FOREST INSECT AND DISEASE CONDITIONS IN VERMONT 2008

FOREST, PARKS & RECREATION
VERMONT
AGENCY OF NATURAL RESOURCES

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FOREST INSECT AND DISEASE CONDITIONS IN VERMONT

CALENDAR YEAR 2008

Hemlock Woolly Adelgid Egg Sac

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AGENCY OF NATURAL RESOURCES
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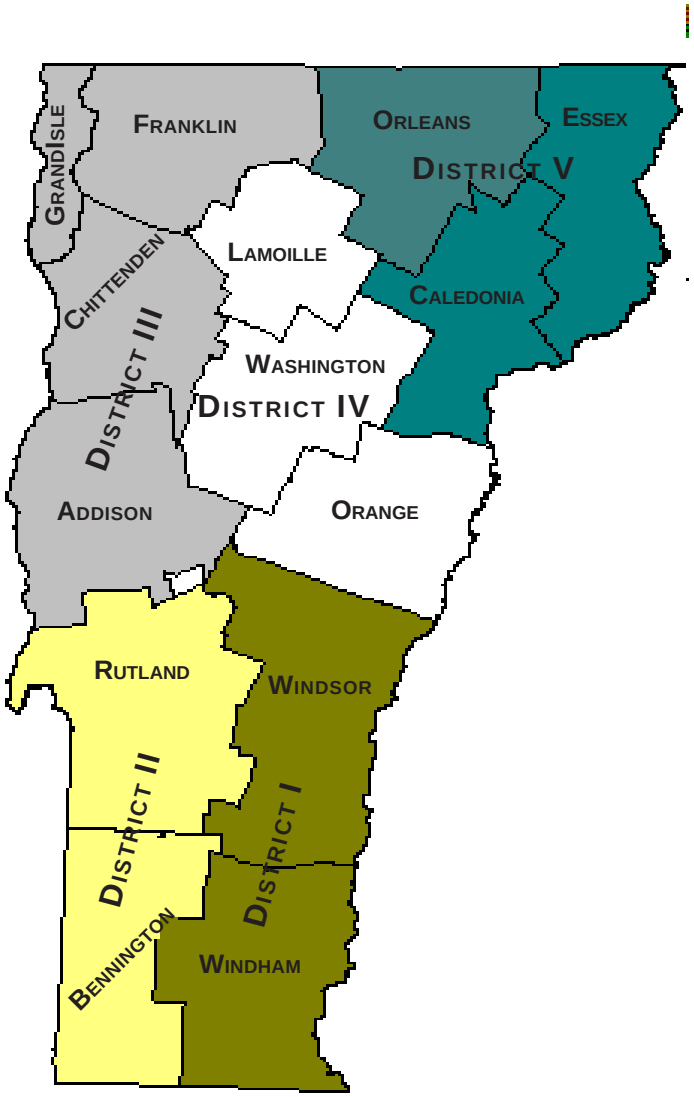

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2008 VERMONT FOREST INSECT AND DISEASE HIGHLIGHTS

Balsam Gall Midge (*Paradiplosis tumifex*) populations continue to increase. Noticeable damage to balsam fir is generally increasing in Christmas tree plantations. Damage was light in Christmas trees in Townshend and West Rutland, but moderate to heavy in scattered locations in northern Vermont.

Balsam Woolly Adelgid (*Adelges piceae*) populations continue to be high at lower elevations in the Green Mountains and surrounding towns including Winhall, Londonderry, Ludlow, Wallingford, Mt Holly and Shrewsbury. All affected stands had recently killed trees and in some stands there was a significant amount of mortality.

Beech Bark Disease, caused by *Cryptococcus fagisuga* and *Neonectria faginata*, remains widespread. Populations of beech scale are noticeable in some areas indicating that the populations are rebounding. Nectria was generally less obvious than the scale insect. Approximately 2,531 acres were mapped during aerial survey compared to 61,859 acres in 2007. The reduction in acres mapped is probably due in part to the crown deterioration of dead and dying trees.

Birch Decline and Mortality appears to be decreasing with 1,736 acres mapped this year compared to 3,563 in 2007. It remains evident on paper birch at upper elevations. Fewer acres were detected for the second consecutive year which is probably due to the deterioration of trees that died a few years ago.

Birch Defoliation, caused primarily by birch leafmining sawflies and leaf fungi (presumably *Septoria* sp.), was mapped during aerial survey on a total of 4,287 acres

Brown Spot Needle Blight, caused by *Scirrhia acicola and Mycosphaerella dearnessii*, was again heavy and widespread on white pine this year. Previous year needles on many trees browned up in early spring and the trees looked better once new growth emerged and brown needles had been cast. The disease was also common on red pine, Scots pine and Mugo pine.

Emerald Ash Borer, *Agrilus planipennis*, has not been found in Vermont but a recently discovered infestation in Carignan, Quebec, Canada is a concern. In 2007, green ash were girdled to create trap trees to survey for this borer at three sites in Grand Isle County and one site in Franklin County. These sites happened to be fairly close to the Canadian border in northwestern Vermont and only 30 miles south of the Quebec infestation. Two trees from each site were peeled this year (four in the spring and four in the fall) to look for signs of the insect. Other insects were present but no evidence of emerald ash borer was found. In addition, the Vermont Agency of Agriculture, with some help from the USDA Animal and Plant Health Inspection Service (APHIS), placed 120 newly-developed sticky purple traps throughout the state to survey for this insect. These traps were baited with an oil that the emerald ash borer finds attractive. All traps were negative for the insect.

European Wood Wasp (*Sirex noctilio*) is an exotic insect that attacks pines. It was detected in Vermont for the first time in 2007 when a single specimen was captured in a baited trap deployed in Stowe by the Vermont Agency of Agriculture. Because of this, Lamoille County is considered to be an infested county. Pine trap trees were again used this year as prescribed in sampling protocols developed by the USDA Forest Service. Since we wanted to determine the extent of *S. noctilio* in the town of Stowe, five pine sites were selected, all within four miles of where the single wasp was trapped in 2007. Eight red pines and eight white pines in poor crown condition were used as trap trees, but no *Sirex* were captured.

Forest Tent Caterpillar (*Malacosoma disstria***)** populations collapsed statewide and have returned to endemic levels. Moth catch in pheromone traps decreased in all trap sites this year. There was a remnant population in Braintree causing some moderate defoliation of sugar maple over a small area, but elsewhere only occasional larvae were observed. Tree health in most defoliated locations has recovered, but in a few stands new mortality and dieback continues. This has required salvage cuts of scattered high-value oak and the reclamation of several sugarbushes.

Gypsy Moth (*Lymantria dispar*) defoliation was mapped on 537 acres in the Rutland County towns of Castleton, Ira, Poultney and Middletown Springs. Occasional larvae were observed in other counties. Egg mass counts per 1/25th acre monitoring plot at focal areas increased in five of the ten monitoring sites, but remained low, indicating a prediction of continued low populations for 2009.

Hardwood Chlorosis was mapped late in the season for every county in the state except Grand Isle. Chlorosis was especially noticeable in low-lying areas and at the base of slopes. Excessive soil moisture from record rainfall amounts is suspected as the cause.

Hardwood Defoliation was mapped during aerial survey on a total of 2,781 acres. The cause of this defoliation could not be determined.

Hemlock Woolly Adelgid was newly detected in Vernon, Townshend, Jamaica, and additional sites in Brattleboro. Formal detection surveys, using a modified Costa method, have been conducted at 67 sites in 15 Windham County towns as of November 19th. Citizen volunteers have also been trained to conduct surveys in Windham County.

We will be implementing an integrated slow-the-spread management plan in cooperation with the Agency of Agriculture, Food, and Markets, the States of Maine and New Hampshire, the US Forest Service, and local universities.

Ice Damage was widespread, due to freezing rain on December 12th. Up to ¾ of an inch of ice accumulated on trees in southern Vermont, centered mostly in Windham, Windsor, and Orange counties. The towns of Marlboro, Wilmington, and Whitingham were hardest hit.

The most severe damage to trees occurred on east or south-east facing slopes at elevations above 1100 feet. Heavy rains occurred prior to freezing causing some trees to be uprooted due to saturation of unfrozen soils. Recommendations for managing forestland and sugarbushes affected by ice have been updated, based on observations and research following the ice storm in 1998.

An **Oak Leaf Tier complex** is thought to be responsible for defoliation of red oak in several locations in Washington, Chittenden, Rutland, Windham, Windsor, and Franklin counties. Damage was mapped on 852 acres, although the known defoliated area is larger. Site evaluations were conducted too late to determine the exact causal agent or agents but some adult moths that were flying at one site in Bolton were collected and identified as *Psilicorsis quercicella*, a leaf-tying oak defoliator. Another species of *Psilicorsis* was associated with a complex of leaf tiers plus *Phigalea titea* that defoliated oak in the Middlesex area of Washington County in 1980.

Saddled Prominent (*Heterocampa guttivata*) caused light damage in Pomfret and Sharon this year. In 2006 and 2007, it caused widespread defoliation in northern Vermont, but was not observed this year. Due to the unavailability of pheromone lures this year, pheromone trapping for this insect was discontinued.

Spruce-Fir Decline remains evident at high elevations but acres mapped decreased to 568 acres in the state this year compared to 5,484 acres in 2007. There has been little or no winter injury in recent years to accelerate the decline.

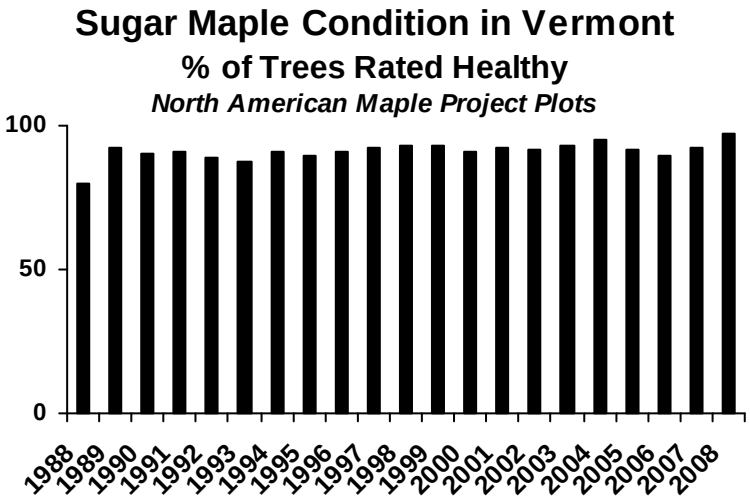
VERMONT 2008 FOREST HEALTH MANAGEMENT RECOMMENDATIONS

FORESTRY CENTENNIAL CELEBRATION

Reported by the State of Vermont
Department of Forests, Parks and Recreation

This report summarizes information of particular importance to forest managers. Additional information can be found in the complete report on Forest Insect and Disease Conditions in Vermont 2008 or in separate summaries for sugarbush and Christmas tree managers. For assistance in identifying pests, diagnosing forest health problems, on-site evaluations, and insect population sampling, or to obtain copies of defoliation maps, management recommendations, and additional literature, contact Forest Resource Protection personnel or your County Forester.

General Tree Condition was particularly good in 2008, with dense, lush foliage. Trees on plots monitored as part of the North American Maple Project were in the best condition observed over the 20 years they have been evaluated.



However, the threats to tree health from **Exotic Pests** accelerated including hemlock woolly adelgid, now established in Windham County, and emerald ash borer, oak wilt, and Asian longhorned beetle detected within fifty miles of Vermont. Detection of infestations while they are still small is the key to having any chance of eradicating these if they are found in Vermont. Although there is no upside to owning or managing lands infested by one of these insects, we're more likely to be able to limit the spread within a property or locality if we receive early reports and are able to respond rapidly. More information on identifying these is at http://www.vtfpr.org/protection/idfrontpage.cfm. We welcome volunteers interested in participating in our exotic pest surveys.

We continue to discourage salvage of host species in advance of potential infestations. Widespread salvage shrinks the gene pool of a species. Important genes, including those that may make trees pest-resistant, could be lost. You may be salvaging unnecessarily. We don't know where these pests will appear next, or how quickly they will spread. Continuing research may uncover better management strategies.

We have begun developing Vermont-specific **Invasive Plant Management** guides. Sites should be inspected for potentially invasive exotics wherever management activities are planned. It may be worthwhile to eradicate isolated plants so they don't spread following disturbance, or to control a more significant invasion before a regeneration cut. You must be a certified pesticide applicator through the Vermont Agency of Agriculture to apply herbicide on any land you do not own.

Updated information about exotic plants is available from the Vermont Invasive Exotic Plant Committee website: http://www.vtinvasiveplants.org/.

Weather Damage from windstorms and the December ice storm were locally important. Based on studies following the 1998 ice storm, most trees with less than 50% crown loss are expected to recover quickly, and most with up to 75% or more crown loss are expected to survive. The exception is paper birch, which is at risk with over 25% crown loss. Updated recommendations for managing stands affected by ice are available at: http://www.vtfpr.org/protection/documents/IceStormrecommendationsforlandownersandforesters.pdf

Recovery of Sugar Maple Damaged by the Ice Storm in 1998 (left) and 2001 (right)

Red Oak stands in scattered locations throughout the state were defoliated in early spring by leaf rolling caterpillars. This damage could be important in stands that are just recovering from tent caterpillar defoliation. Also of concern to red oak is the detection of oak wilt near Albany, NY. Symptoms of oak wilt include leaves that wilt rapidly in June or July, followed by mid-summer leaf drop.

Red Oak Defoliation by Leaf Rolling Caterpillars

Northern Hardwoods continue to recover from recent outbreaks.

Beech bark disease remains common, but the levels of beech scale and the Nectria fungus are returning to "normal" levels. Stem defects, however, may become more noticeable as the bark of surviving trees begins to grow around wounds created during the recent spike in beech bark disease. These sunken lesions will become more severe defects as trees age.

Sunken Lesions from Beech Bark Disease

Decline from Forest Tent Caterpiillar is Stabilizing

In most **Sugar Maple** stands, recent defoliation by forest tent caterpillar is no longer a concern. However, where sugar maple dieback is noticeable, it is often related to the caterpillar outbreak. Often, other stressors are also involved, such as shallow site, sapstreak disease, and wounding.

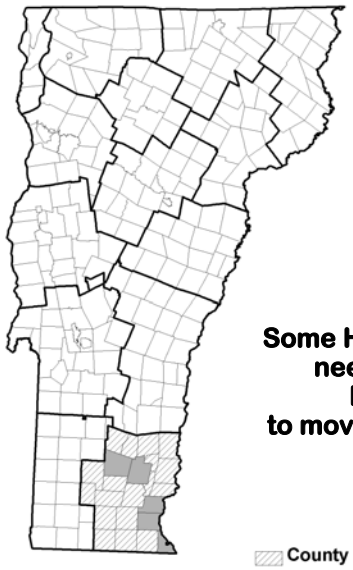
Sapstreak Leaves a Characteristic Staining Pattern in the Stump

Pine symptoms were common in 2008 with the occasional white pine dying from blister rust, and scattered heavy shoot mortality of red pine. We are concerned about scattered red pine stands with pockets of recent mortality, and would be interested in reports of these.

Although there has been discussion of a quarantine of pine logs and lumber from Vermont, due to the detection of a Sirex woodwasp in 2007, no federal quarantine is in place. In 2008, the insect was not found in any of the traps that were deployed at 135 sites statewide.

Hemlock woolly adelgid is now established in Windham County. It has been detected in the towns of Vernon, Brattleboro, Dummerston, Jamaica, and Townshend. We are initiating an integrated management strategy in cooperation with the states of New Hampshire, Maine, and the US Forest Service. Our objective is to slow the spread from infested areas and eradicate outlier populations. Please notify us of any white woolly masses on hemlock you think may be adelgid.

Vermont, New Hampshire, Maine, and Canada have restrictions on moving hemlock logs, lumber with bark, and chips from infested states. If the hemlock is from outside Windham County, a Proof of Origin certificate may be requested. If the hemlock is cut in Windham County, a certificate that the State of Vermont has done a hemlock woolly adelgid inspection may be needed. Hemlock logs are most at risk to move adelgid between the months of March through July. Details about quarantines are accessible through the contact numbers below or http://na.fs.fed.us/fhp/hwa/quarantines/quarantines.shtm.



Some Hemlock Wood Products need to be certified free of Hemlock Woolly Adelgid to move from Windham County

Additional information on managing threatened hemlock forests is online at harvardforest.fas.harvard.edu/

For more information, contact :

Windsor & Windham Counties……..	Springfield (802) 885-8845
Bennington & Rutland Counties……	Rutland (802) 786-3851
Addison, Chittenden, Franklin, & Grand Isle Counties……....	Essex Junction 802) 879-6565
Orange & Washington Counties……..	Barre (802) 476-0170
Lamoille & Washington Counties……	Morrisville (802) 888-5733
Caledonia, Orleans & Essex Counties……	St. Johnsbury (802) 751-0110

INTRODUCTION

The information in this report is based on aerial surveys to detect forest damage, as well as ground surveys and observations by Vermont Forestry Division staff.

A statewide aerial survey to map late season defoliators and general forest conditions was flown between July 29th and September 2nd. A special survey was flown in parts of north-central Vermont on July 7th to assess oak defoliation. All surveys were conducted using a digital sketch mapping system.

ACKNOWLEDGEMENTS

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WEATHER AND PHENOLOGY

2008 weather statistics based on Burlington data are summarized in Figure 1. Unless otherwise noted, all temperature and precipitation reports in the narrative below are from our Essex weather station.

Fall and Winter, 2007-2008. As usual, the oaks and the larches were the last to hold onto their leaves and needles well into the month of November. On the 16th of November, the first real snowfall covered the mountains with 6-8" of white gold for the ski areas—a full week before the Thanksgiving holiday. Continued cold temperatures held the snow in the mountains and gave a great start to the ski season. December 3rd marked the first big snowfall in the mountains (25" at Jay Peak—only about 9" in the Champlain valley). Temperatures remained cold and the snow piled up. On the 16th, a serious nor'easter blanketed Vermont with more heavy snow (17.6" at Essex). In December, a total of 46.1" of snow fell at the Essex weather station with as much as 22" remaining on the ground on the 17th. However, chances for a white Christmas were nearly dashed when heavy rains fell on December 23rd. The considerable snowpack that had built up all month shrank, but did not disappear.

A major thaw soon arrived in the new year (January 6th-9th). Temperatures were in the upper 40's, 50's, and even the low 60's, which was a 80 degree temperature swing in just a few days. Much of the valley snow melted and flood warnings were issued in many locations. The rest of the month was characterized by a series of "wintery mix" storms—starting as snow, changing to rain, and then back to snow. These resulted in little or no snow accumulation in the valleys, but snow did accumulate in the mountains contributing to the great ski conditions in the Northeast. However, these light icing events in the valleys were very hard on the roadways, with the alternating melting and freezing working to pry up any cracks in the pavement.

Back-to-back snowfalls on February 6th and 7th added up to nearly 14" in Burlington—considerably more in the foothills along the spine of the Green Mountains and to the east, re-establishing the snowpack after the January thaw. The month of February was very wet, with many small storms. By the end of February, western Vermont had between 4 and 16 inches of snow on the ground while eastern Vermont had 30-50 inches. The deep snowpack remained in place into April, while much of western Vermont saw little to no snowpack for the remainder of the season.

