

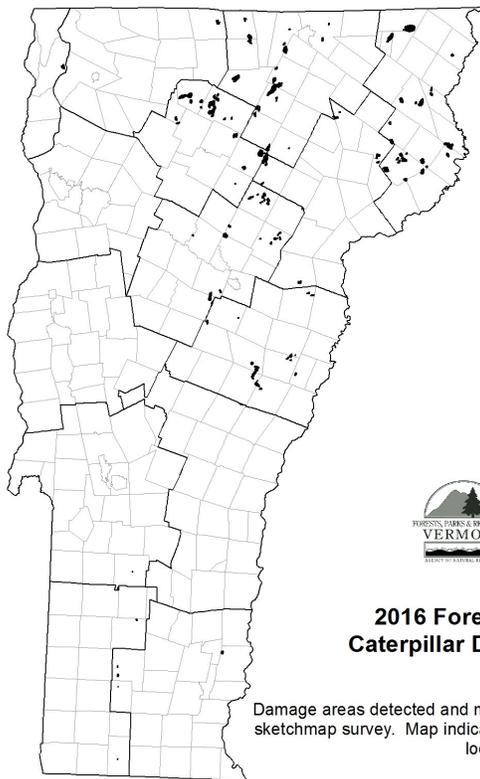
Vermont Forest Health

Insect and Disease Observations—August 2016

Department of Forests, Parks & Recreation
August 2016 vtforest.com

Sugar Maple Health Takes Center Stage in August

A combination of maple defoliators and the impact of drought continue to cause late-season concerns. It turns out that drought may bring out the reds to brighten foliage season in most of the state, but it has increased the impact of defoliation where forest tent caterpillar feeding was heavy.



Aerial forest health surveys are now completed, and approximately 24,500 acres of defoliation by forest tent caterpillar (FTC) were mapped statewide. The mapped area covers less than 1% of Vermont’s northern hardwood forest type. By contrast, in 2006 at the peak of the most recent outbreak, about 10% of the northern hardwood forest type was defoliated.

Dry summer conditions will be an important factor determining the impact of the 2016 defoliation. Trees typically respond to the relatively early-season feeding by FTC by sending out a new flush of leaves. This year, defoliated areas remained noticeable all summer because lack of water reduced the success of refoliation. On some sites, the only visible refoliation was on ash. On sugar maple, refoliated leaves were small. Sometimes, leaves were scorched or dropped to the ground, tender refoliated shoots wilted, and trees attempted a third flush of leaves.

Approximately 24,500 acres of forest tent caterpillar defoliation were mapped during aerial surveys. (Defoliated area not to scale. Data includes survey information from the U.S. Forest Service, Forest Health Protection)

Where conditions have been dry, refoliated leaves are small. Sometimes they are scorched and shoots have died back or wilted.



Even where refoilation was successful, dry conditions in 2016 have limited the new leaves' ability to replenish lost food. This will almost certainly affect wood production, and the amount of foliage and shoot growth next year. The [VT FPR Forest Tent Caterpillar Update](#) has been revised to include these recent observations, describing the current status of forest tent caterpillar, and providing management information for sugar makers, forest land managers, and others concerned about protecting tree health.

At this sugarbush in Albany, VT, very little refoilation occurred after trees were defoliated by forest tent caterpillar.

Photo: T. Greaves



[Maple webworm](#) is surprisingly ubiquitous in some locations. Webworm moths lay their eggs in leaves rolled or tied by other insects like FTC that feed earlier in the season. Increased numbers of maple webworm have coincided in past years with FTC outbreaks. Maple webworm larvae can be found on trees from early July to October. At first, they feed where the eggs were laid, but later web leaves together and feed on surrounding leaves. They overwinter as larvae in a cocoon in the soil. Moths emerge late June and late August.



Maple webworm larvae web together and feed on surrounding leaves. Photo: T. Greaves



Two other sugar maple defoliators observed throughout the state are [maple trumpet skeletonizer](#) (mentioned in last month's update) and the [maple leafcutter](#). As late-season defoliators, their feeding is often considered of little consequence to the health of the tree, but the added stress of damage by these insects to that already apparent due to FTC may be noteworthy.

Both the maple trumpet skeletonizer (top) and the maple leafcutter (bottom) have distinctive, readily-recognizable feeding patterns.

