

Biology and Control of Cankerworms in North Dakota



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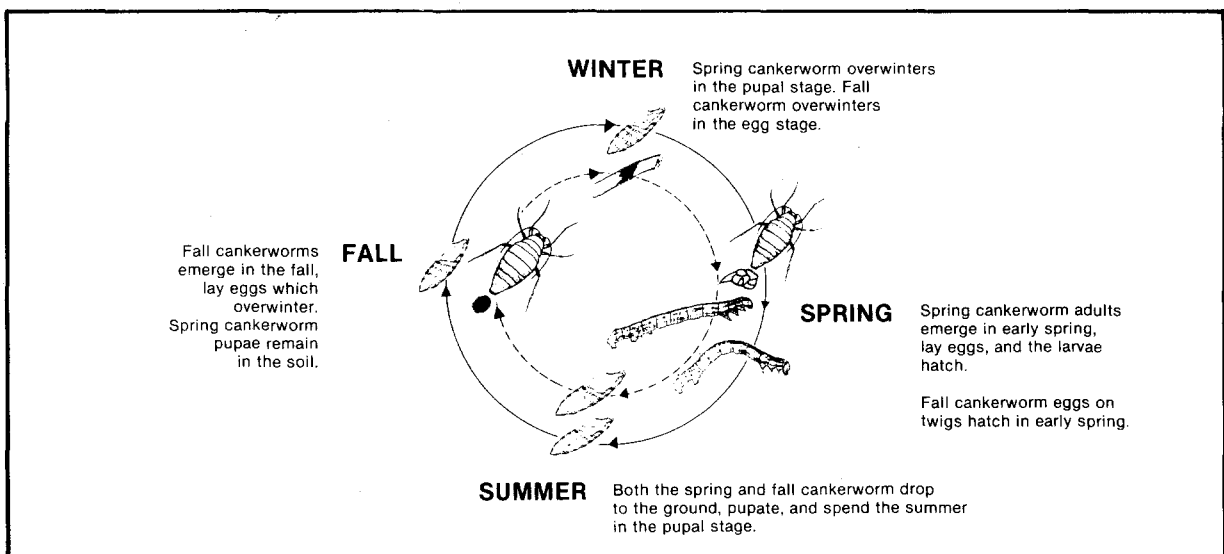
Cankerworms are important defoliators of shade and ornamental trees in North Dakota. Several tree species are affected by cankerworm infestations but elm, hackberry and apple are most vulnerable. To a lesser extent, defoliation may also occur on basswood, oak, boxelder, maple and ash. While defoliation in a single season may not damage a large, mature, vigorous tree, defoliation over several consecutive seasons weakens trees and makes them more susceptible to drought, herbicide drift and other insect pests. If defoliation by cankerworms or other insects occurs several years in a row, these combined stresses may kill the tree directly or increase its susceptibility to disease.

In North Dakota, shelterbelts are highly desirable to protect man, livestock, crops, soils and recreation areas from the harsh climate and winds. In

addition, homeowners are quite interested in protecting their trees for aesthetic, comfort, and real estate value. Damage by cankerworms as a result of defoliation needs to be avoided if maximum tree vigor is to be maintained.

Life Cycle of Cankerworms

Two species, the fall and spring cankerworm, occur in North Dakota. Although similar in appearance and in the damage they cause, their egg-laying habits and life cycles are different. However, both species are a problem at the same time of the year and are often found feeding on the same tree. Both species have one generation per year.



Biology of Spring and Fall Cankerworm

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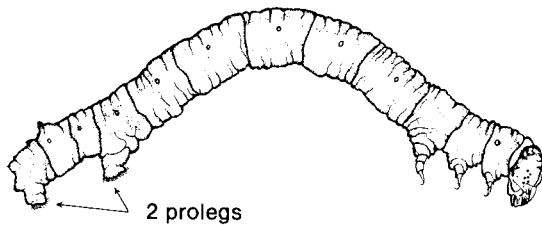
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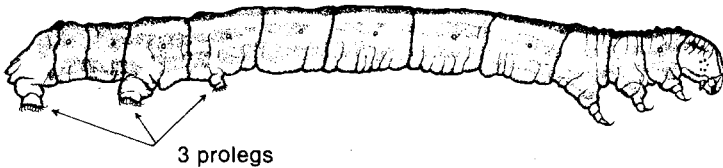
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Fall Cankerworm