A pattern of mixed precipitation events; sleet, snow and freezing rain continued through March. An ice storm on March 8th and 9th coated everything with about ½" of ice. White pines broke branches and the gray birches all leaned down, but the storm ended just before any widespread damage occurred. By Saint Patrick's Day, the temperature rarely rose above freezing...sugar makers were waiting for a break. Late March brought more wet snow, rain, sleet and slush. After the storms passed, the skies would clear and the temperature would drop overnight, freezing the slush into frozen ruts and craters on sidewalks and driveways.

Spring, 2008. A majority of all sugar makers said they had a better than average year, especially in southern Vermont. The sap was sweeter than average, and lots of fancy grade syrup was being made…even by operators without a vacuum system on their pipelines. In Northern areas, sugar makers generally reported a stingy sap flow into April, with higher elevation sugarbushes reporting less quantity on average than lower ones across the state, mostly due to heavy snowpack.

The rain/snow pattern continued into early April keeping the mountain and northeast snowpack in place through mid-April. The snowpack had become layered with ice during March storms. The water content of the snow was estimated at 15 inches and there was significant potential for serious spring flooding. However, from April 15 on, the weather turned mild and dry. A stretch of particularly gorgeous weather from April 15 to 28 was dry (most of the state received less than .25" of rain) and warm (60's, 70's, and even low 80's). This warm, dry period allowed snow to melt slowly and thereby eliminate the threat of flooding at this time.

In addition to allowing for excellent pollination, the dry period increased early spring fire danger. Fire danger ratings reached "Very High" for much of this period, especially in southern Vermont where the rating went to

"Extreme" on April 24. The National Weather Service offices in Burlington and Albany also issued a red flag warning on April 24 for strong winds, low relative humidity, and extremely dry fuels. The warning covered all of Vermont. Many fire wardens stopped issuing fire permits during this time, and consequently, relatively few wildfires resulted. Spring fire season continued into mid May following another 2-week dry spell. Green-up progressed in the valleys through this period and the mid to upper elevations locations became drier. Full green-up occurred by mid-May thus ending spring fire season (Figures 2-5 and Table 1.) Rainfall records for the fire weather observation stations in Vermont are presented in Figures 6-11.

Summer, 2008. The 60 day period from mid-June to mid-August saw several episodes of very heavy rainfall…mainly in central Vermont. Upper level atmospheric conditions on June 14th favored very slow or even backward storm motion allowing thunderstorms to remain stationary or even re-develop over central Vermont. Some areas saw three inches of rain with isolated reports of up to five inches in just a few hours producing flash flooding. The city of Rutland and the towns of East Middlebury and Ripton were the worst hit. Extensive street flooding in Rutland closed businesses, and the heavy rainfall washed out roads in the nearby higher terrain communities. Culverts were overwhelmed, and dirt roads were severely eroded.

Heavy rains picked up again in mid-July. A storm on July 18th spun off an officially designated tornado in Waterville and Cambridge…leaving a path of devastation stretching for miles over the woods and farmland (See NWS report below.) Again on July 23rd and 24th, more rain, more flooding, and more roads washed out. One hundred and forty Boy Scouts and their leaders were stranded when the road leading to their camp near Eden was washed out by the rising waters. The level of Lake Champlain rose right back up to early springtime levels and stayed there through most of the summer (98.78' on August 12th). The most severe event occurred on the 6th of August across the central Green Mountains. Three to five inches of rain led to severe flash flooding along the upper reaches of the White River in the towns of Hancock, Leicester and Ripton. Damage was reported in Danville and West Barnet. Many other communities scattered across the state suffered flood damage from localized heavy rainfall. Rainfall totals for the period of July 15th through August 14th set records in many locations across the state. South Lincoln recorded over 14" and Montpelier measured nearly 12 ½" over this period.

All this rain produced one of the greenest summers in recent memory. Luxuriant vegetative growth was everywhere, and suburbanites never got a break from weekly lawn mowing. Many plants had heavy flowering and fruiting—especially red oak, red maple, cherry, white pine, basswood, yellow birch, apple, berries and grape. Beechnuts, however, were sparse.

The rainy weather pattern ended around August 12th as abruptly as it started. The rest of the summer was dry and pleasant.

Fall, 2008. The trees went into the fall having experienced little or no drought stress throughout the entire growing season. Prospects were good for an exceptional foliage season. We would not be disappointed. Some early color started showing up in the usual low-lying areas in September and the color change progressed steadily throughout the month. The leaves changed color quickly in the last week of September…already at peak foliage in many northern and higher elevation locations (Figure 12). Panoramic views, specimen trees—everywhere you looked was spectacular, and it seemed to last longer than usual. Most people agreed that the 2008 foliage season was the best one in at least ten years, maybe longer.

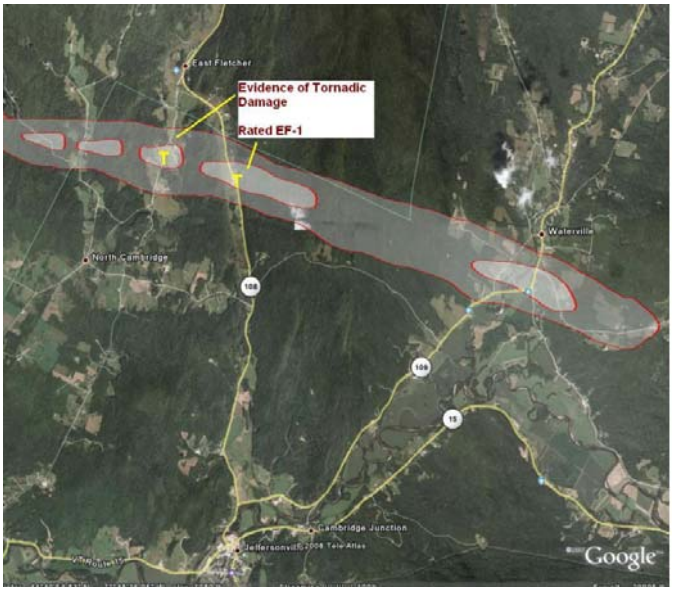
An Ice Storm hit the state on December 12th. Up to ¾ of an inch of ice accumulated on trees in southern Vermont, centered mostly in Windham, Windsor, and Orange counties. The towns of Marlboro, Wilmington, and Whitingham were hardest hit. There were approximately 40,000 power outages as a result of the storm.

Severe Weather Event – July 18, 2008

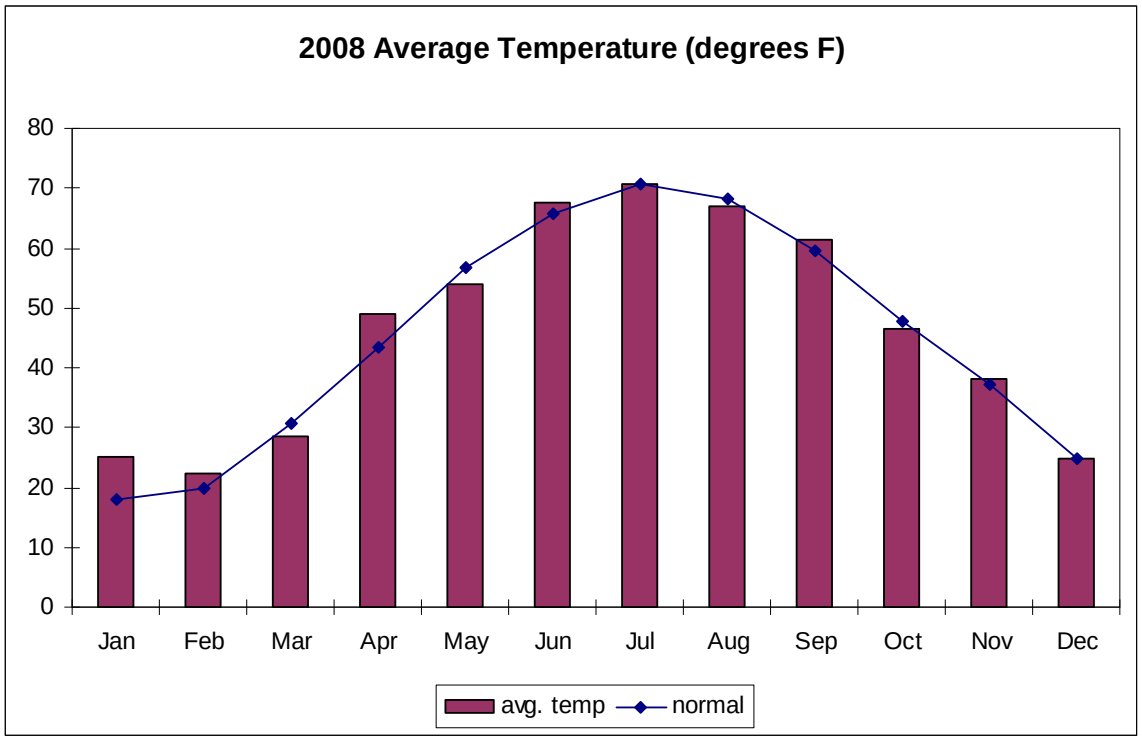
The following is an excerpt from the Burlington, Vermont National Weather Service office report of the July 18, 2008 severe weather event across the North Country.

"On July 18th, 2008, several meteorological ingredients came together to produce a significant severe weather outbreak across northern New York and central and northern Vermont. The highest concentration of damage occurred from the Saint Lawrence Valley in northern New York into the northern Champlain Valley, then into central and northern Vermont. This particular severe weather outbreak produced over two dozen severe weather reports, with the primary damage being caused by strong and damaging straight line wind gusts. However, a damage survey and video obtained by the National Weather Service in Burlington, confirmed a brief EF1 tornado touched down several times in the North Cambridge, Vermont area. It was determined by the survey and the damage; winds approached 100 mph by this tornado. In addition, several nickel to quarter size hail reports occurred during this event. The widespread severe thunderstorms resulted in over 20,000 customers loosing power across northern New York and Vermont during the event.

The image below shows a Google Map outline of the damage, which occurred in the Cambridge to Waterville, Vermont area. From the map and the survey, the National Weather Service determined the damage started on Pond Road in North Cambridge, then continued eastward across Kinsley Road, North Cambridge Road, Route 108, then Route 109 about 1 mile south of Waterville, and finally ended on Plot Road several miles southeast of Waterville. We determined the damage from Pond Road to Kinsley Road was caused by straight-line winds between 70 and 90 mph from the bow echo (intense line of strong thunderstorms that looks like an archer's bow when seen on weather radar, often associated with small tornadoes and damaging winds) which also impacted the Grand Isle County area. Meanwhile, as the bow echo interacted with strong southerly winds moving up the North Cambridge Road Valley, and Route 108 Valley, two brief EF0 and EF1 tornadoes touched down. The first touch down on North Cambridge Road, is labeled with a "T" in the image below and produced winds up to 80 mph. Meanwhile, the next touch down occurred near a farmstead located on Route 108 and produced winds up to 100 mph according to the amount of damage and is also labeled with a "T" on the image below. The lighter white areas represent winds of 50 to 60 mph with isolated to scattered trees down and minor damage was observed. Meanwhile, the brighter white color in the figure below indicates winds between 70 and 90 mph with isolated areas of winds approaching 100 mph based on the damage. The damage path was about 6 to 7 miles long and one third to one half mile wide. According to eyewitnesses the storm occurred between 3:27 PM and 3:35 PM on July 18th. The worst of the damage occurred near North Cambridge Road and Route 108, where 80 to 90 percent of the trees, mostly softwood, were blown over or snapped midway up. There was also significant structural damage which occurred to a farmstead along Route 108."



Outline of the damage that occurred in the Cambridge to Waterville, Vermont area during a severe weather event on July 18, 2008.



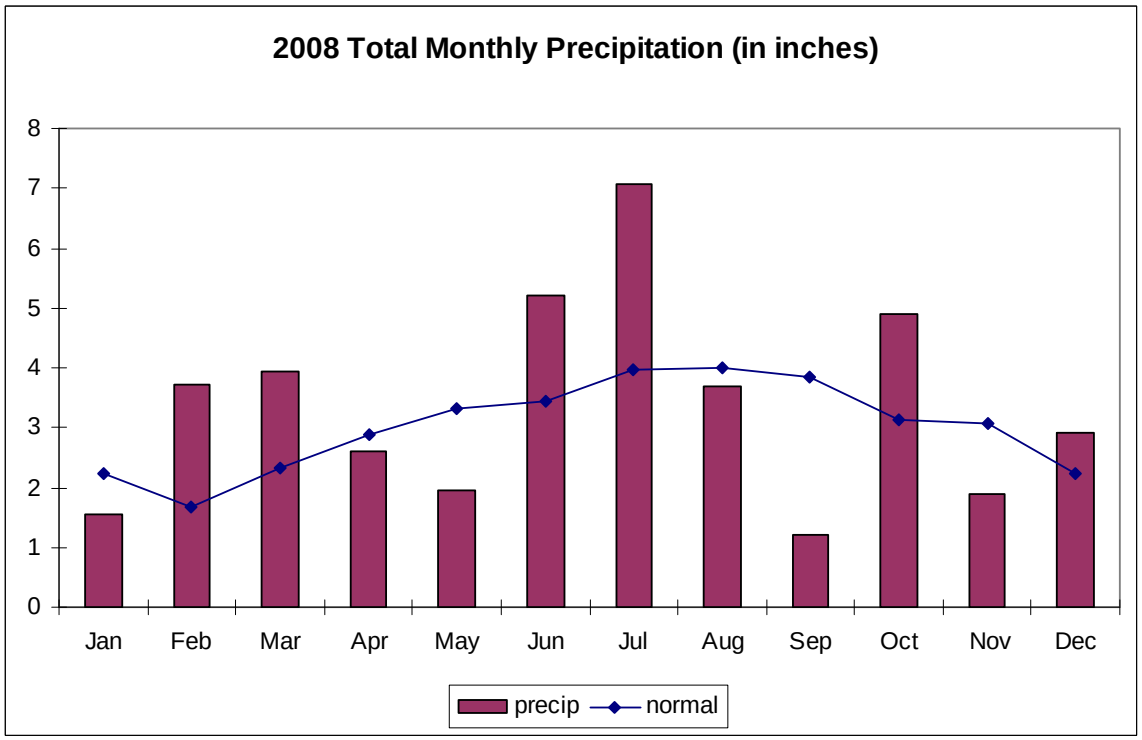


Figure 1. Monthly average temperature and monthly total precipitation in 2008, compared to normal for Burlington, Vermont. (Normals are for years 1971-2000.)

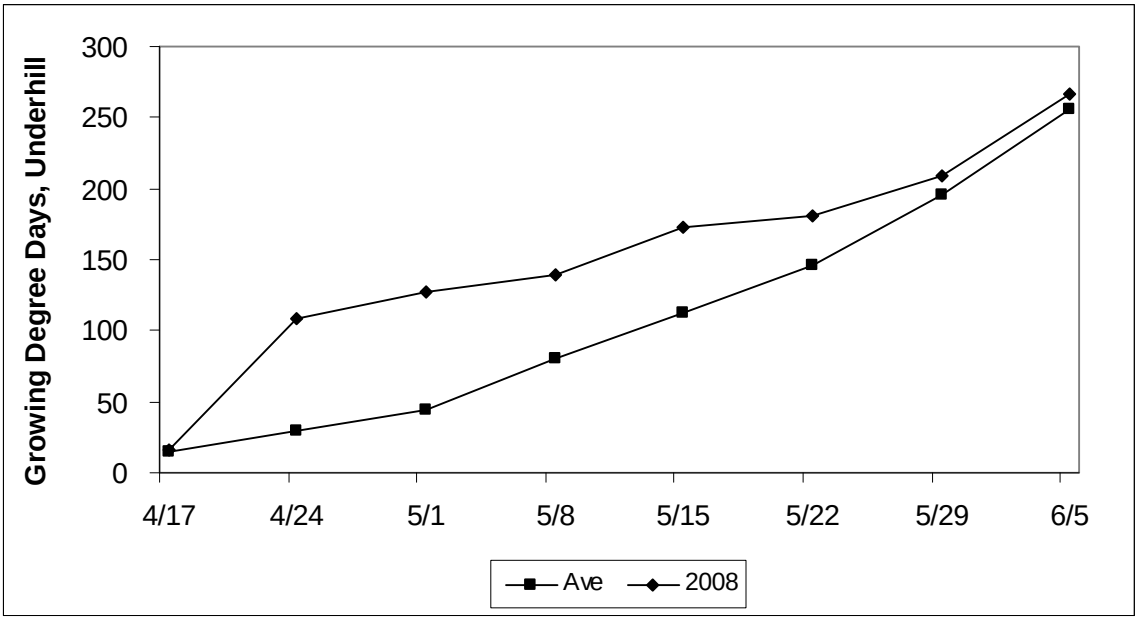


Figure 2. Weekly spring cumulative growing degree days for Underhill, Vermont, in 2008 compared with mean 1993-2008 accumulations. 50° F is used as the threshold of development.

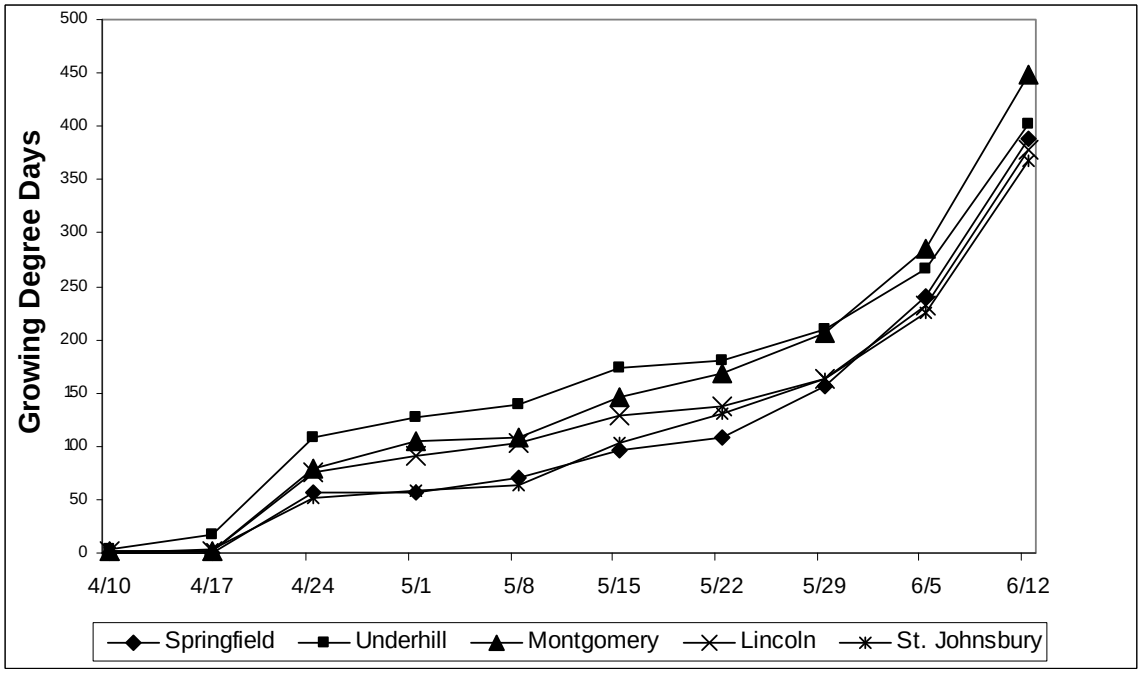


Figure 3. 2008 weekly spring cumulative growing degree days for Springfield, Underhill, Montgomery, Lincoln and St. Johnsbury, Vermont. 50° F is used as the threshold of development.

