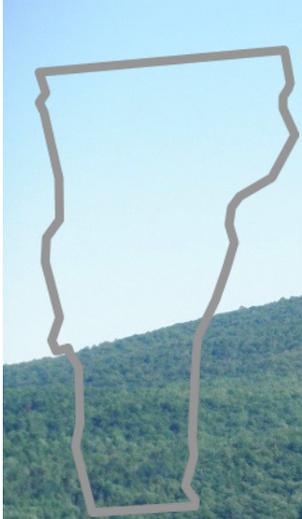


Vermont Forest Health

Forest Tent Caterpillar Update

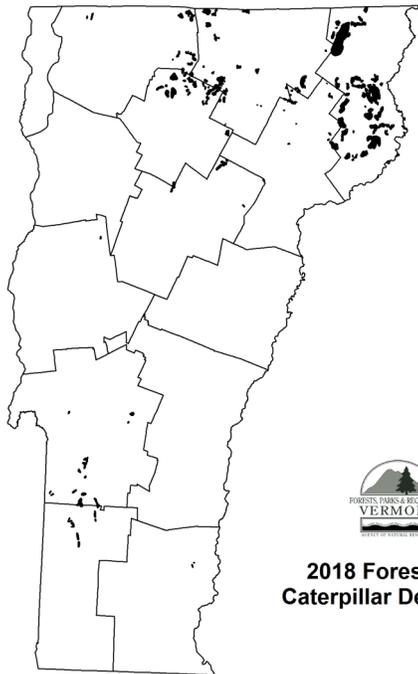


Department of Forests, Parks & Recreation
 October, 2018
vtforest.com

A forest tent caterpillar outbreak is underway in Vermont. The insect is native to the region, and part of our hardwood ecosystem. The most commonly defoliated trees in Vermont are sugar maple and white ash, but forest tent caterpillar will feed on most deciduous species. Red maple is not a host.



Forest tent caterpillar is a native insect.



2018 Forest Tent Caterpillar Defoliation

Damage areas detected and mapped by aerial sketchmap survey. Map indicates approximate location of damage

Current Status

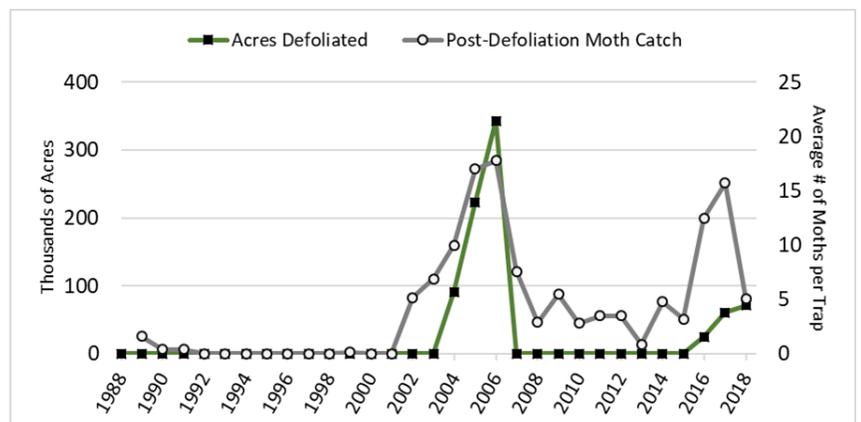
In 2018, 71,315 acres of defoliation were mapped during statewide aerial surveys, which represents a small increase from the 60,584 acres mapped in 2017. The area defoliated decreased in southern and central Vermont, but more than tripled in Essex County. Most trees will recover, but defoliation is a stress on affected trees and can incite tree decline if other stresses are present. In 2018, 4,550 acres of sugar maple dieback and mortality were mapped in locations which had been recently defoliated by forest tent caterpillar in previous years.

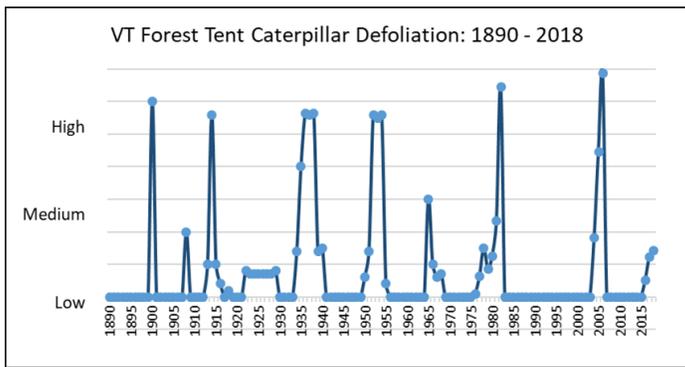
Defoliated areas mapped during aerial surveys are available on the [ANR Natural Resources Atlas](#). To view the data, click on "Layers" at the bottom of the left hand sidebar. Click the "+" sign next to Forests, Parks and Recreation. Then click on "Forest Tent Caterpillar Damage". To see the Legend, click the icon between the check box and the layer name. Users are reminded that maps are sketched at speeds of over 100 mph and can be incomplete, since observers can't see directly under the plane or behind hills.

