

E999 (Revised March 2020)



Fall cankerworm. (L. Johnson, ND Forest Service)

Figure 1.
Male fall
cankerworm
moth

(G. Fauske, NDSU)



Figure 2.
Wingless
female fall
cankerworm
moth with
egg mass

(G. Fauske, NDSU)



Figure 3. Fall cankerworm (caterpillar)

(J. Zeleznik, NDSU)

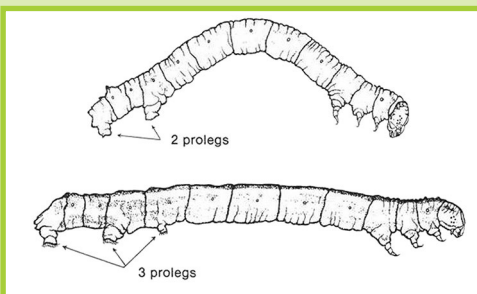


Figure 4. Fleshy prolegs of
spring cankerworm (2 prolegs, top) and
fall cankerworm (3 prolegs, bottom)

Cankerworms in North Dakota

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Cankerworms (Lepidoptera, Geometridae) are small caterpillars that feed on tree leaves and buds each spring. These caterpillars move in a looping inch-wormlike manner and have chewing mouthparts that cause defoliation in the tree canopy.

Cankerworms appear every year in small numbers and usually go unnoticed. Every few years, however, cankerworm outbreaks defoliate large numbers of landscape and forest trees severely.

Many years can pass between large outbreaks, and each outbreak can last three or more years. Severe defoliation by cankerworms needs to be managed to maintain maximum tree vigor.

Tree Hosts

Several tree species are infested by cankerworms, including elm, hackberry and apple, which are the most vulnerable. Defoliation also may occur on basswood, oak, boxelder, maple and ash. While defoliation in a single season may not damage a large, mature, vigorous tree, defoliation for several consecutive seasons weakens trees (especially young trees) and makes them more susceptible to drought, herbicide drift and other pests.

Life Cycle of Cankerworms

Two species of cankerworms can be found in North Dakota: spring cankerworm and fall cankerworm. Caterpillars (larvae) of the two species look similar to each other and feed on tree foliage at the same time in early spring. In fact, spring and fall cankerworms can be found feeding on the same tree. However, their egg-laying habits and life cycles differ. Both species have one generation per year.

Fall Cankerworm — *Alsophila pometaria* (Harris)

■ Identification

Adult moth:

- Male cankerworm moths are about 1 inch long and brownish gray, and have two light, irregular bands on their forewings (Figure 1).
- The wingless females are also brownish gray and approximately $\frac{3}{4}$ inch long (Figure 2).

Caterpillar (larva) (Figure 3):

- Caterpillar size varies from less than $\frac{1}{16}$ of an inch long (young) to 1 inch long (mature).
- They are light green to brownish green, with white lines running along the sides and a dark band down the back.
- Each caterpillar has three pairs of fleshy legs called prolegs (Figure 4) on the back half of the body; one of the pairs is relatively small and rudimentary.

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Life Cycle (Figure 5)

The fall cankerworm overwinters as an egg (Figure 6). Eggs hatch from April through May, usually when elm buds open. Newly hatched caterpillars readily feed on newly formed leaves. Feeding continues through June into early July.

Caterpillars are about 1 inch long when fully grown and complete their development in approximately four weeks. Mature caterpillars drop from their tree host in early July and construct silk pupal cocoons in the soil (Figure 7).

Adults emerge from cocoons from late September through October. Adults mate and the wingless females climb up the trunks of trees, where they lay compact egg masses high up on the trunk and branches (Figure 6). The male and female cankerworms die after egg laying.

Spring Cankerworm —

Paleacrita vernata (Peck)

Identification

Adult moth:

- Males are brownish gray, with three dark bands visible on the forewings (Figure 8).
- Females are wingless and brown to black, with a dark stripe down the middle of the back (Figure 9).