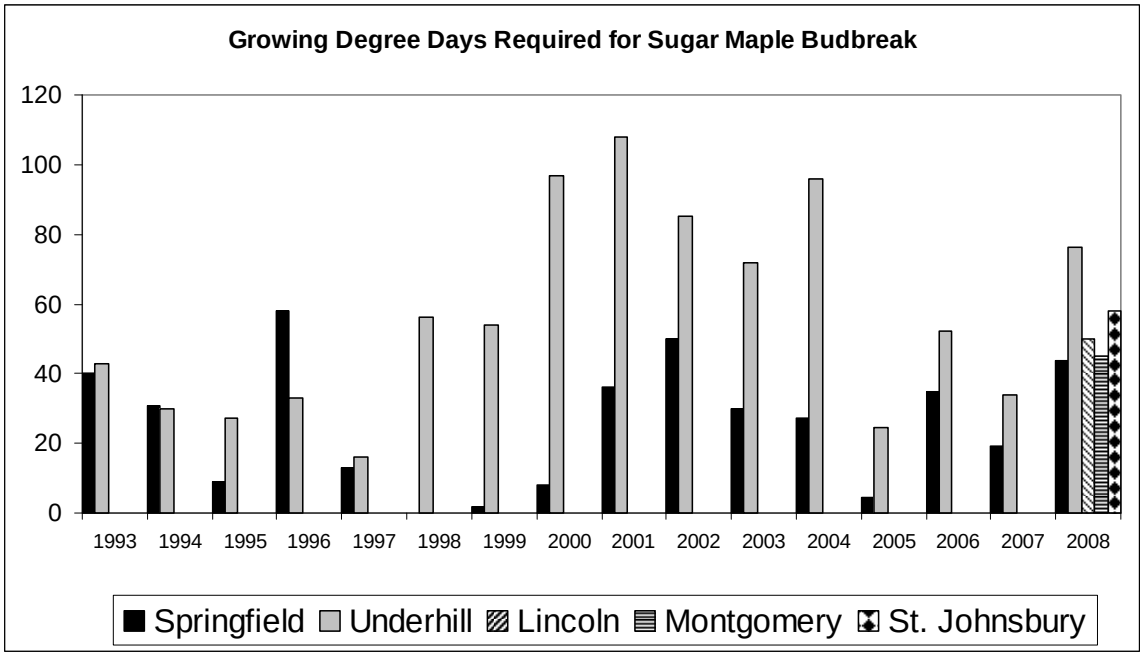


Figure 4. Growing degree days for sugar maple budbreak in Springfield, Underhill (1993 – 2008) and Lincoln, Montgomery and St. Johnsbury in 2008.

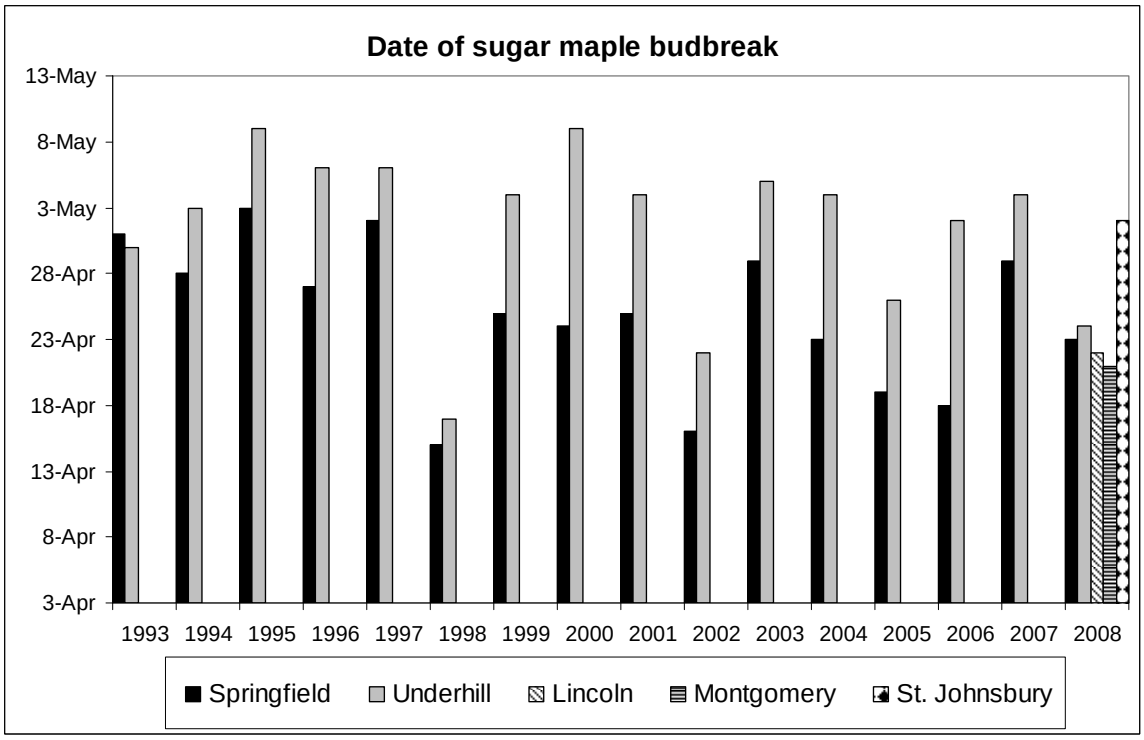


Figure 5. Dates of sugar maple budbreak in Springfield, Underhill (1993 – 2008) and Lincoln, Montgomery and St. Johnsbury in 2008.

Table 1. First observation dates of phenological development and growing degree day accumulation from 5 sites in Vermont in 2008. 50°F is used as the threshold of development.

Biological Indicator	St. Johnsbury	Lincoln	Montgomery	Springfield	Underhill
PLANT DEVELOPMENT					
Showing Green					
Fir, Balsam		5/9 (105.3)	5/19 (166)		5/6 (134.7)
Hemlock		6/1 (193.4)	5/24 (170)	5/17 (102.5)	
Spruce, Red		6/2 (203)	5/31 (224.5)		
Budbreak					
Ash, White		4/27 (87.1)	5/9 (109.5)	5/1 (57)	4/30 (127.2)
Aspen, Quaking	4/28 (57.9)	4/21 (39)	4/24 (79)		
Cherry, Black	5/1 (57.9)	4/20 (30.9)	4/20 ((15.5)	4/20 (19.5)	
Cherry, Choke	4/26 (55.4)	4/19 (19.1)	4/20 (15.5)		
Elm, American			4/23 (67.5)		
Fir, Balsam			5/22 (169)		5/20 (181)
Hemlock			5/27 (200)		
Lilac	4/24 (51.5	4/19 (19.1)	4/18 (9.5)		
Maple, Red	4/28 (57.7)	4/23 (63.3)	4/22 (55.5)		4/23 (105.6)
Maple, Sugar		4/22 (50)	4/21 (45)	4/23 (43.5)	4/21 (76.3)
Oak, Red		4/23 (63.3)	5/5 (104.5)	4/25 (57)	
Shadbush		4/22 (50)			
Spruce, Red			6/5 (286)		
Virginia Spring Beauty		4/19 (19.1)	4/17 (1.5)		
Wild Strawberry			4/23 (67.5)		

Biological Indicator	St. Johnsbury	Lincoln	Montgomery	Springfield	Underhill
Flowers of Deciduous Trees and Shrubs					
Ash, White			4/27 (96)		
Aspen, Quaking		4/19 (19.1)	4/16 (1.5)		
Cherry, Black			5/31 (224.5)		
Cherry, Choke		5/24 (137.2	5/14 (133)		
Lilac (first flowers)			5/13 (127.5)		5/23 (181)
Maple, Red		4/19 (19.1)	4/19 (18)		4/20 (60.9)
Maple, Sugar		5/4 (91.1)			
Shadbush	5/7 (63.4)				4/25 (116)
Wild Flowers					
Marsh Marigold	5/3 (57.9)	5/5 (91.1)			
Virginia Spring Beauty			4/19 (18)	5/6 (59)	4/20 (60.9)
Wild Strawberry		5/9 (105.3)	5/6 (104.5)	5/10 (80)	5/20 (181)
INSECT DEVELOPMENT					
Eastern tent caterpillar (first tent)	4/27 (57.7)	5/10 (108.1)	5/4 (104.5)		
Gypsy moth (egg hatch)		5/8 (102.6)			
Pear thrips (first adults)		4/18 (9.6)			4/16 (3.2)
OTHER OBSERVATIONS					
Spring peepers calling	4/22 (41.3)	4/21 (39.7)	4/18 (9.5)	4/19 (13)	
Full Green up			6/5 (286)	5/31 (180.5)	

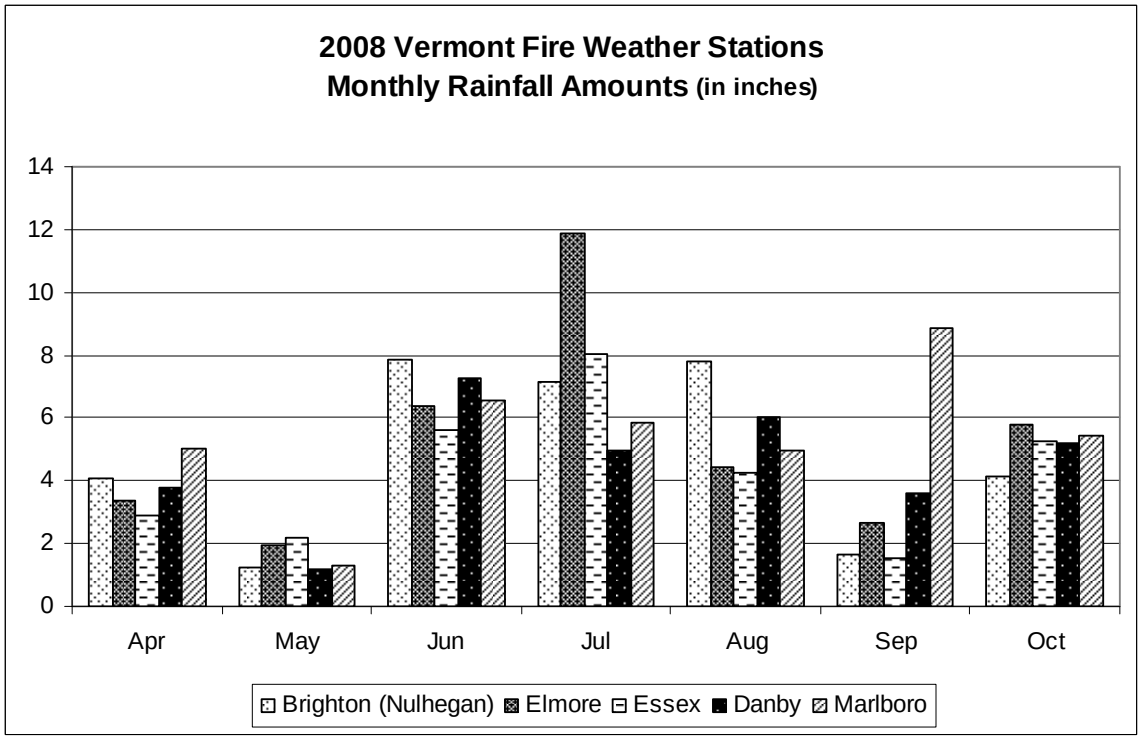


Figure 6. Monthly rainfall amounts (in inches) at Vermont fire weather observation stations through fire season, April – October, 2008.

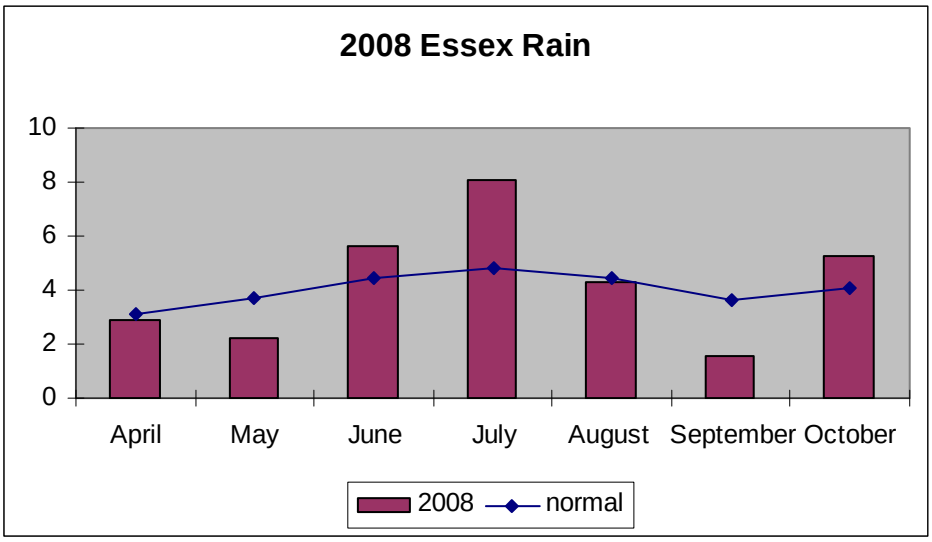


Figure 7. Monthly rainfall amounts (in inches) at Essex, Vermont, fire weather observation station compared to normal through fire season, April – October, 2008. Normal is based on 15 years of data.

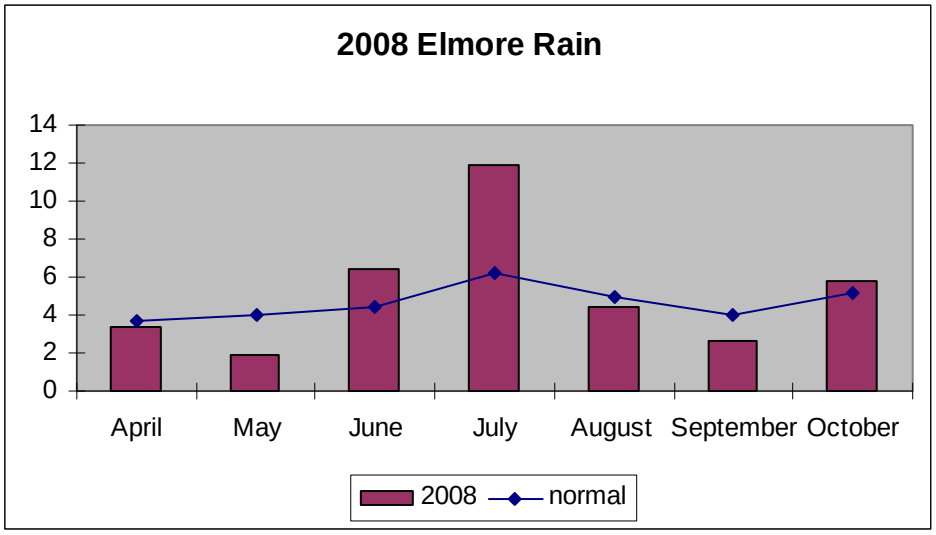


Figure 8. Monthly rainfall amounts (in inches) at Elmore, Vermont, fire weather observation station compared to normal through fire season, April – October, 2008. Normal is based on 14 years of data.

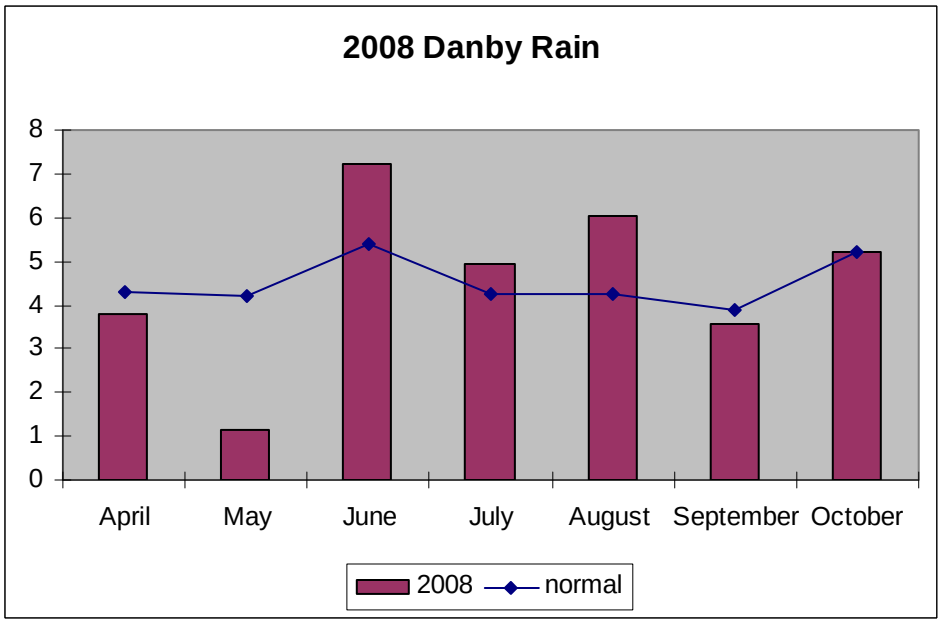


Figure 9. Monthly rainfall amounts (in inches) at Danby, Vermont, fire weather observation station compared to normal through fire season, April – October, 2008. Normal is based on 11 years of data.

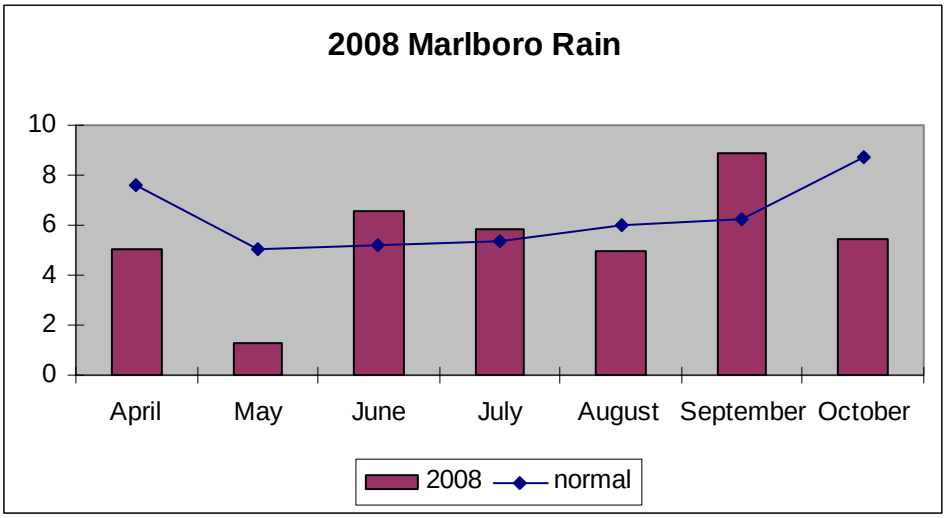


Figure 10. Monthly rainfall amounts (in inches) at Marlboro, Vermont, fire weather observation station compared to normal through fire season, April – October, 2008. Normal is based on 6 years of data.