The fall cankerworm, *Alsophila pometaria*, overwinters in the egg stage. Egg hatch occurs in mid May to early June with the exact time dependent on weather conditions. Newly hatched larvae are less than 1/16 inch long and readily feed on newly formed leaves. Feeding continues through June into early July. Fall cankerworm larvae vary in color from light green to brownish green with white lines running along the sides or a dark band down the back. They are 3/4 to 1 1/2 inches long when fully grown and complete their development in approximately four weeks. They have three pairs of fleshy legs called prolegs on the back half of the body, one of which is relatively small and rudimentary. Mature larvae drop from their host in early July and construct pupal cocoons of silk in the soil. Adults emerge from the 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. Male cankerworm moths are about 1 inch long, brownish gray in color, and have two light irregular bands on their forewings. The wingless females are also brownish-gray and approximately 3/4 inch long.



Spring cankerworm



Fall cankerworm

Spring Cankerworm

The spring cankerworm, *Paleacrita vernata*, 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 scales, in crevices and other protected places on the trunk and lower branches. Females are brown to black with a dark stripe down the middle of the back. Males are brownish-gray with three dark bands visible on the

forewings. The eggs hatch in early May and the larvae begin feeding upon the new foliage. Larvae of spring cankerworms are similar to fall cankerworms in size. However, their color varies from green to reddish-brown or black with faint dark lines or a yellow stripe on the sides. They differ from fall cankerworms by having only two pairs of abdominal prolegs. The larvae 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.

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

Shot hole damage
by early cankerworm feeding



Damage

As leaves begin to appear, the tiny larvae will begin feeding on the foliage. The first sign of larval feeding is the appearance of tiny holes known as "shot holes" in the leaf blades. Shot hole damage may be apparent when larvae are 1/4 to 1/2 inch long and will occur as early as mid May in North Dakota. As the cankerworms grow, they continue to feed on the leaf blades where they show a preference for tissue located between the veins. This results in a type of leaf damage termed skeletonizing, and eventually the entire leaf blade is consumed leaving only the midrib. Most large trees are able to withstand a single season of defoliation; a tree that has been completely defoliated usually leafs out a few weeks after the larvae stop feeding. However, a tree that has been defoliated for several seasons may experience severe stress, and limb dieback and loss of vigor can result. Transplanted, young, or weakened trees are more susceptible to the effects of defoliation. Repeated infestations for three or more consecutive years will kill many of the upper branches and may decrease the tree's aesthetic value. Severe defoliation will also increase the amount of tree mortality caused by drought, diseases, other insects and competition from other trees. Tree mortality from this latter effect may be of major importance in shelterbelts where closely spaced plantings are common.

Control

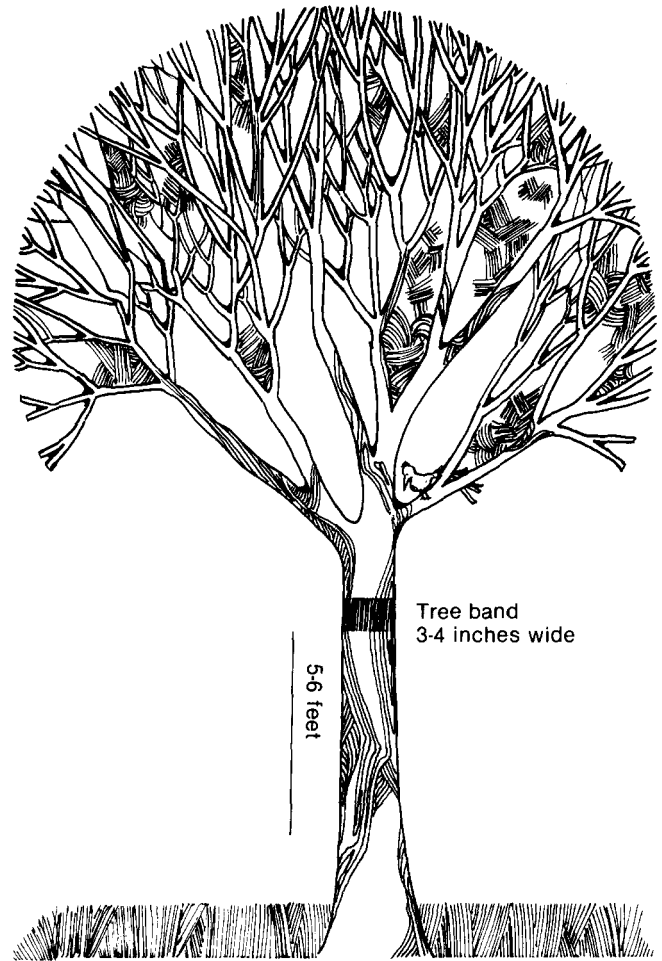
Early detection of cankerworm activity is important. Often, feeding damage is not noticed until larvae are in the late stages of development. While insecticides can provide control at this time such treatments are usually not warranted because extensive defoliation has already occurred. Two types of control are recommended for cankerworms, namely spraying trees with insecticides and banding trees with an adhesive compound.

