

## Recent Research on the Frosted Elfin

Recent research on the Frosted Elfin done in southeastern Massachusetts by Gene Albanese and colleagues has resulted in some very interesting new findings.

Frosted Elfin (*Callophrys irus*) is a rare, non-migratory, single-brooded species inhabiting pitch-pine – scrub oak and other open habitats on sandy or rocky soil. In eastern Massachusetts, its only host plant is Wild Indigo (*Baptisia tinctoria*), although elsewhere it also uses Wild Lupine (*Lupinus perennis*). The butterfly is declining throughout what was formerly a large range, and Massachusetts is one of its last strongholds. The state Natural Heritage and Endangered Species Program lists it as a species of Special Concern.

Albanese's study focused on description of the habitat requirements for the butterfly, but also made new discoveries about larval plant use and associations with ants. The study took place at four locations in southeastern Massachusetts: Myles Standish State Forest in Plymouth; Crane WMA in Falmouth; Gavins Pond Municipal Water Authority property (the Lamson Road site) in Foxboro; and Noquochoke WMA in Bristol County.

The study found that adult Frosted Elfin densities were greatest when the host plant density was greater than 2.6 plants/m<sup>2</sup>, and tree canopy cover was less than 29%. Adult elfin density was inversely related to tree cover and declined when the density of wild indigo was less than 2.6 plants/m<sup>2</sup> and shrub cover was greater than 16%. In addition, even small quantities of non-native shrub cover

negatively affected elfin densities. The results indicated that management for Frosted Elfin should aim to increase both wild indigo and native herbaceous cover, limit although not eliminate native tree cover, and eliminate non-native shrub cover. (Albanese *et al*, 2007a)

The study authors pointed out that habitat needs must be assessed for larvae and adult butterflies, since larvae are less mobile than adults and often have specific microhabitat requirements. They found that Frosted Elfin larvae occurred more often on host plants of large size with moderate tree canopy cover. If there was no tree canopy cover, numbers of larvae found remained low, even when host plant density was high. The authors hypothesize that tree canopy cover may improve host plant quality by affecting the balance of nutrients and defensive chemicals within the host plants (i.e. shaded plants have more nutrients and lower levels of defensive chemicals) and /or reduce the search efficiency of predators and parasitoids that prey on larvae. Larger plants may provide similar benefits for developing larvae by providing increased food resources and more cover. Female adults actually oviposited on a wide range of plant sizes and under varying degrees of canopy cover, not “putting all their eggs in one basket,” but larval survival was greatest under the optimal conditions. (Albanese *et al*, 2007c)

During the research a previously unreported larval feeding behavior was documented. Both field and captive rearing showed that late-instar larvae girdle the stem of the host plant, providing a unique feeding sign that can help in locating the butterfly in the field (see photo below). They propose that there are two possible benefits to larvae from stem girdling: 1) it may allow larvae to trap and tap phloem sap, giving increased access to water and carbohydrates; and 2) it may deactivate the plant’s phytochemical

defenses. The researchers also observed the frequent association of larvae with several species of ants; the ants may protect them from predators and parasitoids. (Albanese *et al*, 2007b)

For further detail, please consult the following articles:

Albanese, Gene, Peter, D. Vickery, Paul R. Sievert. 2007a. Habitat characteristics of adult frosted elfins (*Callophrys irus*) in sandplain communities of southeastern Massachusetts, USA. Biological Conservation 136, pp. 53-64.

Available at

[http://www.umass.edu/nrc/pdfs/2007\\_Albanese%20et%20al\\_Frosted%20Elfin%20Habitat\\_BC\\_136\\_53-64.pdf](http://www.umass.edu/nrc/pdfs/2007_Albanese%20et%20al_Frosted%20Elfin%20Habitat_BC_136_53-64.pdf)

Albanese, Gene, Michael W. Nelson, Peter D. Vickery. 2007b. Larval Feeding Behavior and Ant Association in Frosted Elfin *Callophrys irus* (Lycaenidae). Journal of the Lepidopterists' Society, Vol 61, No. 2. pp. 61-66. Available at

[http://www.umass.edu/nrc/pdfs/2007\\_Albanese\\_et\\_al\\_Frosted\\_Elfina\\_Larval\\_Feeding\\_JLS\\_61\\_61-66.pdf](http://www.umass.edu/nrc/pdfs/2007_Albanese_et_al_Frosted_Elfina_Larval_Feeding_JLS_61_61-66.pdf)

Albanese, Gene, Peter D. Vickery, Paul R. Sievert. 2007c. Microhabitat use by larvae and females of a rare barrens butterfly, frosted elfin (*Callophrys irus*). Journal of Insect Conservation published on line July 19, 2007. Available at

<http://www.springerlink.com/content/75416v6462567q2g/>

*Gene Albanese recently completed his Masters Thesis in the Department of Natural Resources Conservation at the University of Massachusetts Amherst, where he worked with Paul R. Sievert and Peter D. Vickery. He is now pursuing doctoral research at the Department of Natural Resource Ecology and Management, Oklahoma State University, Stillwater, Oklahoma. He would like to thank the several members of the Massachusetts Butterfly Club who assisted him in his research.*



Frosted Elfin larvae making feeding rings on Baptisia stem  
Photo: Gene Albanese, Noquochoke WMA, 7-9-04