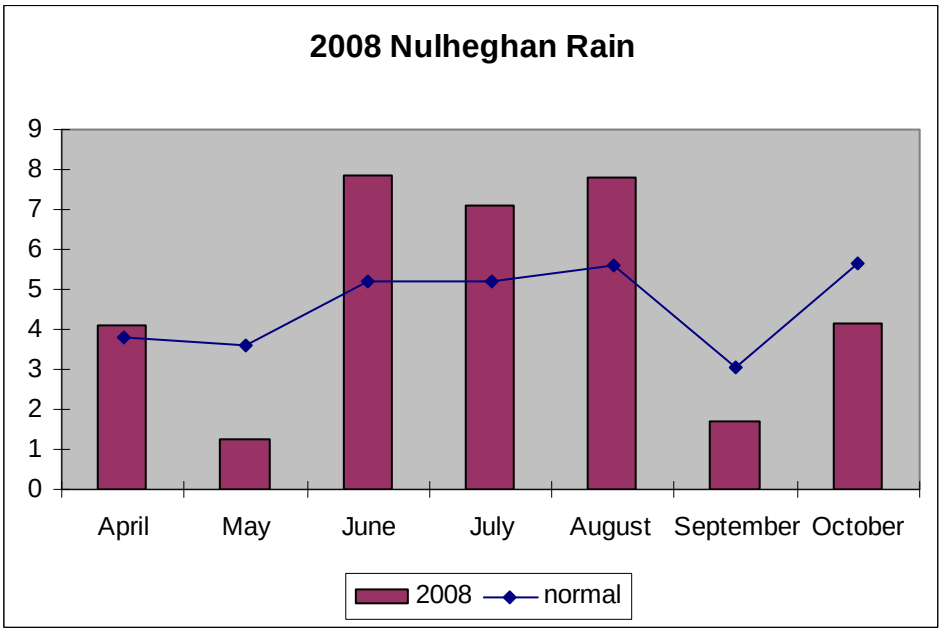


Figure 11. Monthly rainfall amounts (in inches) at Nulhegan, Vermont, fire weather observation station compared to normal through fire season, April – October, 2008. Normal is based on 6 years of data.

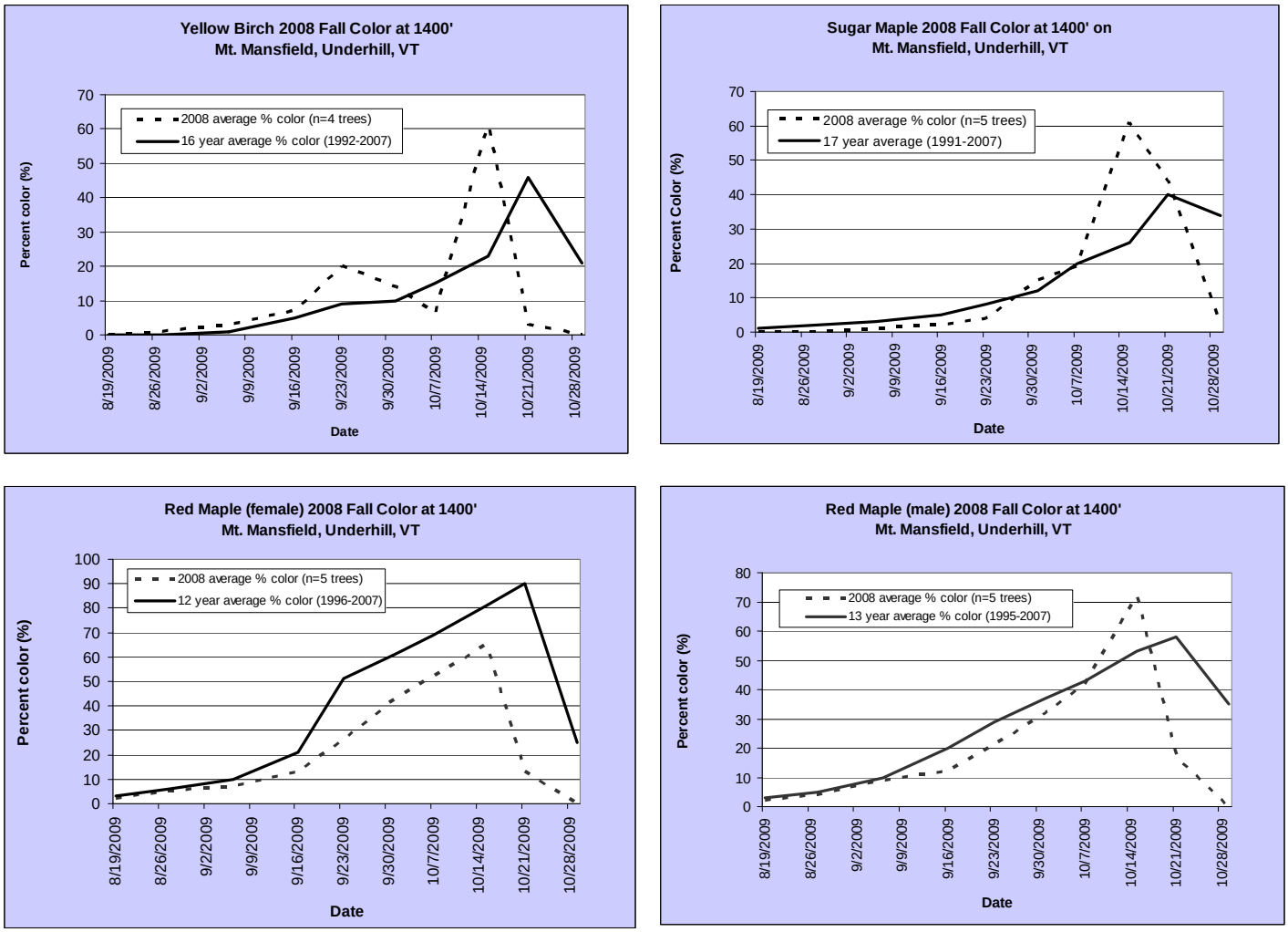


Figure 12. Progression of fall color for Yellow Birch, Sugar Maple and Red Maple at 425M at Mt. Mansfield Vermont. The values are the percent of colored leaves on the tree on that date.

HARDWOOD DEFOLIATORS

Birch Defoliation, caused primarily by birch leafmining sawflies and leaf fungi (presumably *Septoria* sp.), was mapped during aerial survey on a total of 4,287 acres (Table 2 and Figure 13).

Table 2. Mapped acres of birch defoliation by birch defoliator complex in 2008.

County	Acres
Addison	33
Bennington	323
Caledonia	498
Essex	2,416
Franklin	592
Orange	184
Orleans	22
Washington	165
Windsor	54
Total	**4,287**

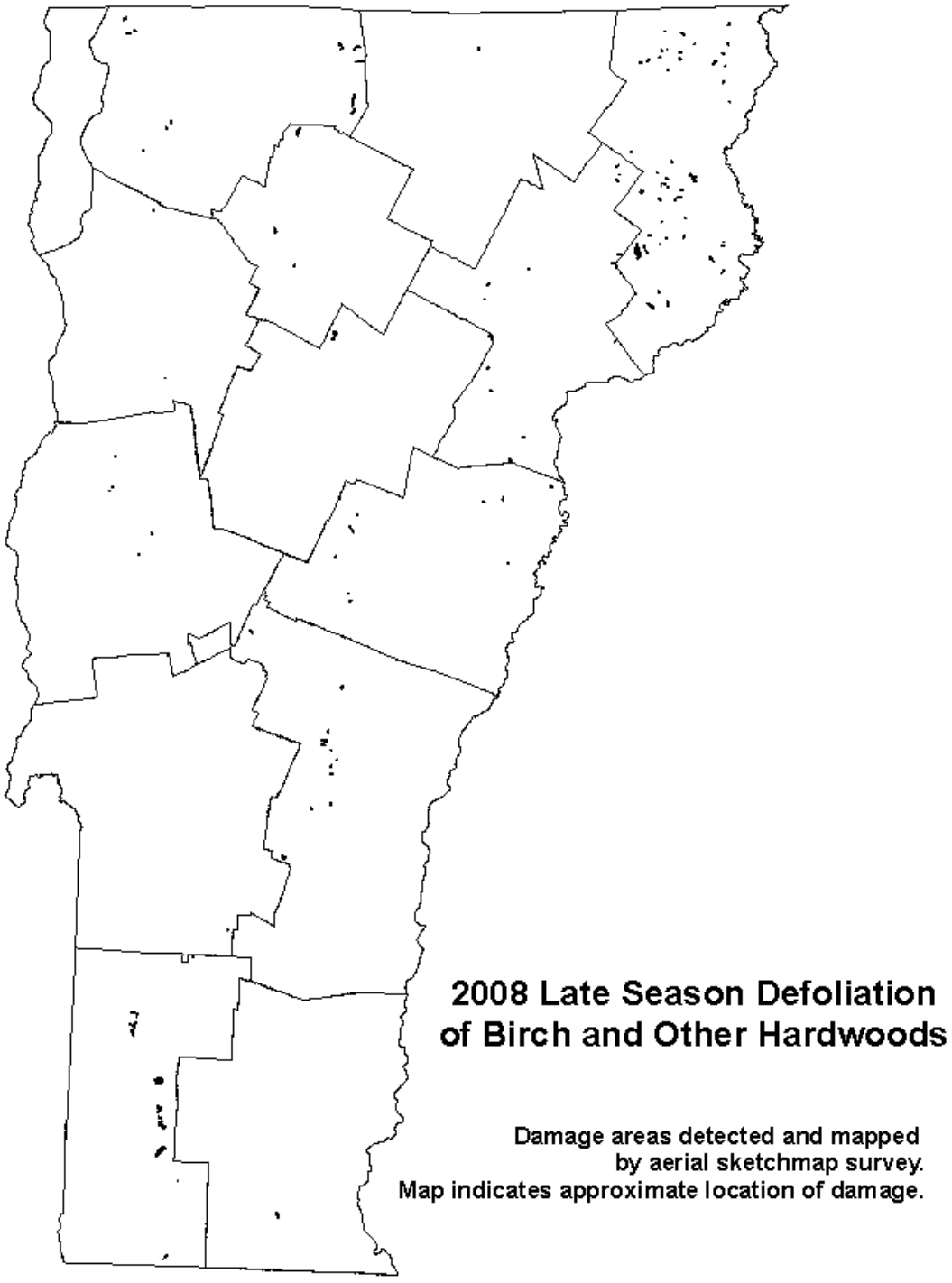


Figure 13. Late season defoliation of birch and other hardwoods in 2008. Mapped area includes 4,287 acres attributed to birch leafmining sawflies and leaf fungi and 2,781 acres of other hardwood defoliation, the cause of which could not be determined. (Also see Hardwood Defoliation and Table 5 below.)

Forest Tent Caterpillar, *Malacosoma disstria***,** populations collapsed statewide and have returned to endemic levels. There was a remnant population in Braintree this year, with some moderate defoliation of sugar maple over a small area. Elsewhere, only occasional larvae were observed. New mortality and dieback from the recent outbreak continue in occasional stands, requiring salvage of scattered high-value oak and reclamation of several sugarbushes. However, tree health in most defoliated locations has recovered.

Moth catch in pheromone traps decreased in all trap sites this year (Table 3 and Figure 14).

Table 3. Average number of forest tent caterpillar moths caught in pheromone traps, 2002-2008. There were 4-5 traps per location in 2002 and 3 traps per location in 2003-2008. Roxbury was an exception, with only one trap in 2008.

Site	Year						
	2002	2003	2004	2005	2006	2007	2008
Castleton	----	----	----	17	17.3	8	1
Fairfield	----	1.3	1.7	----	4.3	4.7	4
Huntington (NAMP 027)	9.2	6.7	10	15.7	16	6.3	4.33
Killington/Sherburne	6.8	9.7	20	15.3	21	17.3	7.33
Manchester (new site in 2008)							0
Rochester	5.9	4.7	9	4.7	29	10.3	0.67
Roxbury	16	14.7	13	7.3	22	22.7	8
SB 2200	3.8	11.7	18.3	23.3	35.3	6.3	5.7
VMC 1400, Underhill	3.6	3	0.3	7.3	9.3	2.7	1.33
VMC 2200, Underhill	3	7	6.3	11.7	6.3	4.7	1.33
VMC 3800, Stowe	1	2.7	10.3	26	5.7	5	1.33
Waterbury	2	0.7	2	41	22.3	0.3	1
Waterville	0	1.3	1.3	17.7	24.7	2.7	2.33
Average	**5.2**	**6.9**	**10**	**17**	**17.8**	**7.6**	**2.95**

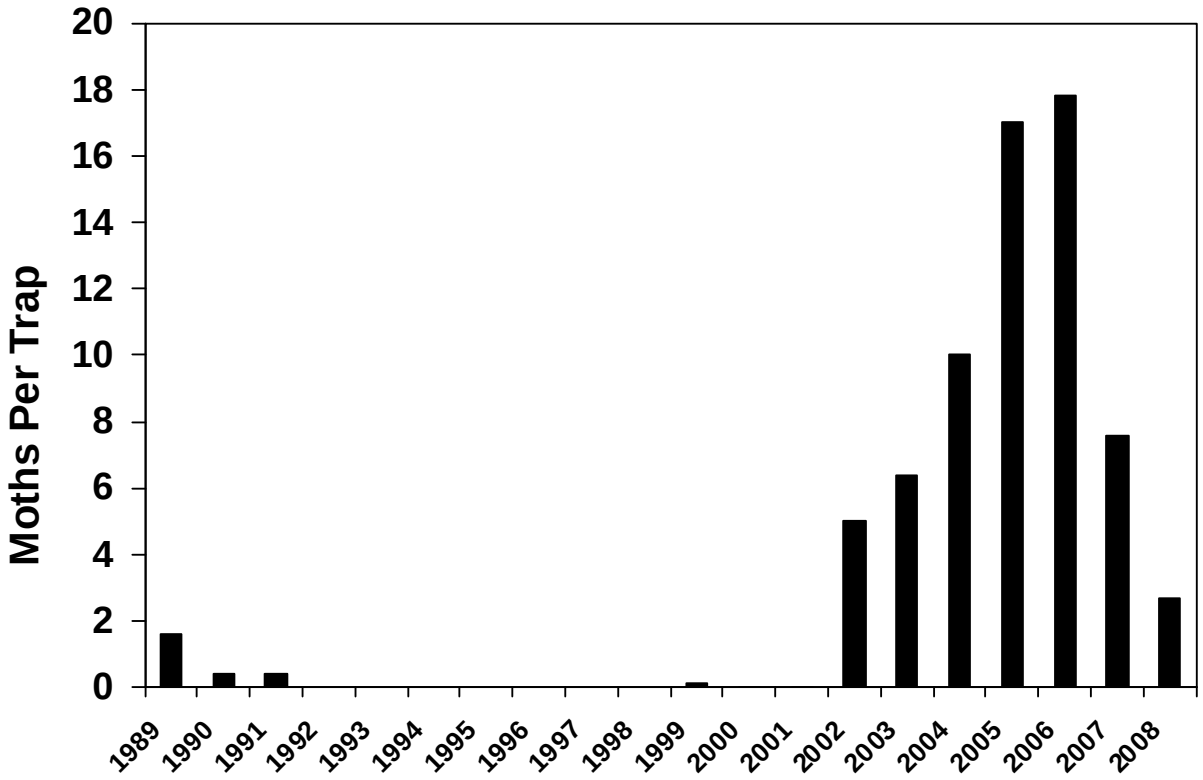


Figure 14. Average number of forest tent caterpillar moths caught in pheromone traps 1989-2008. Five multipher traps per site were baited with RPC 2-component lures through 2001. PheroTech lures were used in 2002-2008. Three traps per site in 2003-2008, except for Roxbury, with only one trap.

Gypsy Moth, *Lymantria dispar*, defoliation was mapped on 537 acres in Rutland County in Castleton, Ira, Poultney and Middletown Springs (Figure 15). Occasional larvae were observed elsewhere. Egg mass counts per 1/25th acre monitoring plot at focal areas increased in five of the ten monitoring sites (Table 4 and Figure 16), but remained low, indicating a prediction of continued low populations for 2009.

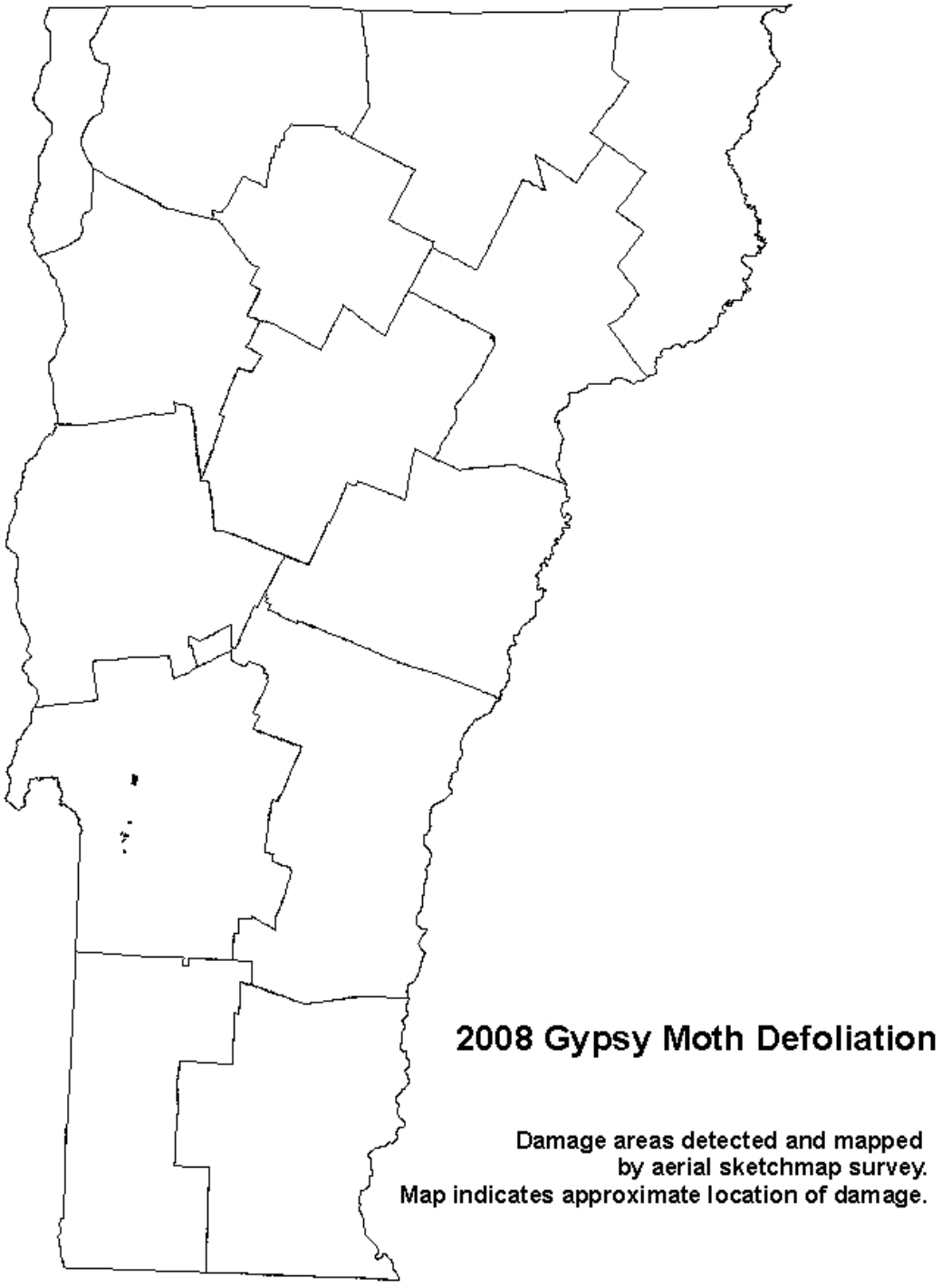


Figure 15. Gypsy moth defoliation mapped in 2008. Mapped area is 537 acres.

Table 4. Gypsy moth egg mass counts from focal area monitoring plots, 2003-2008. Average of two 15 meter diameter burlap-banded plots per location.