Caterpillar (larvae) (Figure 10):

- Caterpillars of spring cankerworms are similar to fall cankerworms in size.
- Caterpillars vary from green to reddish brown or black, with faint dark lines or a yellow stripe on the sides.
- Spring cankerworms have only two pairs of abdominal prolegs (Figure 4).

Life Cycle (Figure 11):

The spring cankerworm passes the winter as a mature larva in the soil. It pupates in late winter and cankerworm moths emerge in early spring, typically during the last week of March in North Dakota, or as soon as the ground thaws.

The wingless females mate and climb up the trees, where they deposit their eggs in loose clusters under bark in crevices and other protected places on the trunk and lower branches (Figure 12). Eggs hatch in early May and larvae begin feeding on the new foliage. Caterpillars complete feeding in mid-June through early July and descend to the ground on silken strands, where they pupate in the soil and remain dormant until the following spring.

Both species of cankerworm often will spin down from the tree on silk threads when disturbed. These threads also serve as a means of transport by wind, and small caterpillars may be blown a considerable distance where they infest new trees.

Figure 5.
Life cycle
of fall
cankerworm

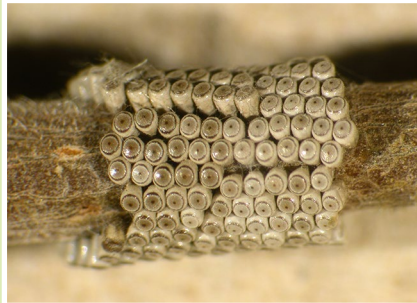
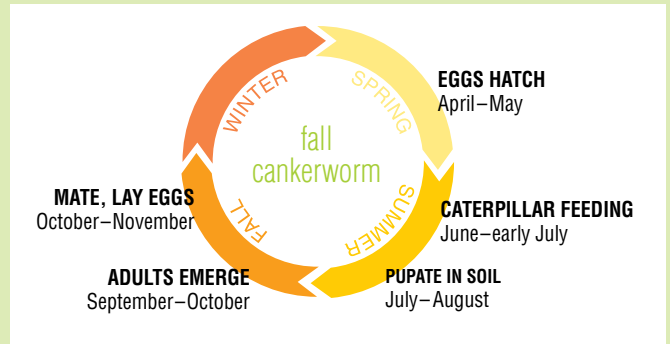


Figure 6. Close up of fall cankerworm egg mass (J. Zeleznik, NDSU).



Figure 7. Pupae of fall cankerworm in soil (W.M. Ciesla, Forest Health Management International, Bugwood.org)



Figure 8. Male spring cankerworm moth (N. Schneider, Bugwood.org)

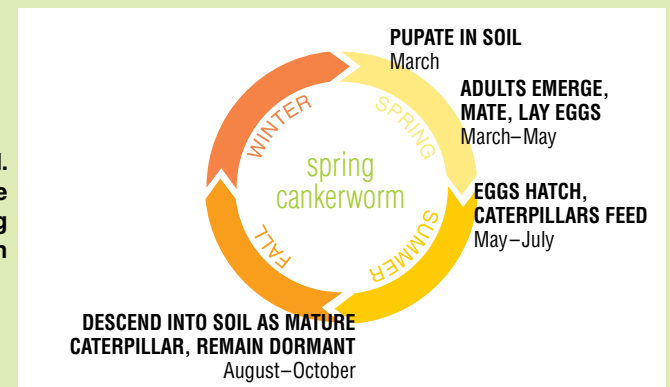


Figure 9. Female spring cankerworm moth (J. Kalisch, University of Nebraska)



Figure 10. Light and dark form of spring cankerworms (J. Kalisch, University of Nebraska)

Figure 11.
Life cycle
of spring
cankerworm



Tree Damage

As leaves begin to emerge in the spring, the tiny caterpillars begin to feed on the foliage. The first sign of larval feeding is the appearance of tiny holes known as “shot holes” between the leaf veins (Figure 13).