Photos: S. Wilmot and Ron Kelley



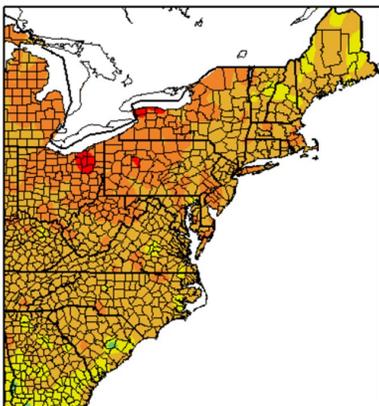
August was Hot!

August was consistently warm but without any heat waves. Temperatures were from 2 to 6 degrees warmer than normal for the month across the state. Burlington's 73.7° average temperature was the highest on record, 4.9° warmer than normal. (The old record from 1947 was 73.1°.) Temperatures reached 90° or higher 12 times this year, while 5/year is normal. By the end of August, Burlington's meteorological summer (June 1 to August 31) was the 2nd hottest on record.

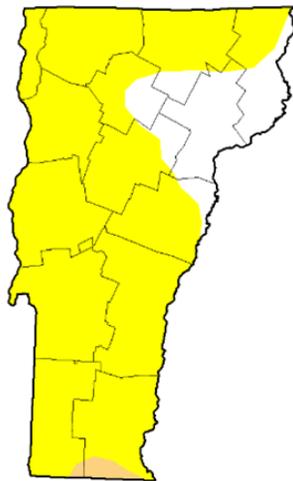
Elsewhere in the state, on August 11, Montpelier/Barre airport was 90° breaking the old record of 88° set in 1988. Mount Mansfield also broke a record that day with a temperature of 76°. The old record was 74° set in 2002.

Summer heat is normally accompanied by high humidity. This year, though, many of those hot days saw low humidity, a dry heat. More typical hot and humid weather arrived on August 9 with the Bermuda high and moisture directly from the Gulf of Mexico. Scattered thunderstorms with heavy rain were common.

Departure from Normal Temperature (F)
8/1/2016 - 8/31/2016



U.S. Drought Monitor Vermont



August 30, 2016
(Released Thursday September 1, 2016)
Valid 8 a.m. EDT

Statistics type: Traditional Percent Area Export table: [PDF](#) [CSV](#) [XLS](#)

Week	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current 2016-08-30	16.04	83.96	1.20	0.00	0.00	0.00
Last Week 2016-08-23	15.62	84.38	1.20	0.00	0.00	0.00
3 Months Ago 2016-05-31	71.57	28.43	0.00	0.00	0.00	0.00
Start of Calendar Year 2015-12-29	31.63	68.37	0.00	0.00	0.00	0.00
Start of Water Year 2015-09-29	33.80	66.20	0.00	0.00	0.00	0.00
One Year Ago 2015-09-01	72.40	27.60	0.00	0.00	0.00	0.00

Estimated Population in Drought Areas: **6,412**

[View More Statistics](#)

Intensity:

■ D0 (Abnormally Dry)
 ■ D2 (Severe Drought)
 ■ D4 (Exceptional Drought)

■ D1 (Moderate Drought)
 ■ D3 (Extreme Drought)

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying [text summary](#) for forecast statements.

Author(s):

Chris Fenimore, NOAA/NESDIS/NCEI

Statewide, average August temperatures were 2 to 6 degrees warmer than normal. Despite some rain and showers, the abnormally dry/drought conditions improved only slightly.

Overall, the month was wetter than normal but despite the rain and showers, the abnormally dry/drought conditions only slightly improved. Due to the scattered nature of the storms, some parts of the state saw little rain. Aug 12 - Aug 14 - t-storms generated from high heat and humidity, hail, gusty winds, rain/heavy rain, minor street flooding, from 0.35 in Windsor county to 4.45" in northeast Addison county. Aug 17 - rain/heavy rain, partial road washouts in Moretown/Duxbury. No rain in southern Vermont. Aug 22 - statewide rain 0.25 to 2"; drought area received ½ to 1½, enough to bring this area to abnormally dry. Aug 29 - heavy rain localized in a swath through Franklin to Essex counties brought down trees and powerlines. Rainfall included 4.5" in Eden Mills, 2.92" St. Albans; South Hero received 2.1" in 1 hr. Elsewhere in the state, little to no rain fell.