Site	Town	Year					
		2003	2004	2005	2006	2007	2008
Arrowhead	Milton	1.5	2.5	0	0	0	2.5
Brigham Hill	Essex	2.5	2	1.5	0	0	0
Ft. Dummer	Guilford	0	-----	0	0	0	0
Middlesex	Middlesex	0	2	0	0.5	2	2.5
Minards Pond	Rockingham	0.5	2	0	0	0	0
Mount Anthony	Bennington	1.5	0	0	0	0	0
Perch Pond	Benson	0	0	0.5	1	0	0.5
Rocky Pond	Rutland	0	0	0.5	3	3	0.5
Sandbar	Colchester	3	1.5	0	0	0	2.5
Tate Hill	Sandgate	0	30	18	3	0	1.5
Average		**1**	**4.4**	**2.1**	**0.8**	**0.5**	**1.0**

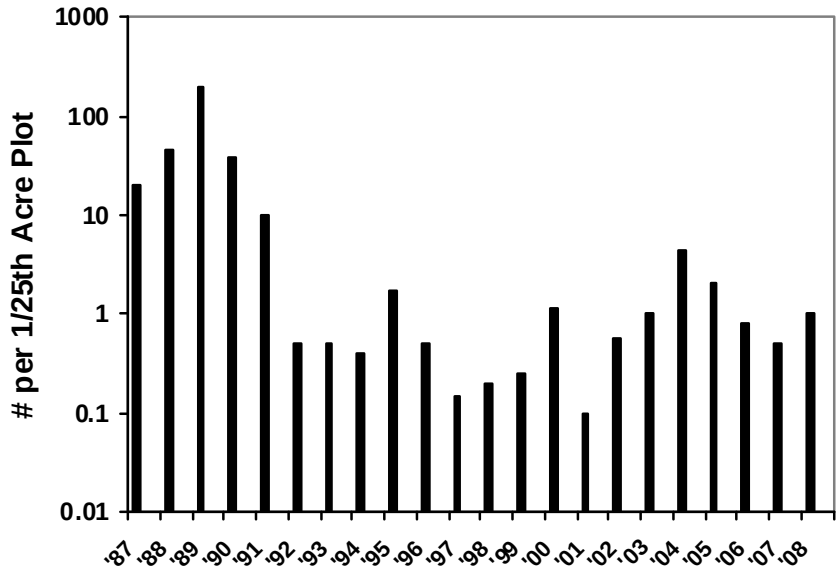


Figure 16. Gypsy moth egg mass counts from focal area monitoring plots, 1987-2008. Average of ten locations, two 15m diameter burlap-banded plots per location.

Hardwood Defoliation was mapped during aerial survey on a total of 2,781 acres (Table 5 and Figure 17 above under Birch Defoliation). The cause of this defoliation could not be determined.

Table 5. Mapped acres of hardwood defoliation by hardwood defoliator complex in 2008.

County	Acres
Addison	34
Bennington	1,428
Chittenden	37
Franklin	176
Lamoille	318
Orange	153
Orleans	22
Rutland	20
Windham	109
Windsor	484
Total	**2,781**

An **Oak Leaf Tier complex** is thought to be responsible for defoliation of red oak in several locations in Washington, Chittenden, Rutland, Windham, Windsor and Franklin counties. Damage was mapped on 852 acres (Table 6), although the known defoliated area is larger. Site evaluations were conducted too late to determine the exact causal agent or agents but some adult moths that were flying at one site in Bolton were collected and identified as *Psilicorsis quercicella*, a leaf-tying oak defoliator. Another species of *Psilicorsis* was associated with a complex of leaf tiers plus *Phigalea titea* that defoliated oak in the Middlesex area of Washington County in 1980.

Table 6. Mapped acres of oak defoliation by oak leaf tier complex in 2008.

County	Acres
Addison	422
Chittenden	138
Franklin	51
Washington	241
Total	**852**

Saddled Prominent, *Heterocampa guttivata*, caused light damage in Pomfret and Sharon this year. It was not observed in northern Vermont, after causing widespread noticeable defoliation in 2006 and 2007. One report of some sugar maple dieback was received at a site in Greensboro where moderate defoliation for the past two years combined with leaf diseases and heavy late-season defoliation by maple trumpet skeletonizer. Due to the unavailability of pheromone lures this year, pheromone trapping for this insect was discontinued.

OTHER HARDWOOD DEFOLIATORS

INSECT	HOST(S)	LOCALITY	REMARKS
Aspen Leaf Rollers	Quaking aspen	Sharon, Randolph, Hartland	Heavy defoliation of highway trees.
Birch Defoliator Complex			See narrative.
Birch Leaf Folder *Ancylis discigerana*	Yellow birch Paper birch	Lamoille County	Very light defoliation.
Birch Leaf Miner *Fenusa pusilla*	Paper birch White birch	Throughout	Increased to noticeable but mostly light levels this year. Some scattered areas of heavy defoliation in northern locations.
Bruce Spanworm *Operophtera bruceata*	Sugar maple		No damage reported. Decreasing- adult moths scarce this fall.
Cherry Scallop Shell Moth *Hydria prunivorata*	Black cherry	Chittenden County	
Early Birch Leaf Edgeminer *Messa nana*	White birch	Southern Vermont	Only very light damage reported.
Eastern Tent Caterpillar *Melacosoma americanum*	Cherry Apple	Scattered throughout	Low populations. Few tents seen.
Elm Leaf Beetle *Xanthogaleruca luteola*	American elm	Widespread	Heavy damage to scattered trees seen for the first time since 1977.
European Snout Beetle *Phyllobius oblongus*	Sugar maple	Northeast	Light damage seen in several locations.
Fall Webworm *Hyphantria cunea*	Hardwoods	Widespread	Noticeable increase. Webs common. Scattered trees completely defoliated throughout.
Forest Tent Caterpillar *Malacosoma disstria*			See narrative.
Gypsy Moth *Lymantria dispar*			See narrative.
Hardwood Defoliator Complex			See narrative.
Hickory Tussock Moth *Lophocampa caryae*	Hardwoods	Springfield Rutland	Larvae.
Imported Willow Leaf Beetle *Plagiodera versicolora*	Willow	Widespread	Very common. Light to moderate defoliation.

INSECT	HOST(S)	LOCALITY	REMARKS
Japanese Beetle *Popillia japonica*	Many	Throughout	Low populations in southern Vermont this year, but appear to be expanding their territory in northern areas. High levels are maintained in some areas but populations are down in others.
Locust Leafminer *Odontata dorsalis*	Black locust	Chittenden County	Present in some new locations but not very noticeable this year; widely scattered light damage.
Maple Basswood Leaf Roller *Sparganothis pettitana*		Widely scattered	Rolled leaves occasionally observed.
Maple Leaf Cutter *Paraclemensia acerifoliella*	Sugar maple	Throughout	Light damage; remains low throughout the state.
Maple Petiole Borer *Caulocampus acericaulis*	Sugar maple	Bennington & Windham Counties	Light damage.
Maple Trumpet Skeletonizer *Epinotia aceriella*	Sugar maple	Throughout	Widely noticeable in southern Vermont, but damage light. Increase in Franklin and Caledonia counties, but little damage noted elsewhere in northern Vermont.
Maple Webworm *Tetralopha asperatella*	Sugar maple	Lamoille County	Only occasional webs seen.
Mountain Ash Sawfly *Pristiphora geniculata*		Springfield Morrisville Newport	Heavy defoliation of ornamental trees.
Oak Leaf Tier/ Oak Leaf Roller Complex			See narrative.
Orange-humped Mapleworm *Symmerista leucitys*	Sugar maple Beech	Windsor County	Larvae observed.
Rose Chafer *Macrodactylus subspinosus*	Apple	Stowe	Heavy on a few trees.
Saddled Prominent *Heterocampa guttivata*			See narrative.
Uglynest Caterpillar *Archips cerasivoranus*	Various hardwoods	Scattered	Occasionally observed.

INSECT	HOST(S)	LOCALITY	REMARKS
Viburnum Leaf Beetle *Pyrrhalta viburni*	Viburnum species	Brandon Middletown Springs in southern Vermont, and widespread elsewhere	Scattered heavy damage to ornamentals.

Hardwood defoliators not reported in 2008 included Alder Flea Beetle, *Altica ambiens;* Birch Sawfly, *Arge pectoralis;* Birch Skeletonizer, *Bucculatrix canadensisella*; Maple Leafblotch Miner, *Cameraria aceriella;* Oak Leaf Tier, *Croesia semipurpurana;* Oak Skeletonizer, *Bucculatrix ainsliella;* Pear Slug Sawfly, *Caliroa cerasi*; Satin Moth, *Leucoma salicis*; White Marked Tussock Moth, *Orgyia leucostigma.*

SOFTWOOD DEFOLIATORS

INSECT	HOST(S)	LOCALITY	REMARKS
Arborvitae Leaf Miner *Argyresthia thuiella*	Northern white cedar	Morrisville Bondville Brandon	Light to moderate damage to ornamentals.
Larch Casebearer *Coleophora laricella*	Tamarack	Rutland County	Only light damage again in 2008.

Softwood defoliators not reported in 2008 included European Pine Sawfly, *Neodiprion sertifer;* European Spruce Needle Miner,*Taniva albolineana;* Introduced Pine Sawfly, *Diprion similis;* Redheaded Pine Sawfly, *Neodiprion lecontei*; Spruce Budworm, *Choristoneura fumiferana;* Yellow-Headed Spruce Sawfly, *Pikonema alaskensis.*

SAPSUCKING INSECTS, MIDGES, AND MITES

Balsam Gall Midge, *Paradiplosis tumifex*, populations continue to increase, with noticeable damage to balsam fir visible in more Christmas tree plantations. Damage was light in Christmas trees in Townshend and West Rutland, but moderate to heavy in scattered locations in northern Vermont. Some growers have had difficulty in controlling the larval stage of this insect with applications of chlorpyrifos at the recommended shoot length of 1.5 to 2 inches but have reported good success by applying bifenthrin (OnyxPro) at budbreak to target adults. One such grower in Walden cooperated by leaving a group of trees untreated to compare with treated trees. Trees were sprayed on May 15 with 4 oz. per acre of OnyxPro applied at about 70% budbreak using a tractor-mounted mistblower. Evaluations on August 29 showed a reduction in number of galled needles of 94% on treated trees compared to untreated trees. There is also some evidence that repeated applications of chlorpyrifos in the past in plantations such as this one have kept populations artificially high by killing the good midge (*Dasineura balsamicola*) that is the primary biological control agent, while not providing adequate control of *P. tumifex*.

Balsam Woolly Adelgid populations continue to be high at lower elevations in the Green Mountains and surrounding towns including Winhall, Londonderry, Ludlow, Wallingford, Mt Holly, and Shrewsbury. Newly dead trees were noticeable in affected stands, with sometimes heavy mortality (Table 7).

Table 7. Mapped acreage of balsam woolly adelgid-related decline in 2008.

County	Acres
Caledonia	103
Orange	25
Rutland	17
Washington	9
Total	155

Hemlock Woolly Adelgid was newly detected in Vernon, Townshend, Jamaica, and additional sites in Brattleboro (Figures 17 and 18). Formal detection surveys, using a modified Costa method, had been conducted at 67 sites in 15 Windham County towns as of November 19th. Citizen volunteers have also been trained to conduct surveys in Windham County.

In Brattleboro and Vernon, some trees have been infested for several years, and have thin, “ghostly-grey” crowns. The infestations in Townshend and Jamaica appear to be newer. Both infested sites that have been detected in these towns are in low-lying recreational areas near the West River.

Follow-up surveys indicated that 2007 eradication efforts were successful in treated sites. No adelgids have been found at the Rockingham site. In Brattleboro, no live adelgids were detected in the spring on the trees sprayed with bifenthrin plus oil and treated with an imidacloprid soil application. There were live adelgids in the spring on trees sprayed with oil only in addition to the imidacloprid treatment, but, by fall, none were found on these trees.

We will be implementing an integrated slow-the-spread management plan in cooperation with the Agency of Agriculture, Food, and Markets, the States of Maine and New Hampshire, the US Forest Service, and local universities.

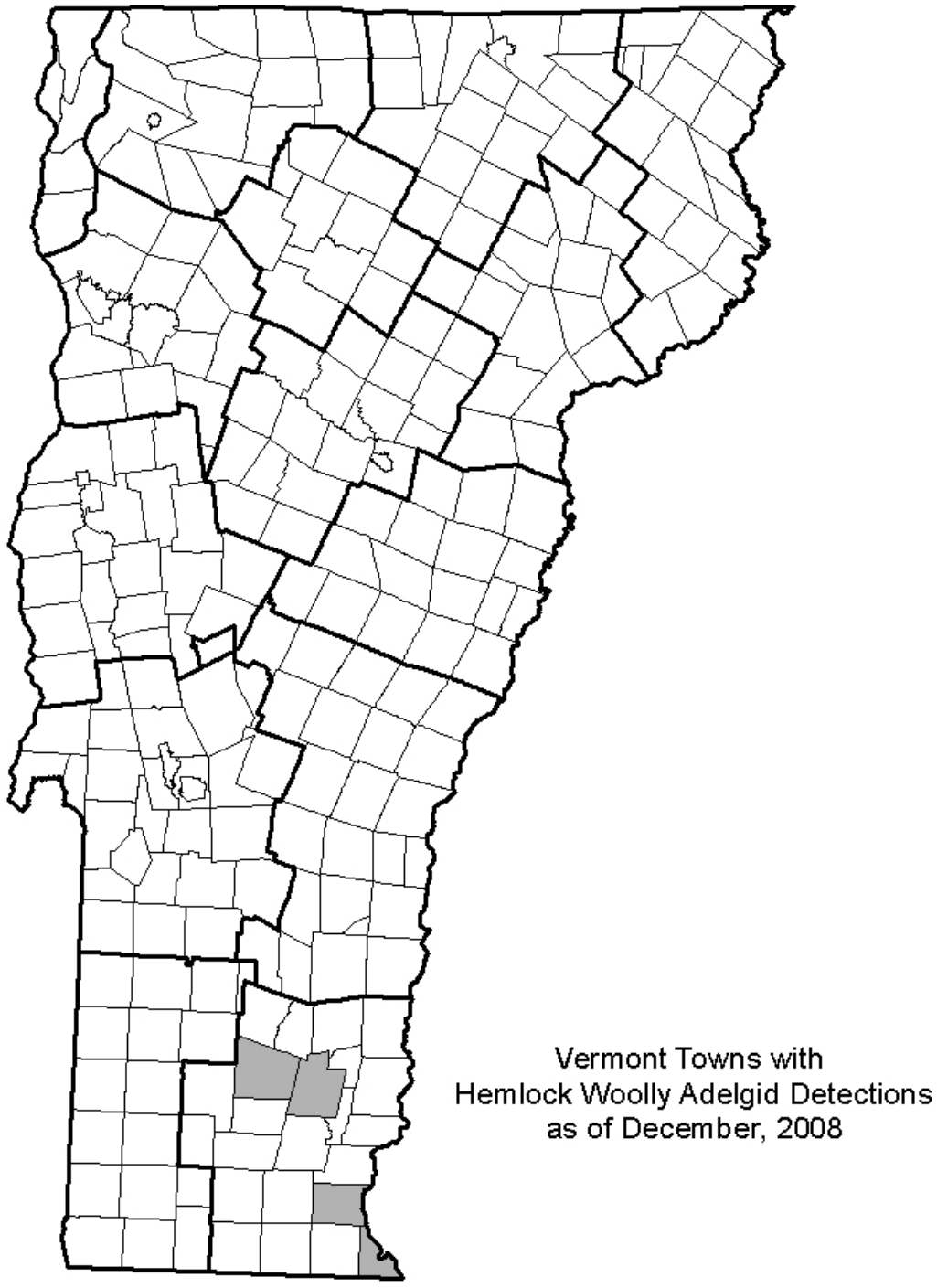


Figure 17. Vermont towns with hemlock woolly adelgid detections as of December, 2008**.**

Figure 18. Confirmed locations of hemlock woolly adelgid in Windham County, VT as of November, 2008.

Oystershell Scale, *Lepidosaphes ulmi*, populations caused light damage to beech in scattered locations. Dieback was not detected by aerial survey. Yearly counts of oystershell scale in survey plots at three tree canopy levels (suppressed, intermediate and codominant) at Camel's Hump State Forest are shown below. (Table 8 and Figure 19)

Table 8. Number of oystershell scales on current year beech twigs in Camel's Hump State Forest, 1994-2008.

	Average Number of Mature Viable Scales per Twig														
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Suppressed	2.1	9	0.6	2.1	4	0.7	2.9	4.2	11	2.1	1.4	5.6	4	3.3	1.9
Intermediate	8.4	16.8	1.2	2.6	3.3	2.8	12.1	10.4	14.7	1.2	3.4	3.8	6.2	11.9	2.4
Codominant	3.4	11.3	0.2	4.5	4.2	2.7	7.3	1.4	4	0.7	2	2	3.4	9.6	0.9

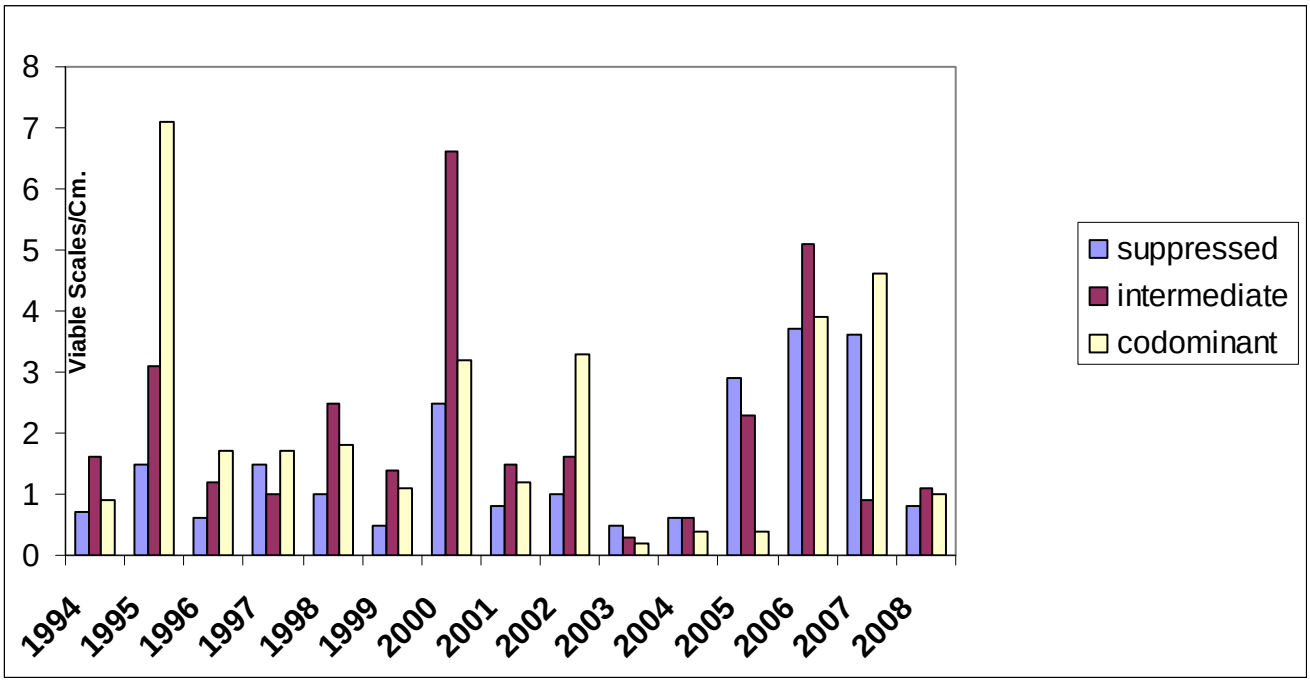


Figure 19. Oystershell scale population in three tree canopy levels in Camel's Hump State Forest, 1994-2008. Average for 10 current year twigs/tree per crown class, collected in autumn.