Our moth trap catch in 2018 decreased significantly from 2017. While this is a hopeful sign, we will have a better prediction for defoliation in 2019 after winter egg mass surveys have been completed.

In 2018, 71,315 acres of defoliation were mapped during aerial surveys. (Defoliated area not to scale. Data include survey information from the U.S. Forest Service, Forest Health Protection).

The graph compares annual acres defoliated in Vermont to the number of moths trapped in mid-summer (following defoliation). The moth catch averaged from statewide monitoring sites dropped substantially in 2018.





Outbreaks have occurred periodically in Vermont, and generally last 2-6 years.

Life Cycle

Forest tent caterpillars emerge from eggs, over several weeks, when sugar maple leaves unfold. More information on the timing of caterpillar emergence and sugar maple leaf expansion, based on our VT monitoring sites, can be found at: http://fpr.vermont.gov/forest/forest_health.

Young caterpillars can spread by “ballooning” from long threads. They feed in groups on expanding leaves when they are young. As they grow, they molt four times, leaving cast skins behind. Defoliation increases quickly when they are large.

Feeding is complete by early July. When about 2” long, the caterpillars pupate inside white cocoons, usually within rolled up leaves. Moths emerge about two weeks later. They mate and lay eggs on twigs, preferably on upper branches, in masses of 150-200 eggs. Embryos inside the eggs develop quickly and consume carbohydrates throughout the winter.

Between outbreaks, natural enemies including birds, spiders and parasitic insects keep populations in check. (With the exception of cuckoos, most birds only eat the innards.) Outbreaks occur when caterpillar growth outpaces natural enemies, such as during early warm springs. Populations build up more quickly where sugar maple and ash predominate, and in stands which have been recently thinned by logging. In these open forests, caterpillar diseases spread slowly, and parasitic insects are vulnerable to predation.

Outbreaks collapse from a combination of factors: starvation, malnutrition from eating less-preferred tree species, viral or fungal diseases, and high rates of parasitism. Parasitic insects increase in numbers, including the friendly fly, which lays eggs on cocoons. Outbreaks may also collapse if eggs hatch early and cold temperatures delay bud development, or if there is a late spring frost. Winters are rarely cold enough to affect survival.



Leaf fragments on the ground are a sign of defoliator activity. In May and June, look for masses of caterpillars.

Forest tent caterpillar populations fluctuate between extremes, reaching outbreak proportions every six to 16 years. Typically, an outbreak may begin at a handful of sites, with the area increasing as insects disperse. That means that while populations may be declining in one area, they will be expanding in another.

Caterpillars emerge from egg masses in spring when sugar maple leaves unfold.



The white cocoons are mostly found in rolled leaves (arrow). Moths prefer to lay eggs on upper branch twigs. (Center: M. Isselhardt, UVM Ext.)

Outbreaks collapse due to starvation, diseases, or parasitic insects such as the friendly fly.



What to Look For

During May and June while caterpillars are active, listen for their droppings, look for leaf fragments on the ground, and for masses of caterpillars resting on the bark. In mid-late summer, look for rolled up green leaves with a white cocoon inside. After leaf drop, use binoculars to see egg masses on the twigs of upper branches.

Forest tent caterpillars do not make a tent! Tents seen in the spring in branch crotches of cherry or apple trees are made by the [eastern tent caterpillar](#). Webbing on the ends of branches later in summer is most likely [fall webworm](#).

Impact

Healthy hardwoods can survive several consecutive years of defoliation. Within a few weeks of heavy defoliation, trees re-foliate. Buds that would normally have generated shoots the following spring expand and produce foliage. Then new buds are set.

Defoliation reduces a tree's ability to produce and store carbohydrates. This affects wood production, and the amount of foliage and shoot growth next year. Maple trees on sites rich in calcium and magnesium are better able to recover from stress. Site factors that increase the risk of tree decline include acidic soils, ridgetops, rocky ledges, and wet areas.

There is always a risk that defoliation could lead to dieback or even tree mortality. In addition to drought, consecutive years of defoliation, severe winters, and other disturbances magnify the impact. Extremely high caterpillar populations are another risk factor when they defoliate trees so quickly that caterpillars are still present and feeding when the re-foliation emerges. After multiple defoliations, or if other stresses are present, food reserves may be depleted so that a tree's ability to survive the winter, defend itself from secondary pests, and maintain its living cells are impaired.