Dry Weather and Fall Foliage

Although opinions are circulating that fall foliage will suffer because of dry conditions in 2016, that hasn't been the case in Vermont. In fact, some of our best foliage years follow dry summers because, most often, dry weather brings out the reds, thanks to some details of plant physiology.



Red pigments are antioxidants produced to protect leaves from stresses such as drought and leaf senescence.

Photo: R. Kelley

Most students of fall color know that the reds are due to anthocyanins, which are produced in response to bright light and high sugar concentration within leaf cells. Foliage geeks know they are antioxidants which help leaves remain biologically active, which, in turn, slows leaf drop. As chlorophyll breaks down during fall senescence, oxidative damage to chemical compounds occurs when leaves are hit with light. Anthocyanins filter out blue and green light which can initiate the production of reactive oxygen and they also sequester damaging oxygen radicals that have been produced.

Trees actively make anthocyanins to protect leaves in response to drought, which can cause stresses similar to normal senescence. With less water in leaf cells, and therefore a higher sugar concentration, they're able to produce more red pigments than they would normally.



Trees that refoliated poorly after forest tent caterpillar defoliation still have minimal foliage.

There are some trees won't be part of the show this year. Defoliated hardwoods refoliated poorly, but account for just 0.5% of Vermont's forestland. And in scattered drought-prone sites, with extreme lack of water, leaves may turn brown or drop prematurely. On these sites, trees have resorbed water from their leaves and the re-supply of water has been interrupted, causing the death of leaf cells. Elsewhere, with the right mix of sunshine and cool temperatures, we should be seeing red.



However, 95.5% of Vermont's forestland was not defoliated.



On some drought-prone sites, like rocky ledges, leaves will turn brown or drop prematurely.



Spotted Knapweed is an Early Detection Invasive

There are a multitude of introduced knapweeds and thistles in Vermont. Among them, the non-native invasive plant called spotted knapweed (*Centaurea stoebe*) is considered highly invasive in the western United States. This plant is spread throughout North America, and is one of at least 13 species of the knapweed genus introduced to New England.

Spotted knapweed is on the watch list in Vermont, meaning the plant has invasive tendencies, but is not yet prohibited. A member of the aster family (Asteraceae), spotted knapweed is considered an early detection invasive species in Vermont because there are scattered accounts of the spread of this plant in the state, but its establishment is not thoroughly documented. Spotted knapweed's native range is Europe. An unintentional introduction brought this plant to North America (in contaminated seed or released in ship ballast in the 1800s). It is commonly found in meadows, roadsides, fields, sandy/gravelly floodplains, and disturbed areas.

A spotted knapweed plant can produce up to 18,000-25,000 seeds each growing season, with seeds remaining viable for almost a decade. Dispersal beyond the parent plant occurs by seed travel on people, animals, vehicles, and contaminated hay. Spotted knapweed prefers full sun conditions, but is highly adaptable and can grow in nutrient-poor, dry, or wet conditions. Spotted knapweed leads to a loss of plant diversity (it releases a toxin in the soil to stop growth of other plants), outcompetes desirable forage and crop species, and can decrease the stability and water-holding capacity of soil (it replaces a system of native plant roots with taproots).

The best time to identify this plant is during the summer and early fall, when it is flowering.

To learn more about spotted knapweed and how to identify it, check out [National Park Service Publications](#), [Go Botany](#), [Midwest Invasive Plant Network](#), [MSU Extension](#), and [CSU Extension](#).



(Left) Flowers are purple, blooming late spring to early fall. Bracts (specialized leaves) directly under the flower have black tips; (Center) First year rosette of leaves, pale green in color, deeply lobed; (Right) Spotted knapweed infestation in a southern New England field. Photos: R. Routledge, Sault College, [Bugwood.org](#), ([left](#) and [center](#)); L.J. Mehrhoff, University of Connecticut, [Bugwood.org](#) (right).

News from Neighbors

Numbers of [spruce budworm](#) moths captured in our Vermont pheromone traps this summer remain low. In contrast, the Campbellton-Dalhousie area of northern New Brunswick, which is located 120 miles northeast of Caribou, Maine, had moths galore when [tremendous numbers rode the warm, summer winds and air currents](#) more than 130 miles from southern Quebec to this corner of New Brunswick. Early results from Maine suggest that budworm numbers in pheromone traps may be down from recent previous years, but results are pending.

