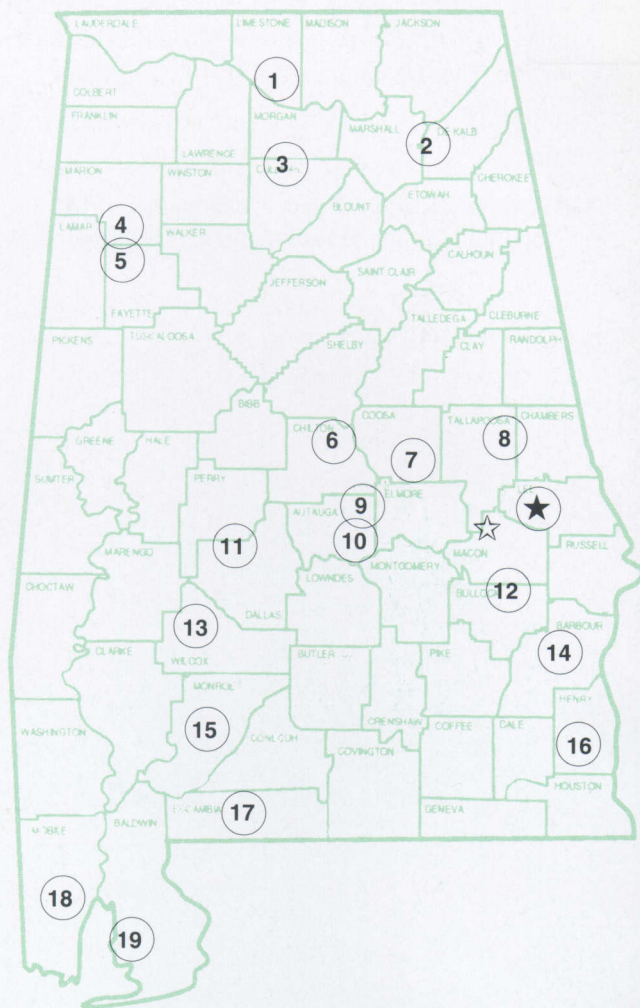
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# Alabama's Agricultural Experiment Station System

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4. Upper Coastal Plain Substation, Winfield.
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6. Chilton Area Horticulture Substation, Clanton.
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