In all years of the current outbreak (2016-2018), some defoliated areas remained noticeable all summer because of a lack of re-foliation. On some sites, the only visible re-foliation was on ash. On sugar maple, re-foliated leaves were small. The exact mechanism by which trees did not re-foliate is unclear, but factors that may have contributed to this include the lingering effects of drought in 2016 and 2017, heavy seed production on sugar maple in 2017, a late start of feeding in 2018 due to wet weather. Infection by leaf fungi and dry summer conditions may also have played a role.

General Management Recommendations

- Maintain a diverse forest. Forest tent caterpillar avoids red maple and most conifers.
- Look for signs of forest tent caterpillar and defoliation. Assume that tree health has been affected if over half the foliage is missing.
- If trees were heavily defoliated, check after late July to make sure they have re-foliated, and that the new leaves are not stunted or brown.
- You can estimate the risk of defoliation next year by doing an [egg mass survey](#) once the leaves have dropped in the fall.
- Trees are resilient, but more caution is called for where summer was dry, if heavily defoliated trees didn't re-foliate successfully, where trees were recently thinned, or if the site is less-than-optimal.



Multiple defoliations may lead to decline, especially in stands that were recently thinned, when accompanied by drought, following cold and snow-free winters, or on nutrient-poor sites.

Trees should start to re-foliate within a few weeks of heavy defoliation.
(Photo: M. Isselhardt, UVM Ext.)



Trees that are still defoliated in September have limited ability to replenish food reserves.



Assume tree health is affected if over half the leaf area is defoliated. Check to make sure that heavily defoliated trees re-foliate by mid-summer (above right). Trees with stunted and/or brown re-foliation (below right) are at greatest risk.



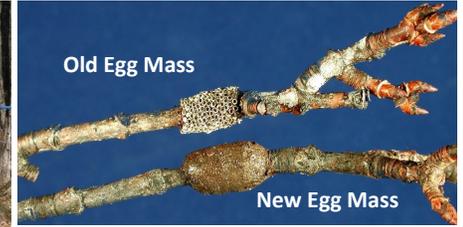
Sugarbush Management

Multiple defoliations are more likely in sugarbushes because they are dominated by sugar maple and their widely spaced trees increase caterpillar survival. In addition to the reduction in carbohydrate production, the decreased wood growth of defoliated trees reduces taphole closure and tapping sustainability. If defoliation has occurred, a minimum recommendation is to “tap conservatively” and delay thinning for 1-3 years. Consider not tapping small diameter trees, or with more than one tap regardless of diameter.

By request, the Department of Forests, Parks and Recreation provides assistance in conducting egg mass surveys. Where defoliation is predicted and if trees were defoliated last year or if tree health is at risk due to other factors, sugar makers should consider the pros and cons of management alternatives. These include aerial insecticide treatment and leaving defoliated trees untapped next spring.

The only legal material for controlling caterpillars on maple that will be tapped for a food product is the biological insecticide Btk. The Btk formulation that is used to protect sugarbushes is OMRI (Organic Materials Review Institute) certified for use in organic production.

Even if a sugarbush is treated, some defoliation will occur. The caterpillars need to be actively feeding to consume lethal doses of Btk. Aerial applications can be delayed by weather or other operational constraints, and there may be missed areas. In 2018, based on egg mass surveys, landowners arranged to have 16 sugarbushes treated, covering approximately 5,000 acres. We assessed defoliation at some treated and untreated sites predicted to be defoliated, and a few sites where defoliation was not predicted. Sites predicted to be defoliated had the similar levels of defoliation prior to treatments (9% foliage loss), but once FTC feeding was complete untreated stands averaged 25% foliage loss compared to 15% for treated stands. Stands not predicted to be defoliated averaged only 5% foliage loss by the end of the season.



Egg mass surveys help estimate the risk of defoliation next year.



Only Bt products may be used to treat active sugarbushes.

Timber Management

Postpone harvesting where forest tent caterpillar is building. By reducing the number of trees in the stand, thinning concentrates more insects on each remaining tree.

If a stand is defoliated, delay timber harvesting at least 3 years after the outbreak to prevent additional stress from soil and root disturbance. The delay also allows time for the impacts of defoliation to become apparent so the healthiest trees can be identified.

Unless there are significant additional concerns, we have not found it necessary to protect foliage of timberland trees.

Shade Trees

For those homeowners and arborists who want to protect the foliage of valuable shade trees or reduce nuisance caterpillars, we also recommend Bt. Large trees require specialized equipment.

Citation: Vermont Dept. of Forests, Parks and Recreation. 2018. Forest Tent Caterpillar Update. Vermont Forest Health leaflet 2018-13. 4 pp. Available at vtforest.com.

Where not otherwise credited, images are from VT-FPR, including the Ron Kelley photo archive.



For more information, contact the Forest Biology Laboratory at 802-879-5687 or:

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