Insecticide Application

Insecticidal control measures are most effective if implemented when the larvae are relatively small and feeding damage is not severe. Insecticides can be applied by either ground based equipment or by aerial equipment. Aerial application is fast and convenient and is most often used to apply chemicals in shelterbelts. Ground based equipment has been shown to be effective and may give better vertical coverage of foliage in the canopy of trees. Good coverage of the infested trees is critical for acceptable control.

Several products are recommended for controlling cankerworms. Spray timing is critical and, if done at the correct time, only a single application will be needed. *Bacillus thuringiensis* (BT) is a selective bacterial pathogen of several caterpillars including cankerworms. These bacteria have the advantage of being specific on the cankerworms and do not have a detrimental effect on beneficial insects, wildlife, or humans. Previous research has shown BT to be most effective when the compound is applied with a mist blower. Other chemicals recommended for cankerworm control include the following compounds:

Insecticide	Formulations	Amount required for	
		1 Gallon	100 Gallons
<i>Bacillus thuringiensis</i> (Dipel, Thuricide, Biotrol)	Several formulations	Follow label directions	
Carbaryl (Sevin)	50% WP	2 tbsp	2 lb
Carbaryl	4 L	2 tsp	1 qt
Malathion	57% EC	2 tsp	2 pt
Methoxychlor	50% WP	2 tbsp	3 lb
Acephate (Orthene)	9.4% EC	3 tbsp	9.4 pt
Acephate (Orthene)	75% WP	1 tsp	2/3 lb



Tree band for cankerworm control

Tree Banding

While timely insecticide treatments directed at the early larval stage of the cankerworm will give effective control, many trees in residential areas are too large to thoroughly treat with spray equipment available to the average homeowner. Also, the homeowner is often unaware a cankerworm infestation exists until after extensive damage has already occurred to the tree.

An alternative method of control is to "band" the trees with an adhesive compound. Tree banding can also be used in shelterbelts as an early cankerworm detection technique. Since female moths are wingless and must crawl up the trunk of their host tree to lay eggs, there is an opportunity to mechanically isolate them from the upper trunk and lower branches. Placing a band adhesive completely around the trunk of the tree traps females and prevents them from depositing their eggs.

For banding to be effective, it should be done during early to mid September to trap fall cankerworms and again in mid March to trap spring can-

kerworm 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 selectively placed 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 chemical control may be warranted when cankerworm larvae begin feeding.

Adhesive should be applied in a 3- to 4-inch band approximately 5 feet above the ground. It may be necessary to smooth the bark where the band is to be applied with a steel brush, wood rasp or chisel. Extreme caution should be exercised to remove only the higher corky ridges of the bark and to avoid disturbing the inner living bark layer. Smoothing the bark allows the applicator to apply an even coat of adhesive around the tree trunk.

While several adhesives may be used for banding trees, one of the most common products is Tanglefoot®. Tanglefoot® is available as a paste and also as a pressurized aerosol spray. Either formulation is satisfactory. However, since the paste can be easily applied with a putty knife, it is often the best formulation to use for the first application of a new band. Old bands may be easily rejuvenated by spraying with the aerosol formulation. Tanglefoot® is nontoxic and presents no potential hazards to the applicator or environment.

WARNING — Due to the potential for bark deterioration, never apply Tanglefoot® directly to young or thin-barked trees such as apple, flowering crab and mountain ash.

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