Shot hole damage becomes apparent when caterpillars are $\frac{1}{4}$ to $\frac{1}{2}$ inch long and will occur as early as mid-May in North Dakota. As the caterpillars grow, they continue to feed on the leaf tissue, skeletonizing the tissue between leaf veins, and eventually the entire leaf is consumed, leaving only the midrib (Figure 14).

Repeated defoliation for three or more consecutive years will kill many of the upper branches and decrease the tree's aesthetic value. Severe defoliation also causes trees to be more susceptible to other stresses, such as drought, diseases, other insects and competition from other trees, especially in overcrowded shelterbelts.

Pest Management

■ Monitoring

Early detection of cankerworms and defoliation is important. Monitor the upper tree branches for young caterpillars and early defoliation using binoculars during the spring from early to late May.

Early larval feeding injury often is overlooked until large holes are present in leaves and caterpillars are mature. Insecticide treatments usually are not warranted this late because extensive defoliation already has occurred and mature caterpillars will be dropping to pupate in the soil.

■ Trunk Banding

Tree banding is not an effective control of cankerworms, although it can be used for early detection. For early cankerworm detection, place a 3- to 4-inch band of a sticky adhesive compound completely around the trunk about 5 feet above the ground (Figure 15). Because female moths are wingless and must crawl up the trunk of their host tree to lay eggs, this band traps females and prevents them from depositing eggs on the upper trunk and branches.

Tree banding should be done during early to mid-September to trap fall cankerworms and again in mid-March to trap spring cankerworm females. The canopies of treated trees should be isolated from the canopies of neighboring trees. If the canopies of several trees intermingle, the trunks of all of the trees must be banded.

When banding is used as an early detection technique in shelterbelts, the adhesive should be applied as soon as the snow melts. The bands should be placed selectively on three or four trees along the length of the shelterbelt and monitored weekly for the presence of trapped moths. If large numbers are present, serious defoliation is likely to occur and management may be warranted when cankerworm larvae begin feeding.

Adhesive compounds are available as a paste and also as a pressurized aerosol spray. Because the paste can be applied easily with a putty knife, it is often the best formulation to use for the first application of a new band.

Old bands may be rejuvenated easily by spraying with the aerosol formulation. Adhesive compounds are generally nontoxic and present no potential hazards to the applicator or environment.



Figure 12.
Spring
cankerworm
egg mass
(J. Kalisch, University
of Nebraska)



Figure 13.
Early
'shot hole'
defoliation
caused by
cankerworm
feeding
(J. Zeleznik, NDSU)



Figure 14.
Severe
defoliation
caused by
cankerworm
feeding
(USDA Forest Service,
Ogden, Bugwood.org)



**Figure
15. Trunk
banding for
detection of
cankerworms**
(W.A. Carothers,
USDA Forest Service,
Bugwood.org)

■ Biological Control

Several species of parasitic wasps are known to attack eggs or caterpillars of fall and spring cankerworms (Figure 16). However, the parasitism rate is typically too low (about 15% to 20%) for effective management. A nuclear polyhedrosis virus also can infect and kill caterpillars (Figure 17), especially during outbreak years and moist conditions.

■ Chemical Control

Insecticidal control measures are most effective if implemented when the caterpillars are young (about ½ inch long) and feeding defoliation is low. Spray timing is critical and, if done at the correct time, only a single application will be needed.

Insecticides can be applied by ground-based equipment or by aerial equipment and should be directed at the trunk, branches and newly expanding leaves. Aerial application is fast and convenient and most often is used to apply insecticides in shelterbelts.

Ground-based equipment has been shown to be effective and may give better vertical coverage of foliage in the tree canopy. Good coverage of the infested trees is critical for acceptable control.

While timely insecticide treatments directed at the early larval stage of cankerworm provides effective control, many trees in residential areas are too large to treat thoroughly with spray equipment available to the average homeowner. Also, the homeowner often is unaware a cankerworm infestation exists until after extensive damage already has occurred to the tree. Insecticides listed for management of cankerworms includes biopesticides and conventional insecticides.