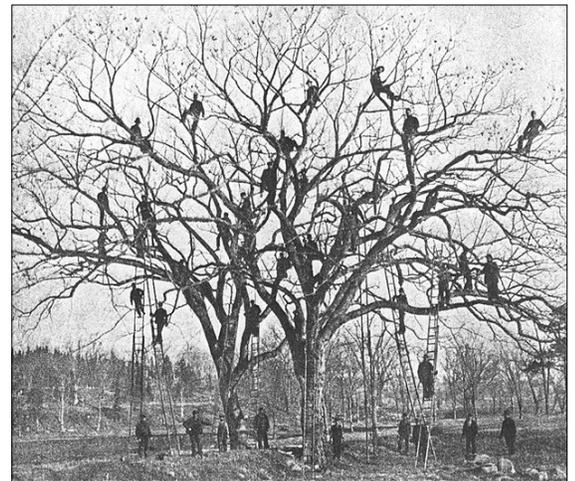
As a result of a massive "blow in", spruce budworm moths appeared by the millions in New Brunswick, Canada.

Photo: J. Wiersinga, Forest Protection Ltd.



Confirmation of the presence of [emerald ash borer \(EAB\) in Delaware](#) brings the state tally to 28. Like Vermont, Delaware was surrounded by infested states and discovery of the invasive pest was anticipated. While ash makes up only 2 percent of the trees in Delaware, white ash is one of the ten most common tree species in Vermont. Progress continues on the shocking potential control strategy using [EAB decoys](#).

[Gypsy moth populations have exploded](#) in Massachusetts, Rhode Island and Connecticut this summer. One explanation is that dry conditions have hampered the proliferation of *Entomophaga maimaiga*, a fungus credited with keeping gypsy moth populations in check.



(Left) Ash borer decoys produced in a heat-cured plastic method developed by engineers at Penn State and Western Michigan University. Photo: [Penn State](#);

*(Center) Gypsy moth larva infected with *Entomophaga maimaiga*. Photo: Steven Katovich, USDA Forest Service, [Bugwood.org](#); (Right) Early efforts to control gypsy moths included egg-scraping parties.*

Mosquito Update

The season has been dry for mosquitoes, but despite the low number of pest species, *Culex pipiens*, the so-called house mosquito that lives in artificial containers around the house and barn, has been doing well.

According to the [Vermont Agency of Agriculture, Food and Markets](#) and the [Vermont Department of Health](#) mosquito pools in Burlington, Brattleboro, Hardwick, and Vergennes tested positive for [West Nile Virus](#) (WNV) this season. A pool is a group of 1-50 mosquitoes of the same species, collected at the same trap location, on the same date. The mosquitoes in the 13 positive pools this year were a mixture of *Culex pipiens* and *Culex restuans*. These species are hard to separate but they have distinctive feeding behaviors. *Culex restuans* appears earlier in the season and is primarily a bird-feeding species. If there is a WNV viremia in the bird population, *Culex restuans* is a good vector species to monitor virus activity. *Culex pipiens* will readily feed on both birds and mammals, making it a species of concern for transmitting WNV to humans. Two human cases of WNV have been reported in Windsor County this year, the first human cases since 2003. So far in 2016, no mosquito pools or humans have tested positive for [Eastern Equine Encephalitis](#) (EEE).

Although [Vermont's checklist](#) of mosquitoes includes 45 species, the mosquitoes that carry the [Zika virus](#), notably *Aedes aegypti* and *A. albopictus*, are unlikely to be found in Vermont. Additional information is at the [Center for Disease Control](#) website.



Broom Rust and Slug Sawflies

Early signs of [fir broom rust](#), which results in the formation of witches' brooms within trees, include stunted needles, rubbery twigs, gall-like swellings at the base of infected areas, and the beginnings of a "broom." Yellow fruiting structures have not yet formed on the needles shown here.

Several species of [slug sawfly](#) larvae attack the foliage of oak trees. Commonly referred to as oak slugs or slug sawflies, the larvae feed gregariously on the underside of leaves, leaving a thin upper surface that quickly turns brown.



(Top) Initial symptoms of fir broom rust. Photo: J. Esden

Skeletonizing feeding behavior of the slug sawfly larvae. Photo: L. Lund.



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

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