# RESEARCH PAYS OFF

# Weevils Help Tennessee DOT Control Musk Thistle

Musk thistle, introduced into the United States from Europe more than 100 years ago, is classified as a noxious weed in Tennessee, where it infests thousands of acres of land. Recognized by its distinctive reddish-purple flower, musk thistle grows along highway and railroad rights-of-way, unkept ditches, pastures and unused farmland, and suburban residences. Its prolific seeds are easily dispersed to noninfested or managed areas. Because of the extent of infestation, the thistle has become increasingly problematic for Tennessee. In addition to limiting the amount of pasture grass available for grazing, it hinders general maintenance of properties and rights-of-way.

## Problem

Musk thistle is an area-wide problem that affects many groups and individuals. The Tennessee Department of Transportation (TDOT), among those affected, has been mandated by the state to control musk thistle along roadways. Until early 1990, TDOT relied heavily on herbicide applications and mowing to control it. However, because of increasing public concern about potential groundwater contamination and the use of chemical controls in general, coupled with increasing costs for herbicides, TDOT began to reevaluate their strategies for managing musk thistle.

## Solution

In 1989 TDOT and the University of Tennessee began a cooperative research project aimed at managing musk thistle through biological control mechanisms, which take advantage of one organism's ability to reduce the viability of another organism. Insects feed on and reduce the ability of musk thistle to survive and reproduce. The initial phase of this project concentrated on the introduction, release, and establishment of two plant-feeding weevil species in eastern and middle Tennessee.

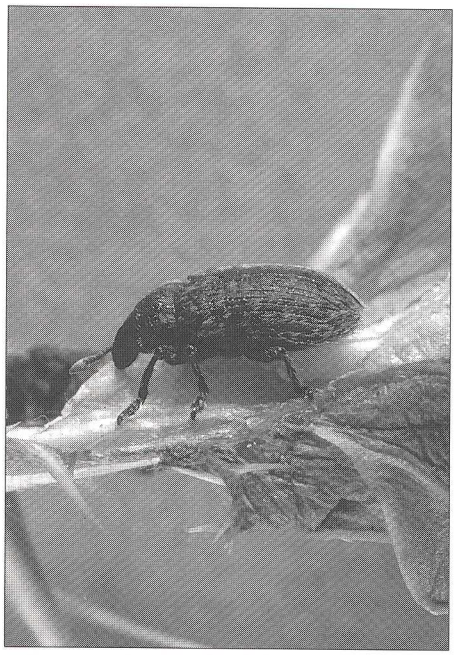
Both species, the head weevil and the rosette weevil, were introduced from Europe and feed and reproduce specifically on thistle and pose no problem to other plants, including agricultural crops. The head weevil feeds within the plant buds and destroys the developing seeds. Because each seed head may produce as many as 1,000 seeds, feeding by the larvae within the seed head will reduce the number of viable seeds available for dispersal. The rosette weevil, which attacks the plant at the rosette stage, feeds on the crown of the rosette and causes necrosis to occur around the feeding site. Feeding by large numbers of these weevils may kill the plant.

These plant-feeding weevils have been released at many sites along roadways in Tennessee and are well established at the oldest release sites. Populations are maintained at several reservoir sites, where the weevils are allowed to multiply. Individuals are collected from the reservoir sites annually and transferred to other areas of the state. Weevils will eventually be released and established along roadways in all thistle-infested counties in Tennessee. At several sites in 1991, approximately 60 to 80 percent of the seed heads were infested. This infestation should correlate directly with a dramatic reduction in seed production and plant density. After several years of seed destruction, musk thistle infestations should be greatly reduced. As fewer seeds are available for dispersal, and fewer plants are present and visible, the TDOT can use their personnel and budget for other demanding concerns.

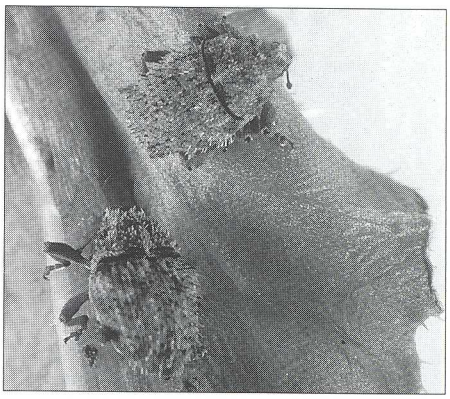
## Application and Benefits

The goal of this project is to reduce thistle infestation across the state to non-pest levels. As thistle spreads to other areas of the state, especially west Tennessee, the

Musk thistle-infested area along Interstate system.



Head weevil adults.



Rosette weevil adults.

weevils should move into these localized areas and reduce infestation levels. A reduction in weed population should relate directly to a reduction in costs. For example, both plant-feeding species have been released in several states, including Virginia and Maryland, where they are estimated to save taxpayers approximately $1 million annually. Similar savings are anticipated in Tennessee.

In addition to reducing annual expenditures for control of musk thistle, this project will provide a (a) nontoxic, nonpolluting means of controlling thistle area wide; (b) control method that is compatible with other means of control, such as mowing and herbicides; (c) permanent, self-perpetuating means of control; (d) reduction in dependency on herbicide use (now at $200,000 a year for the herbicide only) for thistle control; and (e) reduction in labor-intensive methods for thistle control. Biological control techniques will provide an alternative method of reducing the number of thistles over a large region, from roadsides to pastures, and provide citizens with an environmentally safe approach to effectively reduce a problem plant.

The cooperative efforts between TDOT and the University of Tennessee should lead to the development of a successful area-wide management program for musk thistle. The end results are likely to be a long-term reduction in costs and labor input for thistle control, as well as a safer and less polluted environment.

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Suggestions for "Research Pays Off" topics are welcome. Contact Crawford F. Jencks, Transportation Research Board, 2101 Constitution Avenue, N.W., Washington, D.C. 20418 (telephone 202-334-2379).