Biorational pesticides (Table 1) are natural pesticides from natural materials, such as minerals, bacteria, plants or animals or insect growth regulators.

Bacillus thuringiensis var. kurstaki (*Btk*) is a selective bacterial pathogen that kills the caterpillars of cankerworms as well as caterpillars of other moths and butterflies. These bacteria do not have a detrimental effect on beneficial insects, wildlife or humans.

***Bacillus thuringiensis var. kurstaki* is highly recommended for management of cankerworms where possible.** For optimal control, apply *Btk* when caterpillars are less than ½ inch long, about 10 days after egg hatch.

Synthetic insecticides (Table 2) are recommended when caterpillars are greater than ½ inch long and extensive defoliation already has occurred.



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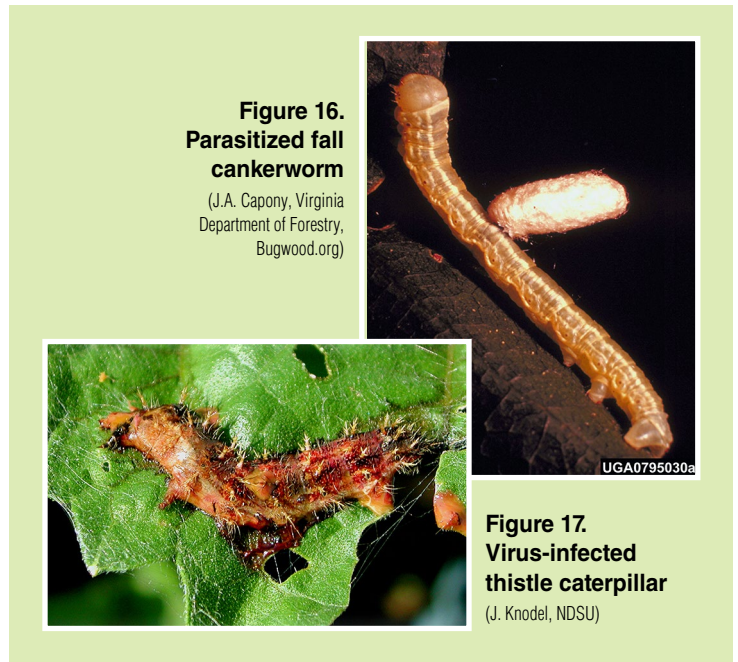


Figure 16.
Parasitized fall cankerworm

(J.A. Capony, Virginia Department of Forestry, Bugwood.org)

Figure 17.
Virus-infected thistle caterpillar

(J. Knodel, NDSU)

Table 1. Biorational pesticide products for cankerworm control.

Active Ingredient	Commercial Trade Name
azadirachtin	Azatin XL, Bioneem
<i>Bacillus thuringiensis var. kurstaki</i>	DiPel, Javelin, Lepinox
diflubenzuron	Dimilin (insect growth regulator)
insecticidal soap	Safer Insecticidal Soap
pyrethrins	PyGanic
spinosad	Conserve, Entrust, SpinTor
tebufenozide	Mimic (insect growth regulator)

Table 2. Synthetic insecticide products for cankerworm control.

Active Ingredient	Commercial Trade Name
acephate	Orthene, Isotox
bifenthrin	BifenthrinPro, Talstar
carbaryl	Sevin
cyfluthrin	Tempo
deltamethrin	DeltaGard
lambda-cyhalothrin	Scimitar
malathion	Malathion
permethrin	Astro

“Always read, understand and follow the pesticide label. The label is the law.”

Disclaimer: Mention of any product does not imply an endorsement of one product versus another nor discrimination against any product not mentioned by NDSU Extension or the authors.

This publication originally was authored by R. Dean Christie, former NDSU Extension entomologist, 1990.

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