

# BIOLOGICAL CONTROL OF PLUMELESS THISTLE USING BENEFICIAL WEEVILS

## NCDA PLANT INDUSTRY DIVISION

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**Biological control:** The introduction by man of parasites, pathogens, and predators to suppress populations of insect and weed pests. It is an **ecological** method of pest control.

Plumeless thistle, *Carduus acanthoides* L., is a Eurasian weed accidentally introduced into the eastern United States in the mid-1880's. Since then, it has spread as far west as Idaho, and south to North Carolina. It is established in Jackson, Haywood, Madison, and Watauga Counties, and is most likely established in other mountain counties of western North Carolina. In Virginia and several states in the midwest, this thistle has become a weed pest of economic importance. The NCDA is committed to using beneficial weevils to biologically control populations of plumeless thistle before infestations become economically damaging, or to suppress current populations below economic levels. In 1991 the plumeless thistle was added to the N.C. Noxious Weed List, thus making its movement and cultivation regulated by law.

To effectively implement this program, it is necessary that landowners and extension personnel understand how to properly identify the type of thistle infesting an area and how the beneficial weevils affect the thistle plants. This guidesheet explains the program, and discusses the identifying characteristics of the plumeless thistle and the life cycles of the beneficial weevils.

### THE PLUMELESS THISTLE

Like other thistles, the plumeless thistle has sharp spines on the leaves, stem, and bracts of the flowerhead. This thistle is easily confused with the musk thistle (See the NCDA Guidesheet "Biological Control of Musk Thistle Using Introduced Weevils" for a description of musk thistle). The plant height at maturity ranges from 1 to 5 feet and the stem is branched (Figure 1). The leaves are deeply lobed with spiny margins. Plumeless thistle leaves have hairs on the lower

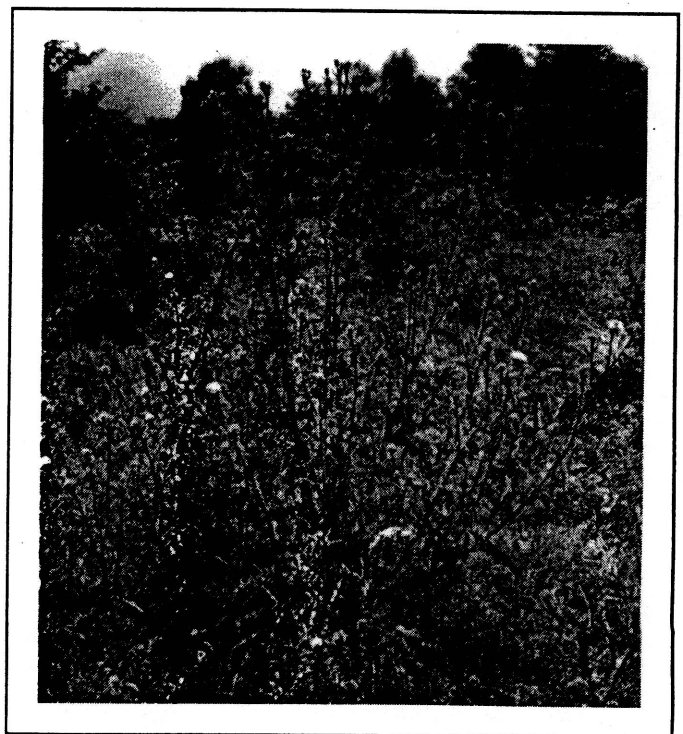


Figure 1. A mature plumeless thistle plant.

surface, while musk thistle leaves have no hairs. The leaves are dark green with a lighter colored midrib.

Although it is generally classed as a biennial (two growing seasons needed for a plant to mature), plumeless thistle can develop as a winter annual, or annual, depending on local conditions.

Plumeless thistle reproduces by seed. One plant may produce several thousand wind dispersed seeds. Seeds generally germinate in the early spring or fall. Following germination, the plant develops into the rosette stage (Figure 2). The rosette grows and increases in diameter until the onset of cold weather. A fleshy tap root develops, which allows the plant to overwinter. The next spring, new leaves grow from the crown bud and the plant soon begins to bolt. During bolting, the stem elongates and the thistle grows in height. Branches and flowerheads then develop. Plumeless thistle blooms from early June through August. Flowerheads are erect and solitary, but grow in clusters of 2 to 5. The size of the flowerheads ranges from one half inch to one inch, which is smaller than musk thistle flowerheads. Flower color is primarily purple. The plant dies after its seeds have fully developed.

Plumeless thistle may become a problem in pastures, Christmas tree plantations, wastelands, fence borders, roadsides and railroad right-of-ways. The thistle may be of particular economic concern in fall planted grains, alfalfa, or clover if conditions are favorable for seed germination. Newly established rosettes are difficult to see until they bolt. If you are concerned with having thistles, check fence borders, ditch banks, waste areas and other places where the soil has been recently disturbed.