OTHER SAPSUCKING INSECTS, MIDGES, AND MITES

INSECT	HOST(S)	LOCALITY	REMARKS
Balsam Gall Midge *Paradiplosis tumifex*			See narrative.
Balsam Twig Aphid *Mindarus abietinus*	Balsam fir	Throughout	Damage remains light in most areas, but was variable, ranging from light to heavy, on ornamentals and Christmas trees in Chester, Brandon and Athens.
Balsam Woolly Adelgid *Adelges picea*			See narrative.

INSECT	HOST(S)	LOCALITY	REMARKS
Beech Blight Aphid *Fagiphagus imbricator*	Beech	Clarendon	Regeneration.
Beech Scale *Cryptococcus fagisuga*			See Beech Bark Disease.
Black Pineleaf Scale *Nuculaspis californica*	Mugo pine	Stowe	On ornamental plantings.
Boxelder Bug *Leptocoris trivittatus*	Boxelder	Throughout	Fewer than usual number of "nuisance invader" inquiries.
Cooley Spruce Gall Aphid *Adelges cooleyi*	Blue spruce White spruce	Scattered	Occasional damage observed.
Eastern Spruce Gall Adelgid *Adelges abietis*	White spruce Red spruce	Widespread	Common at light levels. Occasionally heavy damage to white spruce ornamentals.
Erineum Gall Mite *Aceria elongatus*	Sugar maple	Scattered	Light damage observed.
Hackberry Psyllids *Pachypsylla celtidismamma* *Pachypsylla celtidisvesicula*	Hackberry	Weathersfield	Nipplegalls and blistergalls on ornamental trees.
Hemlock Woolly Adelgid *Adelges tsugae*			See narrative.
Oystershell Scale *Lepidosaphes ulmi*			See narrative.
Pear Thrips *Taeniothrips inconsequens*	Sugar maple	Throughout	Decrease from 2007. Light scattered damage observed.
Pine Bark Adelgid *Pineus strobi*	White pine	Scattered	Occasionally heavy in individual trees in southern towns. Light, scattered populations in northern Vermont.
Pine Spittlebug *Aphrophora parallela*	White pine	Scattered	Occasionally seen. Less noticeable in southern Vermont than in 2007.
Ragged Spruce Gall Aphid *Pineus similis*	Red spruce	Throughout	Remains common. Very heavy damage observed in Brattleboro.
Spruce Spider Mite *Oligonychus ununguis*	Conifers	Widespread	Down from 2007, but moderate damage to ornamentals in Waterbury.

INSECT	HOST(S)	LOCALITY	REMARKS
Woolly Alder Aphid *Paraprociphilus tessellatus*	Alder	Northeast	Noticeable on scattered trees.
Woolly Fold Gall *Cecidomyidae*	Red oak	Andover	Noticeable damage.

Sapsucking insects, midges and mites that were not reported in 2008 included Aphids, *Cinara sp. and Periphyllus sp.;* Ash Flowergall Mite, *Aceria fraxiniflora;* Birch Lacebug, *Corythuca palipes*; Boxelder Erineum, *Aceria negundi*; Butternut Blister Mite, *Aceria cinereae*; Cottony Maple Scale, *Pulvinaria innumerabilis*; Hemlock Scale, *Abgrallaspis ithacae*; Maple Bladdergall Mite, *Vasates quadripedes*; Maple Spindlegall Mite, *Vasates aceris-crummena*; Pine Fascicle Mite; *Trisetacus alborum*; Pine Leaf Adelgid, *Pineus pinifoliae*; Pine Needle Scale, *Chionapsis pinifoliae*; Red Pouch Gall, *Pemphigus rhois*; Vagabond Aphid, *Mordwilkoja vagabunda*; Woolly Elm Aphid, *Eriosoma americana*.

BUD AND SHOOT INSECTS

INSECT	HOST(S)	LOCALITY	REMARKS
Balsam Shootboring Sawfly *Pleroneura brunneicornis*	Fraser fir Balsam fir	Throughout	Scattered light to moderate damage to Christmas trees. Heavier than in 2007.
Common Pine Shoot Beetle *Tomicus piniperda*	Scotch, Red and White pine		None observed and no damage reported. A federal quarantine is in place to limit the spread of this exotic insect into non-affected states. Pine material is free to move inside Vermont. Quarantine details can be found at: www.vtfpr.org/protection/for_protect_forhealth.cfm
Oak Twig Pruner *Elaphidionoides parallelus*	Red oak	Addison County Chittenden County Lamoille County	Observed in oak stands defoliated by leaf tiers. Numerous landowner calls this year.
Pine Gall Weevil *Podapion gallicola*	Red pine	Widespread	Increasing damage, unusually heavy in 2008. Often associated with red pine dieback and mortality. Common on healthy and unhealthy trees, sometimes causing moderate shoot mortality. Especially prevalent on roadside and open-grown trees.
White Pine Weevil *Pissodes strobi*	White pine Spruces	Throughout	Damage remains common, mostly at low levels. Heavy damage (15% of trees) to a young Norway spruce plantation in Eden.
Whitespotted Sawyer *Monochamus scutellatus*	White pine Balsam fir	Scattered	Some light damage to Christmas tree shoots and young forest trees.

Bud and shoot insects not reported in 2008 included European Pine Shoot Borer, *Eucosma gloriola;*

ROOT INSECTS

INSECT	HOST(S)	LOCALITY	REMARKS
Japanese Beetle Popillia japonica	Many	Throughout	Low populations in southern Vermont this year, but appear to be expanding their territory in northern areas. High levels are maintained in some areas but populations are down in others.
June Beetle Phyllophaga spp.	Many	Throughout	Population decline from previous year.
Root Aphid Prociphilus similis	Fraser fir	Stannard	Associated with yellowing of recently transplanted Christmas trees.

Root insects not reported this year included Conifer Swift Moth, *Korsheltellus gracilis.*

BARK AND WOOD INSECTS

Emerald Ash Borer, *Agrilus planipennis*, has not been found in Vermont but a recently discovered infestation in Carignan, Quebec, Canada is a concern. In 2007, green ash were girdled to create trap trees to survey for this borer at three sites in Grand Isle County and one site in Franklin County. These sites happened to be fairly close to the Canadian border in northwestern Vermont and only 30 miles south of the Quebec infestation. Two trees from each site were peeled this year (four in the spring and four in the fall) to look for signs of the insect. Other insects were present but no evidence of emerald ash borer was found. In addition, the Vermont Agency of Agriculture, with some help from the USDA Animal and Plant Health Inspection Service (APHIS), placed 120 newly-developed sticky purple traps throughout the state to survey for this insect. These traps were baited with an oil that the emerald ash borer finds attractive. All traps were negative for the insect.

European Wood Wasp (*Sirex noctilio*) is an exotic insect that attacks pines. It was detected in Vermont for the first time in 2007 when a single specimen was captured in a baited trap deployed in Stowe by the Vermont Agency of Agriculture. Because of this, Lamoille County is considered to be an infested county. Pine trap trees were again used this year as prescribed in sampling protocols developed by the USDA Forest Service. Since we wanted to determine the extent of *S. noctilio* in the town of Stowe, five pine sites were selected, all within four miles of where the single wasp was trapped in 2007. Eight red pines and eight white pines in poor crown condition were used as trap trees, but no *Sirex* were captured.

Trap trees were girdled chemically with the herbicide dicamba. Dicamba treatments were made on May 21 by injection into 3/16 or 3/4 inch holes drilled in test trees. One unbaited wet Lindgren funnel trap was suspended from each trap tree, with collection cups about 10 feet above the ground. Traps were collected every two weeks henceforth until September 24, 2008, making nine collection periods. Trap collections were screened by personnel at the Forest Biology Lab. No *S. noctilio* were collected in traps.

In addition, the Vermont Agency of Agriculture, with help from the USDA APHIS, placed 130 traps baited with host volatiles in pine sites located in every county except Lamoille. No *S. noctilio* were captured in any of these traps.

Oak Commodity Survey
This Cooperative Agriculture Pest Survey (CAPS), involved (1) field observations and trapping of insects that were lured to baited and girdled oak trees and (2) rearing insects from oak bolts that were collected in the field. During the field season of 2008, two sites containing declining oaks were surveyed for city longhorned beetle, *Aeolesthes sarta*, oak splendor beetle, *Agrilus biguttatus*, oak ambrosia beetle, *Platypus quercivorus*, European oak bark beetle, *Scolytus intricatus*, and Tremex woodwasp, *Tremex fuscicornis*, and oak decline caused by *Phytophthora ramorum* or *P. quercina*.

Field Observations and Trapping Efforts: One site was in Addison County in the town of Bristol at the Bristol Waterworks property. The stand at that site was comprised of chestnut oak, *Quercus prinus*. The second site was in Windham County in the town of Guilford at Fort Dummer State Park and was comprised of white oak, *Q. alba*. Two traps were deployed at each site. One trap per site was baited with UHR ethanol. One unbaited trap per site was placed on a trap tree that was girdled according to the procedure used for emerald ash borer trap trees. A dry cup containing a vaportape killing strip was used to collect insects that entered the trap. Traps were visited approximately every two weeks between April 18 and September 19, 2008 at the site in Windham County and between May 6 and September 10, 2008 at the site in Addison County (Table 9). All beetles caught in the traps were removed with forceps or by screening and placed in labeled plastic cups. They were then transported to our Forest Biology Laboratory.

Rearing Insects from Oak Bolts: Sample trees were cut on April 18, 2008 at the Windham County site and on May 6, 2008 at the Addison County site. Six bolts from each of two sample trees per site were transported to a rearing facility, where they were placed in individual rearing chambers constructed of builder's tubes 30 cm in diameter and 43 cm long. The back opening of the tube was covered with 5 mm luan mahogany, and the front

opening was fitted with 1 mm screen that was secured with a metal band. A 4 cm hole was cut in the screen, and the lid of a snap-on rearing cup, with a corresponding hole, was secured with silicon caulking to the center of each screen. Collection cups were examined daily for insect emergence. Bolts taken from trees in Windham County were in rearing chambers from April 18 through September 13, 2008 and bolts taken from trees at the site in Addison County were in place from May 6 through September 13, 2008. All beetles caught in the cups were removed, placed in labeled plastic cups, and transported to our Forest Biology Laboratory for identification.

None of the target insects were trapped at either site, and none were reared from the oak bolts. Numerous non-target insects were collected in traps, including approximately 1,400 Coleoptera in 12-15 families, as well as smaller numbers of several other orders of insects. Most non-target Coleoptera were retained for the State Collection. No sudden oak death symptoms were observed on trees is study sites.

Table 9. Summary of site and collection data for 2008 oak commodity survey for city longhorned beetle, *Aeolesthes sarta*, oak splendor beetle, *Agrilus biguttatus*, oak ambrosia beetle, *Platypus quercivorus*, European oak bark beetle, *Scolytus intricatus*, and Tremex woodwasp, *Tremex fuscicornis*. Data include counties, towns, sites, GPS coordinates, dates of trapping survey, oak species, and numbers of target species found. (Log bolts used for rearing were taken from the locations indicated below. Log bolts from the Bristol Waterworks in Addison County were held from May 6 through September 13, 2008 and bolts taken from trees at the site in Windham County were in place from April 18 through September 13, 2008.)

County	Town	Site	GPS Points (NAD83)	Dates of trapping survey	Number of site visits	Oak species	# of target species found
Addison	Bristol	Bristol Waterworks Property	N44.16755, W73.14127	5/6/08-9/10/08	10	*Quercus prinus*	0
Windham	Guilford	Fort Dummer State Park	N42.82228, W72.55894	4/18/08-9/19/08	11	*Quercus alba*	0

OTHER BARK AND WOOD INSECTS

INSECT	HOST(S)	LOCALITY	REMARKS
Asian Longhorned Beetle *Anoplophora glabripennis*	Sugar maple Other hardwoods		None observed in Vermont but newly discovered infestation in Worcester, MA is cause for concern.
Bronze Birch Borer *Agrilus anxius*	Paper birch	Widely Scattered	Occasionally observed.
Brown Prionid *Orthosoma brunneum*	Dead wood of various species	Scattered	Adult beetles observed in several areas.
Brown Spruce Longhorned Beetle *Tetropium fuscum*			Not observed or known to occur in Vermont.

INSECT	HOST(S)	LOCALITY	REMARKS
Eastern Larch Beetle *Dendroctonus simplex*	Eastern larch	Throughout	Associated with larch decline and mortality. Acres mapped dropped this year.
Elm Bark Beetle *Hylurgopinus rufipes* and *Scolytus multistriatus*			See Dutch Elm Disease.
Emerald Ash Borer *Agrilus planipennis*			See narrative.
European Wood Wasp *Sirex noctilio*	Red pine Scots pine White pine		See narrative
Japanese Cedar Longhorned Beetle *Callidiellum rufipenne*			Not observed or known to occur in Vermont.
Locust Borer Megacyllene robiniae	Black locust	Champlain Valley	Common throughout.
Northeastern Sawyer *Monochamus notatus*	Balsam fir	Jamaica, Windham, Waitsfield, Springfield	Adults submitted as Asian longhorned beetle suspects.
Pigeon Tremex *Tremex columba*	Sugar maple	Lyndon	Observed on declining trees.
Round-headed Apple Tree Borer *Saperda candida*	Pear Crabapple	Barre Sutton	Ornamentals attacked.
Sirex Woodwasp *Sirex noctilio*			See narrative.
Sugar Maple Borer *Glycobius speciosus*	Sugar maple	Throughout	Remains common.
Whitespotted Sawyer *Monochamus scutellatus*	Various conifers	Brattleboro, Guilford	Adults common statewide.

Bark and Wood insects not reported in 2008 included Allegheny Mound Ant, *Formica exsectoides;* Carpenter Ant, *Camponotus spp*;, Hemlock Borer, *Melanophila fulvoguttata*; Maple Callus Borer, *Synanthedon acerni*: Northern Engraver, *Ips borealis borealis*; Pine engraver, *Ips pini*; Pitted Ambrosia Beetle, *Corthylus punctatissimus;* Redheaded Ash Borer, *Neoclytus acuminatus*.

FRUIT, NUT AND FLOWER INSECTS

INSECT	HOST(S)	LOCALITY	REMARKS
Asiatic Garden Beetle *Autoserica castanea*	Many flowers and ornamentals	Chittenden County	Population decline from previous year.
Plum Curculio *Conotrachelus nenuphar*	Apple Plum	Throughout	Remains common.
Western Conifer Seed Bug *Leptoglossus occidentalis*	Conifers	Throughout	Fewer reports than in past several years.

Fruit, Nut and Flower insects not reported in 2008 included Ash Flowergall Mite, *Aceria fraxiniflora.*

STEM DISEASES

Beech Bark Disease, caused by *Cryptococcus fagisuga* and *Neonectria faginata*, remains widespread. Populations of beech scale are noticeable in some areas indicating that the populations are rebounding. *Nectria* was generally less obvious than the scale insect. Approximately 2,531 acres were mapped during aerial survey compared to 61,859 acres in 2007. The reduction in acres mapped is probably due, in part to the crown deterioration of dead and dying trees.

OTHER STEM DISEASES

DISEASE	HOST	LOCALITY	REMARKS
Annual Canker *Fusarium sp.*	Maple	North-Central VT	Occasionally observed.
Ash Yellows *Mycoplasma-like organism*	White ash	Widely scattered	Witches brooms commonly observed on declining ash in the warmer climate zones.
Beech Bark Disease *Cryptococcus fagisuga* and *Neonectria faginata*			See narrative
Black Knot *Dibotryon morbosum*	Black cherry	Throughout	Remains common.
Botryosphaeria Blight *Botryosphaeria sp.*	Various	Throughout	Damage found on trees under stress.
Butternut Canker *Sirococcus clavigignenta-juglandacearum*	Butternut	Throughout	Healthy trees difficult to find.
Caliciopsis Canker *Caliciopsis pinea*	White pine	West Rutland Brandon	Suspected cause of symptoms.
Cedar-Apple Rust *Gymnosporangium juniperi-virginianae*	Cedar	Westminster	Heavy fruiting.
Chestnut Blight Cryphonectria parasitica	American chestnut	Colchester	Continues to cause mortality of scattered remaining nut-bearing trees. Orchard of potentially resistant trees planted in Weathersfield by the American Chestnut Foundation.
Cytospora Canker *Leucostoma kunzei*	Colorado blue spruce	Scattered	Sometimes observed.

DISEASE	HOST	LOCALITY	REMARKS
Delphinella Tip Blight *Delphinella balsamae*	Balsam fir	Widely scattered	Less commonly seen on Christmas trees this year.
Diplodia Shoot Blight *Diplodia pinea*	Red pine Scots pine Austrian pine Mugo pine	Widespread	Heavy damage frequently observed. Associated with red pine dieback, commonly combined with other stressors such as brown spot needle blight and pine gall weevil.
Dutch Elm Disease *Ceratocystis ulmi*	Elm	Throughout	Remains common. Browning of roadside trees by elm leaf beetle this year sometimes mistaken for this. One mature Liberty Elm in Montpelier infected.
Hypoxylon Canker *Hypoxylon pruinatum*	Quaking aspen	Throughout	Commonly observed.
Juniper Blight *Phomopsis juniperivora*	Skyrocket juniper	Stowe	Severe dieback on a closely spaced row of ornamentals.
Lilac Blight *Pseudomonas syringae*	Lilac	Throughout	Light damage commonly seen.
Maple Canker *Steganosporium spp.*	Sugar maple	Widely scattered	Found occasionally on shaded or damaged branches.
Nectria Canker *Nectria galligena*	Various	Scattered	Observed on stressed trees.
Oak Wilt *Ceratocystis fagacearum*			No suspects seen during aerial surveys. Increased concern due to find in Scotia, NY.
Phomopsis Gall *Phomopsis sp.*	Bitternut hickory	Hartland Pawlet Poultney	Heavy on individual forest trees.
Red Ring Rot *Phellinus pini*	White pine	Throughout	Continues to cause degrade and volume loss in timber stands.
Verticillium Wilt *Verticillium albo-atrum*	Sugar maple	Brandon	Ornamental.
White Pine Blister Rust *Cronartium ribicola*	White pine	Throughout	Remains common on ornamentals, forest trees and Christmas trees. Scattered mortality of mature trees.

DISEASE	HOST	LOCALITY	REMARKS
Woodgate Gall Rust *Endocronartium harknessii*	Scots pine	Widespread	Occasionally found on dead and dying trees.
Yellow Witches Broom Rust *Melampsorella caryophyllacearum*	Balsam fir	Throughout	An increase in brooms was seen again this year.

Stem diseases not reported in 2008 included Brown Rot, *Monolinia fructicola,* Eastern Dwarf Mistletoe, *Arceuthobium pusillum,* Fireblight, *Erwinia amylovora,* Sapstreak, *Ceratocystis coerulescens,* Scleroderris Canker, *Ascocalyx abietina,* Sirococcus, *Sirococcus strobilinius,* Tomentosus Butt Rot, *Inonotus tomentosus.*

FOLIAGE DISEASES

Brown Spot Needle Blight, caused by *Scirrhia acicola and Mycosphaerella dearnessii* , was again heavy and widespread on white pine this year, although damage was lighter than 2007 in southern Vermont. Previous year needles on many trees browned up in early spring. Trees looked better once new growth emerged and brown needles had been cast. The disease was also common on red pine, Scots pine and Mugo pine.