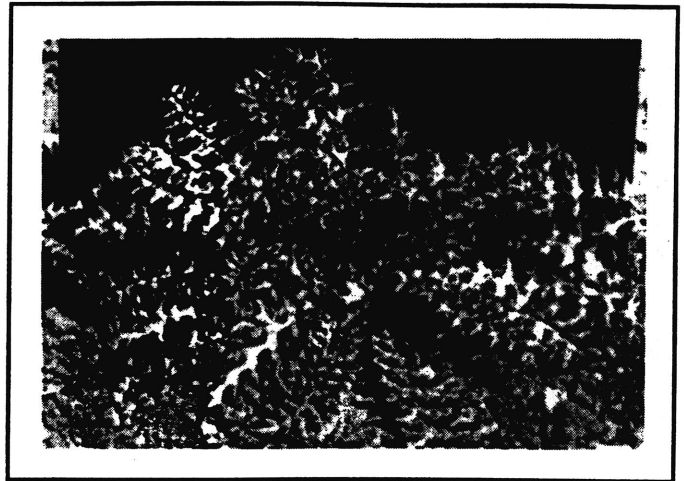
## **BENEFICIAL WEEVILS**

### **ROSETTE WEEVIL**

*Trichosiocalus horridus* (Panzer)

This weevil is native to Europe, where it keeps thistle populations at tolerable levels. The USDA extensively studied this beneficial

weevil to ensure it would not damage desirable and economically important plants. Figure 3 shows an adult rosette weevil.



**Figure 2.** Following germination, a rosette develops. Courtesy of Univ. of Nebraska Ag. Experiment Station.

The rosette weevil overwinters as an adult. It may also overwinter as a larva or egg. In the late winter or early spring (March and April), the adults emerge from their hiding places and begin to feed and mate on the young thistle plants - still in the rosette stage. The females lay eggs along the midrib of the underside of the leaves. Each female may lay up to 800 eggs. The eggs hatch in about 10-12 days. The young larvae burrow into the midrib of the leaves and proceed to eat their way toward the growing center, or crown bud, of the thistle. There the larvae feed on the crown tissue for 6-8 weeks, causing tissue damage (Figure 4).

Damage caused by the larvae effectively changes the growth of the thistle, if not killing it. The thistle does not grow as tall and develops more branches with fewer flowerheads. With fewer flowerheads, the number of seeds produced is considerably less.

After the larvae has developed and finished feeding, they emerge from the rosette and pupate in the leaf litter or soil for 12-20 days. By mid-May, the new generation adults have emerged and begun to feed on the thistle plants. The weevils feed until temperatures rise to around 85 degrees, at which point they take cover in the leaf litter

to aestivate until fall. In the fall, the adults emerge, feed, and may mate and lay eggs again on the thistle rosettes. These eggs may overwinter or hatch, in which case the larvae would overwinter. Generally, the rosette weevil produces one generation per year.

#### FLOWERHEAD WEEVIL *Rhinocyllus conicus* Froelich

The flowerhead weevil is another beneficial insect which helps to control thistle populations. It is also native to Europe and has been tested for host specificity by the USDA.

This weevil also overwinters as an adult. In early spring, they begin to crawl about and feed on the thistle rosettes. Mating takes place at this time, and by the time the thistles begin to bolt, the females are ready to lay eggs. The eggs are deposited on the flowerhead bracts (Figure 5) and hatch in six to eight days. The larvae then tunnel into the receptacle, which is the swollen base of the thistle flowerhead. There they feed and develop, causing tissue damage. The feeding weevils cause the flowerhead to produce fewer seeds or abort.

The larvae continue to develop for 25-30 days and then pupate for another 8-14 days. New adults emerge from the flowerheads in June and July and seek overwintering sites, where they remain dormant until the next spring.

The flowerhead weevil has been shown to effectively reduce populations of musk thistle (a relative of the plumeless thistle) but is less effective against the plumeless thistle. The flowerhead weevil can be used with the rosette weevil as an additional control measure against plumeless thistle.

Research in Virginia has shown successful reductions of plumeless thistle populations using these weevils together. Control of plumeless thistle generally takes 10 to 12 years using the two weevils.

#### COLLECTION AND REDISTRIBUTION

Rosette weevils are collected and redistributed on a local level in mid-to-late

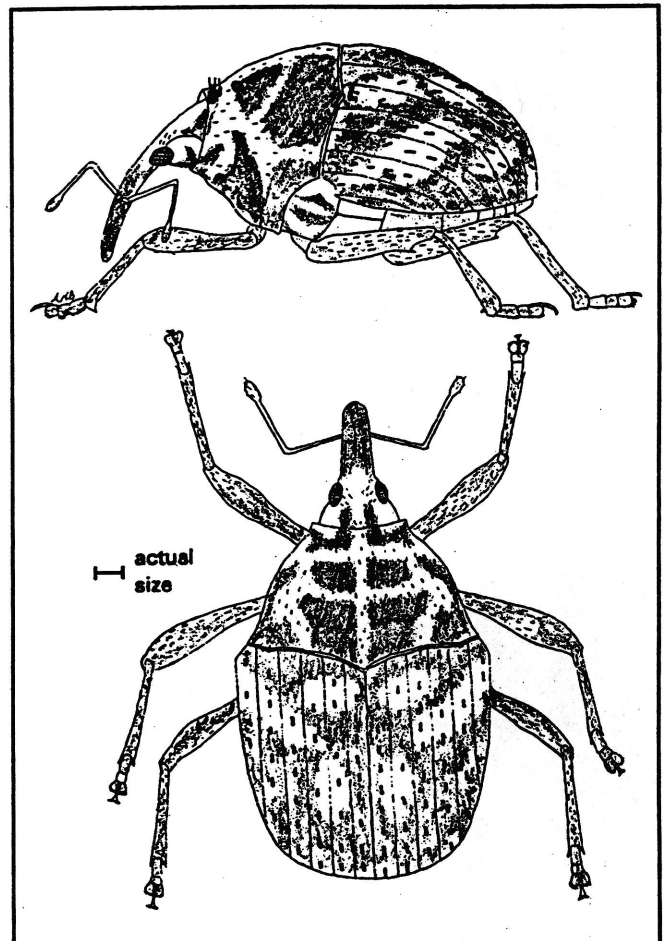


Figure 3. The adult rosette weevil.



Figure 4. A thistle rosette with tissue damage caused by the rosette weevil.



Figure 5. Flowerhead weevil eggs on the bracts of a thistle flowerhead.

## BEST AREAS FOR WEEVIL RELEASE

Studies show the thistle eating weevils do better in areas where the following factors are present:

- The area will not be mowed or sprayed;
- The area is infested with several hundred thistle plants;

It is also important to:

- Release all of the weevils in one area (5-10 per plant);
- **Remember It takes an average of ten to twelve years for weevil populations to build to a point where thistle control occurs.**

## WHY IS BIOLOGICAL CONTROL OF THISTLES A GOOD OPTION?

1. It is very cost effective.
2. There is no threat to nontarget organisms.
3. Little additional effort is required once the weevils are established, while other control methods must be applied periodically.
4. It can reduce potential ground and water pollution from herbicides.

May. Contact your local Cooperative Extension office or the North Carolina Department of Agriculture, Plant Industry Division (919-733-3611) about collections in your area and receiving weevils to control thistle infestations on your land.

The program is intended to distribute the weevil to locations in all infested counties. As a result, the weevils are expected to naturally disperse and subsequently control plumeless thistle populations. Figure 6 provides a summary of the weevil and thistle life cycles.

Printed in furtherance of the biological control of thistles and for public awareness. 2,000 copies were printed at a total cost of \$282.83 or ¢14 per copy.

For more information contact: NCDA, Plant Industry Div. Plant Protection Section, PO Box 27647 Raleigh, N.C. 27611

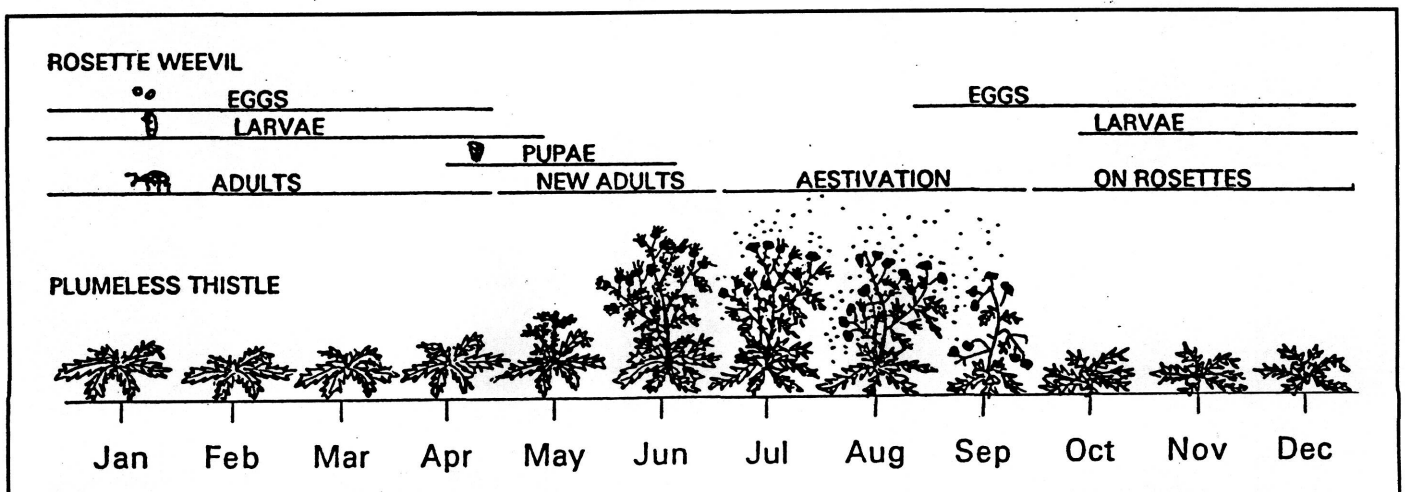


Figure 6. Time line showing the annual development of the rosette weevil and the plumeless thistle.