OTHER FOLIAGE DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Anthracnose *Glomerella spp.* *Apiognomonia spp.* *Gloeosporium spp.*	Various hardwoods	Throughout	Common but most of the damage didn't appear until late in the season.
Apple Scab *Venturia inaequalis*	Apple	Throughout	Common at light to moderate levels.
Ash Anthracnose *Gloeosporium aridum*	White ash	Throughout	Commonly seen.
Balsam Fir Needlecast *Lirula nervata*	Balsam fir	Widely scattered	Less commonly seen on Christmas trees this year.
Brown Spot Needle Blight *Scirrhia acicola* *Mycosphaerella dearnessii*			See narrative
Bullseye Spot *Cristulariella moricola*	Hackberry	Perkinsville	Ornamentals
Fir Fern Rust *Uredinopsis mirabilis* *Uredinopsis spp.*	Balsam fir	Throughout	Extremely noticeable everywhere this year, similar to 2007 levels.
Giant Tar Spot *Rhytisma sp.*	Norway maple	Throughout	Noticeable but decreasing compared to 2007.
Linospora Leaf Blight *Linospora tetraspora*	Balsam poplar	Northeast	Some damage seen.
Maple Anthracnose *Gloeosporium sp.*	Sugar maple	Widespread	Most damage was light, decreasing from 2006 levels.
Rhizosphaera Needle Blight *Rhizosphaera pini*	Balsam fir	Widespread	Increasingly common on Christmas trees, especially mature trees that are somewhat crowded.
Rhizosphaera Needlecast of Spruce *Rhizosphaera kalkhoffi*	Blue spruce White spruce	Throughout	Remains a common cause of defoliation and branch dieback on ornamentals and Christmas trees. Occasional mortality of severely damaged trees.

DISEASE	HOST(S)	LOCALITY	REMARKS
Septoria Leaf Spot *Septoria aceris*	Sugar maple	Throughout	Decreasing. Commonly seen at light levels.
Septoria Leaf Spot *Septoria betulae*	Paper birch	Throughout	Decrease from 2007, but commonly seen. Some heavy defoliation in southern Vermont mountains. Elsewhere, only light damage.
Spruce Repeating Rust *Chrysomyxa weirii*	Blue spruce	Derby Colchester	
Tar Spots *Rhytisma americanum*	Red maple Silver maple	Throughout	Commonly observed in northern Vermont.
Venturia Leaf Blight *Venturia macularis*	Trembling aspen	Northeast	Light damage seen throughout.
White Pine Needle Blight *Canavirgella banfieldii*	White pine	Craftsbury	Some light damage to Christmas trees.

Foliage diseases not reported in 2008 included Actinopelte Leaf Spot, *Actinopelte dryina*; Cedar-Apple Rust, *Gymnosporagium spp.;* Coccomyces Leaf Spot, *Blumeriella jaapii;* Cyclaneusma Needlecast, *Cyclaneusma minus;* Dogwood Anthracnose, *Discula destructiva;* Larch Needlecast, *Mycosphaerella sp.;* Lophodermium Needlecast, *Lophodermium seditiosum;* Peach Leaf Curl, *Taphrina deformans;* Phyllosticta Needlecast, *Phyllosticta sp.;* Poplar Leaf Blight, *Marssonina spp.;* Powdery Mildew, *Erysiphe polygoni;* Rhabdocline Needlecast, *Rhabdocline pseudotsugae;* Swiss Needlecast, *Phaeocryptopus, gaeumannii;* Willow Scab, *Venturia saliciperda.*

ROOT DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Annosus Root Rot *Heterobasidion annosum*	White pine	Dummerston	Declining ornamental tree.
Brown Cubical Root Rot *Polyporous schweinitzii*	White pine	Widespread	Fruiting bodies commonly observed.
Feeder Root Rot Unidentified fungi, *Phytophthora* species suspected	Fraser fir Balsam fir	Widespread	Remains an increasing problem in Christmas tree plantations where soil is not adequately drained, especially for Fraser fir.
Shoestring Root Rot *Armillaria spp.*	Many	Throughout	Remains increasingly common as a cause of Christmas tree mortality, especially for plantations with more than two generations of trees and for Fraser fir.

DIEBACKS, DECLINES, AND ENVIRONMENTAL DISEASES

Birch Decline and Mortality appears to be decreasing with 1,736 acres mapped this year compared to 3,563 in 2007. It remains evident, especially on paper birch at upper elevations but fewer acres were detected for the second consecutive year, probably due to deterioration of trees that died a few years ago.

Hardwood Chlorosis was evident throughout the state late in the season and some acreage was mapped for every county except Grand Isle (Table 10, Figure 20). Chlorosis was especially noticeable in low-lying areas and at the base of slopes. Excessive soil moisture from record rainfall amounts is suspected as the cause.

Table 10. Mapped acres of hardwood chlorosis in 2008.

County	Acres
Addison	533
Bennington	1,511
Caledonia	589
Chittenden	60
Essex	718
Franklin	228
Grand Isle	0
Lamoille	365
Orange	1,533
Orleans	1,049
Rutland	1,480
Washington	1,616
Windham	1,493
Windsor	3,859
Total	15,034

Hardwood Decline and Mortality was evident in widely scattered locations but only 367 acres were mapped in the state this year, It was another good growing season with adequate moisture and little insect defoliation.

Ice Damage was widespread, due to freezing rain on December 12th. Up to ¾ of an inch of ice accumulated on trees in southern Vermont, centered mostly in Windham, Windsor, and Orange counties. The towns of Marlboro, Wilmington, and Whitingham were hardest hit.

The most severe breakage to trees occurred at elevations above 1100 feet, and on east or south-east facing slopes. With heavy rains occurring prior to the freezing, unfrozen soil was saturated, and some trees were uprooted. Recommendations for managing forestland and sugarbushes affected by ice have been updated, based on observations and research following the ice storm in 1998.

Larch Decline, caused by past drought and an increase in eastern larch beetle populations, appears to be decreasing, as only 133 acres were mapped this year compared to 3,918 acres for the state in 2007.

Spruce-Fir Decline remains evident at high elevations but acres mapped decreased to 568 acres in the state this year compared to 5,484 acres in 2007. There has been little or no winter injury in recent years to accelerate the decline.

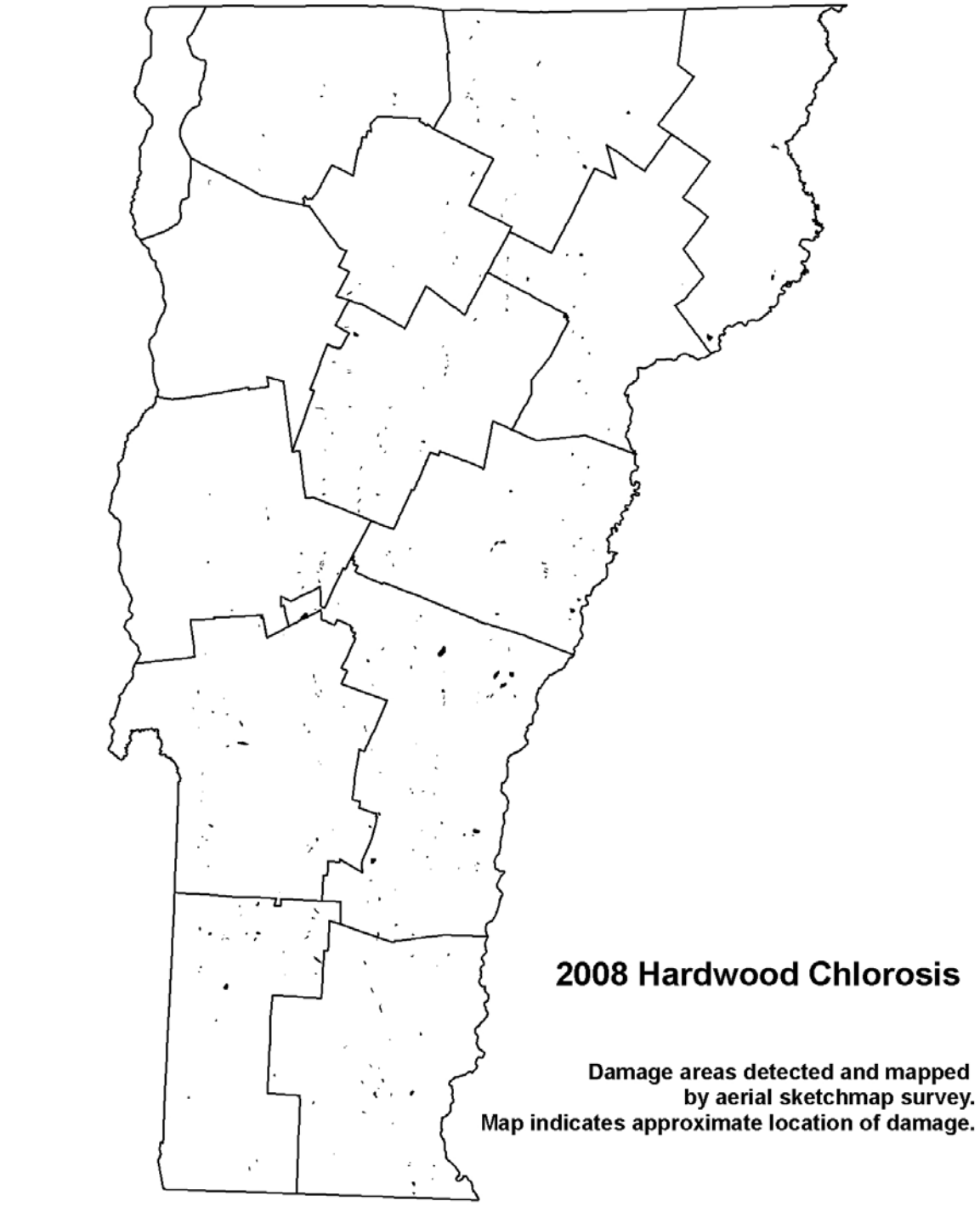


Figure 20. Mapped acres of hardwood chlorosis in Vermont in 2008.

Unthrifty Crowns Associated with Logging were again evident this year but mapped acreage decreased from 3,778 in 2007 to 1,147 acres in 2008.

Decline and mortality on **Wet Sites** remains common but acreage mapped actually declined this year from 7,082 acres in 2007 to 2,401 in 2008. There was a lot of hardwood chlorosis evident at low elevations this year due to the extremely wet growing season. This could result in an increase in tree decline on wet sites in future years.

Wind Damage from violent storms was again common this year. A tornado was confirmed by the National Weather Service for severe wind damage in the Cambridge-Waterville area of Lamoille County. Damage was mapped for 108 acres, mostly in Franklin and Lamoille counties (Table 11).

Table 11. Mapped acreage of wind damage in 2008.

County	Acres
Caledonia	8
Franklin	58
Lamoille	42
Total	**108**

OTHER DIEBACKS, DECLINES, AND ENVIRONMENTAL DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Air Pollution Injury	Bioindicator plants	In statewide ozone plots	Many plots showed ozone symptoms this year.
Ash Dieback	White ash	Widely scattered	Fairly common but appears stable.
Birch Decline			See narrative.
Frost Damage	Fraser fir Balsam fir	Walden Waterbury	Very light damage to Christmas trees.
Girdling Roots	Norway maple	Widespread	Common in landscape situations.
Hardwood Decline and Mortality			See narrative.
Ice Damage			See narrative.
Improper Planting	Many	Throughout	A common cause of dieback and mortality of recently planted ornamentals.
Larch Decline			See narrative.
Logging-related Decline			See narrative.
Snow Breakage	Fraser fir	Brookfield Lyndonville	Limb breakage on young Christmas trees from icy snow crust settling toward spring.
Spruce/Fir Dieback and Mortality			See narrative.
Wet Site			See narrative.
White Pine Needle Blight			See foliage diseases.
Wind Damage			See narrative.
Winterburn	Balsam fir	Craftsbury Waterbury	Evident on the south side of Christmas trees where bordering tree were harvested the previous autumn.

Delayed Chlorophyll Development, Edema, Fertilizer Injury, Fire Damage, Heavy Seed, Ice Damage, Interior Needle Drop, Lightening, Maple Decline, Salt Damage, White Pine Mortality and Winter Injury were not reported in 2008.

ANIMAL DAMAGE

ANIMAL	SPECIES DAMAGED	LOCALITY	REMARKS
Beaver			Damage levels remain stable.
Deer	Native woody plants	West Haven	Heavy damage to all native regeneration species, including prickly ash.
	Sumac	Northern Vermont	Bark stripping in late winter due to heavy snow and lack of food availability
Moose	Various, except red Spruce and Beech	Northeast Kingdom	Localized heavy damage, with moderate damage elsewhere.
Porcupine			Damage levels remain stable.
Sapsucker	Apple Paper birch Hemlock	Throughout	A common cause of damage to ornamentals.
Woodpecker	Northern white cedar Maple, oak, apple	Burlington Morrisville	Much damage to young ornamentals in Morrisville where a nearby bird feeding station was supplied with sunflower seeds and suet all summer.

INVASIVE PLANTS

Concern continues to grow about the impact of invasive plants on biodiversity and forest regeneration. Key species of concern are glossy buckthorn, exotic honeysuckles, Japanese barberry, and oriental bittersweet, with Norway maple, winged euonymus and multiflora rose becoming increasingly noticeable.

Interest in exotic invasive plant management has increased both on public and private land. A group within the Agency of Natural Resources is addressing these concerns by conducting educational workshops and establishing demonstration sites to compare management methods.

Trends in Forest Condition

North American Maple Project (NAMP) Plots

Sugar Maple Health

This year was a tremendous year for sugar maple health. Sugar maple trees on NAMP plots had dense foliage with little new dieback, showing remarkable recovery from recent stress years. In 2008, the number of plot-clusters was reduced from 38 to 30, and new long-term averages were created based on these 30 plots. Of the 1,029 canopy sugar maples monitored, 97% were healthy (15% dieback or less) (Figure 21). Less than 1% of trees had thin foliage (less than 25% foliage transparency) (Figure 22), a new record for dense foliage. There were 12 new dead trees, 1.2% mortality. An index of crown condition showed a 2.1% improvement in overall tree condition (Figure 23).

A new system for recording bole damages was implemented in 2007. The presence of bole damages likely to cause significant health problems was recorded for 21 types of injuries. Only 45 bole damages were recorded for all sugar maples on all plots. The most frequent damages were broken bole, conks, and sugar maple borer (Table 12).

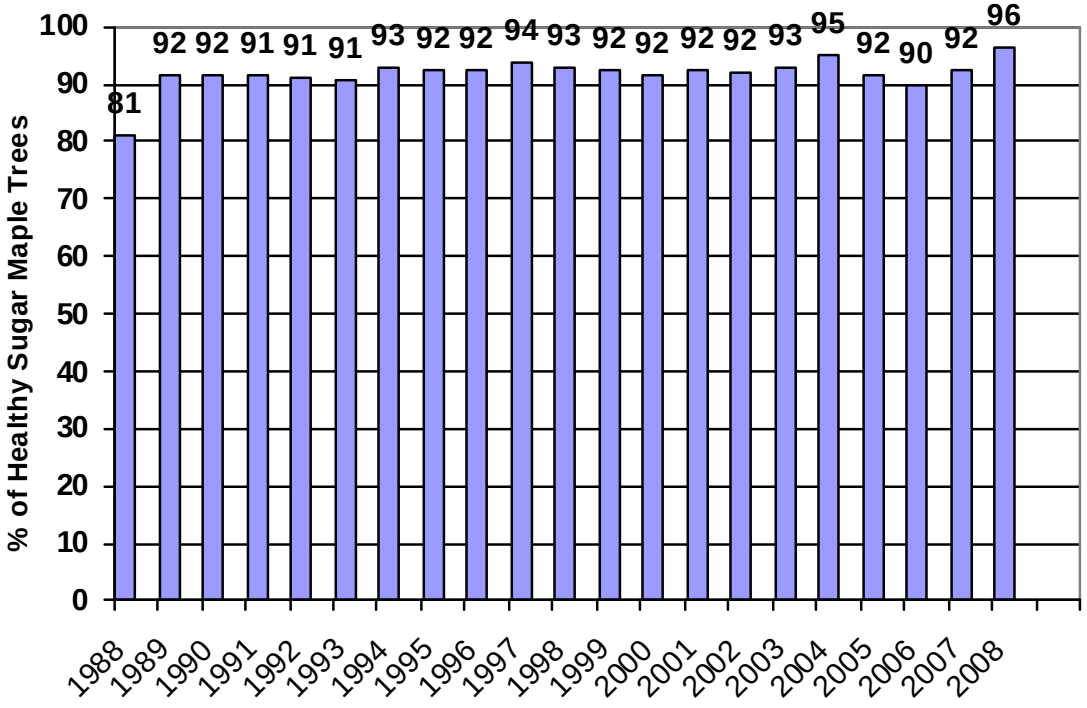


Figure 21. Trend in healthy overstory sugar maple trees on NAMP plots. Health based on trees with less than 15% dieback.

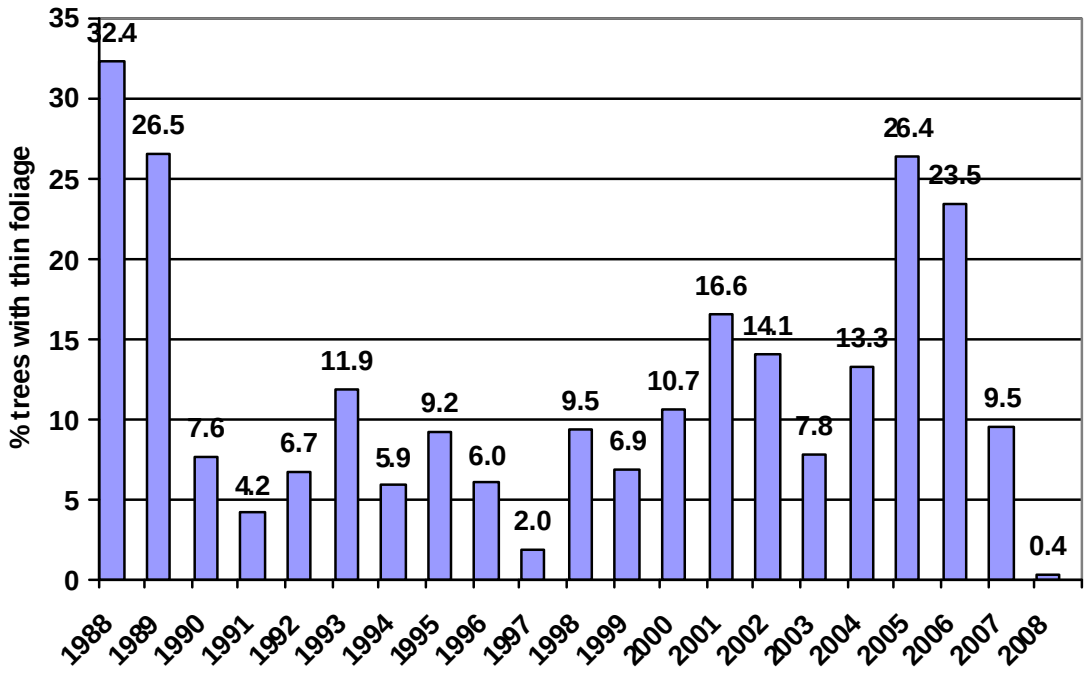


Figure 22. Percent of overstory sugar maple trees with thin foliage (foliage transparency >25%) showing dense foliage in 2008.

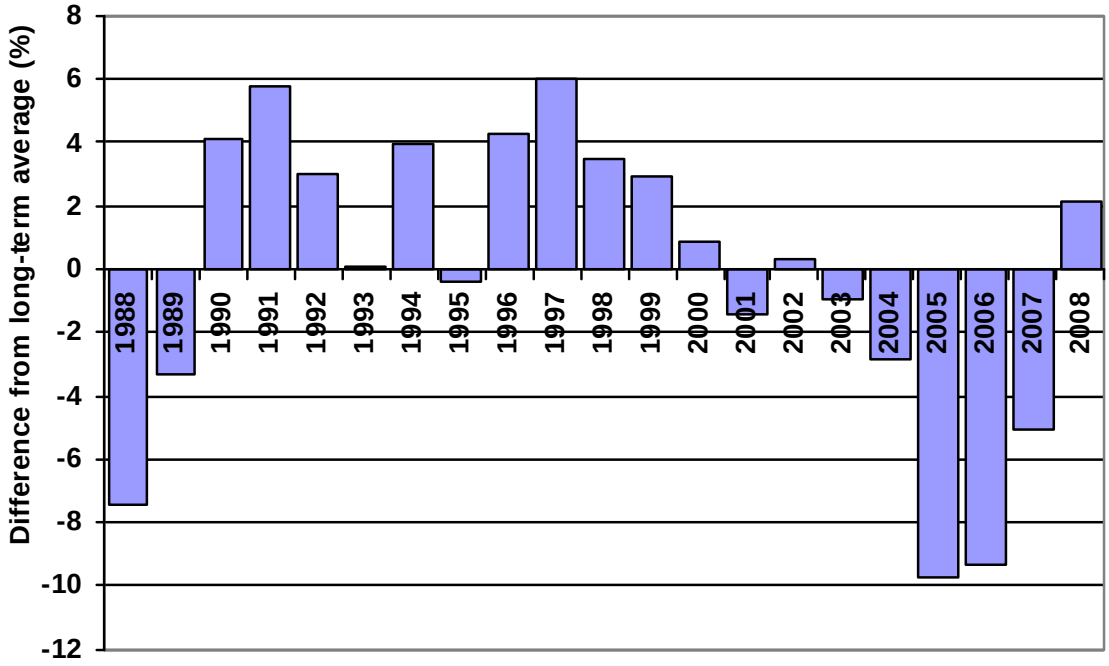


Figure 23. Annual variation in the Crown Condition Index (CCI) shows improvement in sugar maple condition in 2008. The CCI is calculated using both dieback and transparency. Positive CCI values indicate better than average crown condition.

Table 12. Sugar maple bole damages as a percent of the 45 total damages recorded.

Bole damage agent	% of total bole damages
Broken bole	20
Conks	18
Sugar maple borer	11
Animal damage	9
Sapsucker damage	9
Wind thrown/uprooted	7
Cracks and seams	7
Eutypella canker	7
Logging damage (>20% of circumference)	4
Canker	4
Weather damage	2
Nectria canker	2

Vermont Monitoring Cooperative (VMC) Tree Health

Trends in tree health on the east slope of Mount Mansfield

In 2008, six forest health monitoring plot-clusters were evaluated on the east slope of Mount Mansfield in Ranch Valley. Paired plot-clusters were measured at three elevations: 1400, 2200 and 3000 feet, for a total of 320 trees and 134 live overstory trees.

Hardwood trees at all three elevations have been declining gradually over the past 12 years, but most change has occurred since 2002. Average dieback increased for hardwood species between 2002 and 2006, with paper birch trees averaging over 25% dieback in 2006. The trend in trees with high dieback (greater than 15% crown dieback) has been steadily increasing, especially at the two lower elevations plots (Figure 24). There is no clear cause for this decline, since a variety of stress agents have been present over the years: 1998 ice storm, 1999 drought, pear thrips damage on sugar maple, 2000 Septoria birch leaf blight, 2000 heavy seed year and others.

A Crown Condition Index applied to each tree in the Ranch Valley plots combines four crown health indicators (dieback, foliage transparency, crown density and live crown ratio) (Figure 25). When compared against the long-term average (1997-2008), 2008 shows great tree health improvement, especially from the all time low of 2006.

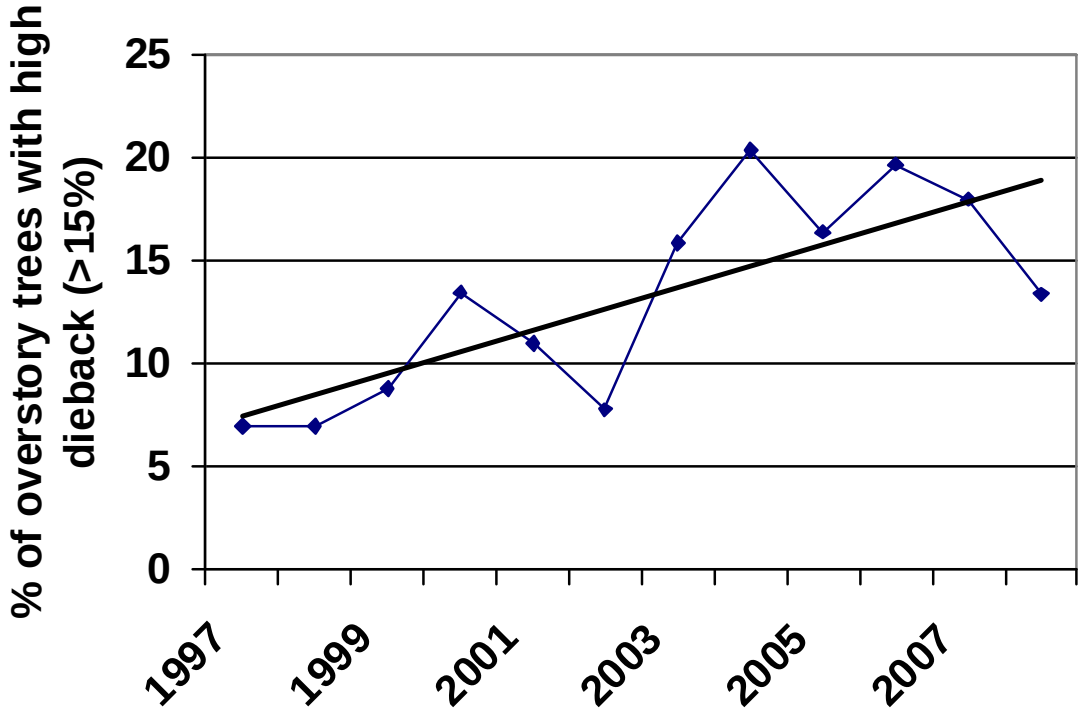


Figure 24. Percent of overstory trees with high dieback (>15%) showing a steady decline in tree health on Ranch Valley plots. Tree health improved in 2008.

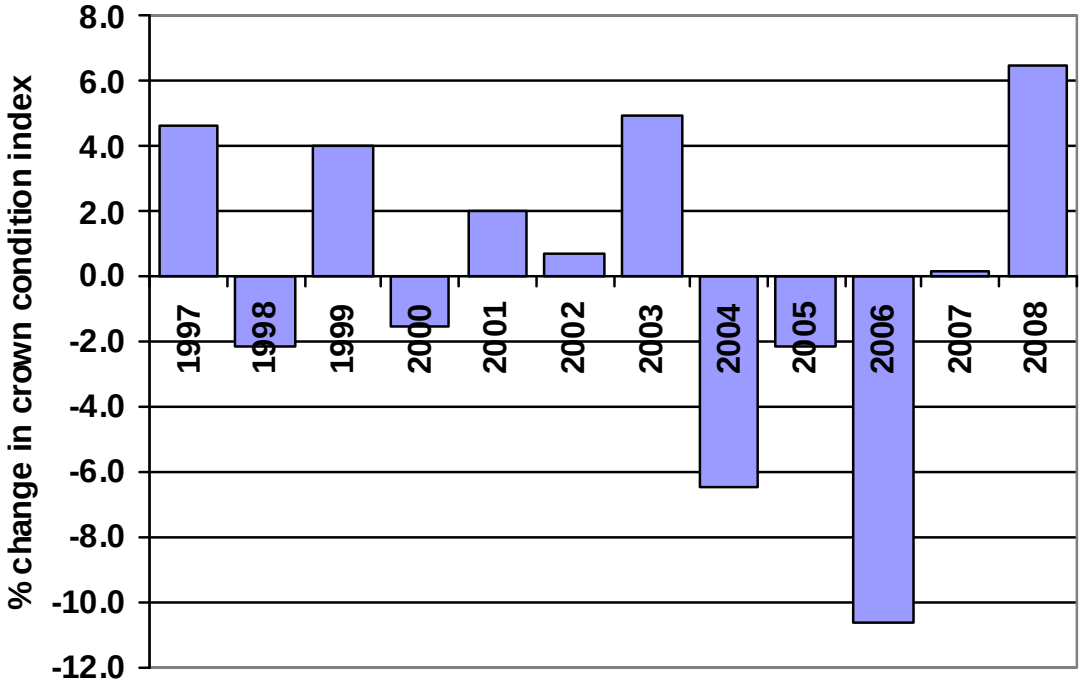
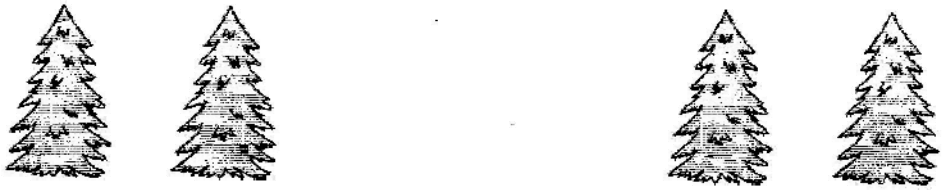


Figure 25. Annual variation in the Crown Condition Index (CCI) showing improvement in Ranch Valley tree health in 2008. The CCI is calculated using dieback, transparency, crown density and live crown ratio. Positive CCI values indicate better than average crown condition.

COMMON PESTS OF CHRISTMAS TREES IN VERMONT 2008

REPORTED BY THE



DEPARTMENT OF FORESTS, PARKS AND RECREATION

INTRODUCTION

Information in this report is based largely on observations made by Forest Resource Protection personnel, including some spot-checks of key plantations. This was again an excellent growing season for Christmas trees, similar to the past three years, and again many growers reported that their trees had few insect and disease problems.

INSECTS

Balsam Gall Midge populations continue to increase, with noticeable damage to balsam fir visible in more and more Christmas tree plantations throughout the region. Damage was moderate to heavy in scattered locations. Some growers have had difficulty in controlling the larval stage of this insect with applications of chlorpyrifos at the recommended shoot length of 1.5 to 2 inches but have reported good success by applying bifenthrin (OnyxPro) at budbreak to target adults. One such grower in Walden cooperated by leaving a group of trees untreated to compare with treated trees. Trees were sprayed on May 15 with 4 oz. per acre of OnyxPro applied at about 70% budbreak using a tractor-mounted mistblower. Evaluations on August 29 showed a reduction in number of galled needles of 94% on treated trees compared to untreated trees. There is also some evidence that repeated applications of chlorpyrifos in the past in plantations such as this one have kept populations artificially high by killing the good midge that is the primary biological control agent, while not providing adequate control of *P. tumifex*.

Gall midge damage was observed on edge trees in some balsam plantations that have remained free of this pest in the past so careful monitoring by growers is recommended to control this pest before it becomes a larger problem.

Balsam Shootboring Sawfly population levels were heavier than in 2007, this being an even numbered year, but damage in most fir plantations was light, with some spots of moderate damage.

Balsam Twig Aphid damage was mostly light, with a few spots of heavier damage, similar to what was seen in the past three years. It's surprising that populations have remained so low for four years in a row.

Balsam Woolly Adelgid populations remain visible on wild balsam fir trunks due to recent mild winters but mortality of large trees as mapped by aerial surveys decreased. Damage was most evident in southern Vermont. This insect was not observed on Christmas trees but has the potential to become a problem if populations continue to build.

Cooley Spruce Gall Adelgid caused heavy damage to scattered blue spruce Christmas trees in Waterbury.

Eastern Spruce Gall Adelgid damage to white spruce remains common, at mostly light to moderate levels.

Root Aphids were associated with the foliar yellowing and stunting of recent Fraser fir transplants in Stannard.

Sawyer Beetle adults were sometimes seen but damage was infrequent.

White Pine Weevil damage to pine and spruce trees remained common throughout the state but damage remained mostly at light levels in Christmas tree plantations.

DISEASES

Armillaria Root Rot continues to be a problem associated with tree mortality in more and more plantations. This is particularly true for sites that are beyond their second rotation and plantations where trees are inter-planted near old stumps. Some Armillaria caused mortality was again found on the majority of such plantations visited in northern Vermont this year. Fraser fir is much more susceptible to this root rot than balsam fir, while balsam-Fraser crosses appear to be intermediate in susceptibility. Growers who are converting to Fraser fir by planting them between mature balsam Christmas trees may be inviting a greater risk of loss due to Armillaria in the future.

Brown Spot Needle Blight was widespread and often heavy on white, red and Scots pines again this year. Infected needles turn brown from the tips back and develop small black fruiting bodies.

Cyclaneusma Needlecast of Scots pine remains very common but mostly at light levels.

Delphinella Shoot Blight was less commonly observed on balsam fir this year.

Fir-Fern Rust was widespread again this year at light to moderate levels. Needle loss was similar to or slightly less than what was seen in 2007. Although it was very noticeable on balsam fir nearly everywhere during the growing season, it was rarely heavy enough to impact marketability.

Lirula Needlecast remains common but infection levels were down this year compared to 2007. One grower reported that heavy Lirula damage in his plantation was restricted to one particular seed source. Needles killed by this fungus maintain their orientation on the stems, with retention of dead two and three year needles. Mature trees that are crowded or partially shaded are most likely to be infected. Look for long narrow black fruiting bodies down the midrib on the upper side of brown previous-year needles.

Phytophthora Root Rot continues to be associated with the death of Fraser fir and occasionally balsam fir growing on poorly or somewhat poorly drained sites in more and more locations. The extremely wet summer is likely to result in increased mortality on such sites. It appears that once the organism gets established during wet years, it persists and becomes more of a problem in years with average precipitation.

Rhizosphaera Needle Blight of fir, caused by *Rhizosphaera pini*, was increasingly noticeable in Christmas tree plantations this year. Some needle loss from this fungus was observed in nearly every plantation visited. Infected needles tend to bend and hang straight down from the twigs. Close inspection will reveal rows of tiny black fruiting bodies on the undersides of needles, arising from the stomates. Damage was especially heavy on crowded or shaded trees.. Harvesting of crowded trees and basal pruning in plantations helps to alleviate the damage.

Rhizosphaera Needlecast of white and blue spruce remains widespread and very common, with some heavy damage to blue spruce again this year.

Scleroderris Canker has not been found in any new towns since 1986.

White Pine Blister Rust damage remains common throughout the state and continues to kill white pines at moderate levels in plantations that have had the problem in the past.

White Pine Needle Blight was observed in one Craftsbury plantation but damage was light.

Woodgate Gall Rust damage to Scots pine is decreasing, as growers remove heavily damaged trees.

Yellow Witches Broom Rust of balsam fir was again very noticeable in scattered locations. Removal of these brooms during shearing is recommended.

Frost Damage was light and was only observed in a few northern locations.

Winter Injury was not observed except for light injury to the south sides of some fir trees where the companion tree to the south had been harvested the previous year.

Winter-Related Branch Breakage of Fraser fir occurred in young plantations in Lyndonville and Brookfield. When an icy crust develops on the surface of the snow and then drops due to a thaw, it sometimes rips off all the branches that were covered by the ice layer. This leaves the trees without branches for a lower section of the main stem. Fraser fir must be particularly vulnerable to this type of damage, as it has not been reported for other tree species.

ANIMAL DAMAGE

Moose Damage remains an increasing problem in remote northern plantations, including one in Craftsbury.

The following pests were not observed on Christmas trees this year.

Insects: Cinara Aphids, Introduced Pine Sawfly, Pine Leaf Adelgid, Pine Needle Midge, Pales Weevil, Pine Root Collar Weevil, Pine Thrips, Spruce Speder Mite and Yellow-Headed Spruce Sawfly.

Diseases: Diplodia Shoot blight, Sirococcus Shoot Blight, Rhabdocline Needlecast, Swiss Needlecast , and Lophodermioum Neeedlecast.

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RSK 1/09/09

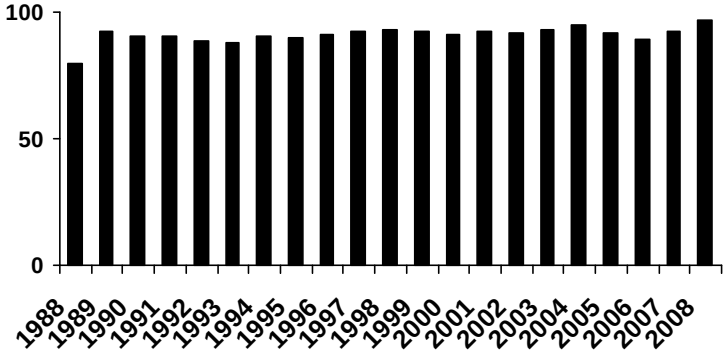
HEALTH OF SUGAR MAPLE IN VERMONT — 2008

Reported by the State of Vermont Department of Forests, Parks and Recreation

This information on sugar maple health is based on aerial surveys and field observations. Every year, the Department of Forests, Parks and Recreation looks at tree health from the ground and from the air. In 2008, all 4.7 million acres of forestland were evaluated from an airplane at least once. In addition, crews assessed monitoring plots on the ground to rate tree condition.

Sugar Maple Condition was particularly good in 2008, with dense, lush foliage. Trees on plots monitored as part of the North American Maple Project were in the best condition observed over the 20 years they have been evaluated. Weather conditions continued to be good for growing trees, with adequate precipitation throughout the growing season, and above-average rainfall in June, July, and early August.

Sugar Maple Condition in Vermont
% of Trees Rated Healthy
North American Maple Project Plots



An **Ice Storm** in mid-December caused widespread breakage. The most severe damage was in southern Windham County at elevations above 1000 feet. The storm was preceded by heavy rain on unfrozen ground, causing some uprooting. Recommendations for managing stands affected by ice have been updated based on studies following the 1998 ice storm. Most broken sugar maples are expected to recover.

Windstorms in mid-July were locally important in northern Vermont, especially in Cambridge and Waterville.

There was very little **Sugar Maple Defoliation** in 2008, with populations of most defoliators at low levels.

Forest tent caterpillar populations have collapsed statewide, although there was a remnant population in central Vermont this spring. Moth catches in 2008 were the lowest since 2001. Dieback from the recent outbreak continues in occasional sugarbushes. However, tree health in most defoliated locations has recovered.

Saddled prominent populations have also returned to background levels, but caused some light damage in northern Windsor County

In spite of the ample rainfall, maple foliage diseases, like anthracnose, were uncommon.

Of great concern to sugarmakers is the detection of **Asian Longhorned Beetle** in Worcester, MA. As of November, over 4000 infested trees had been detected, including some in wooded areas. A 63 square mile area is under quarantine.

Officials intend to eradicate the Worcester infestation. All infested trees that have been identified will be removed by the time the beetles emerge from trees next summer.

The most important tools for protecting maples from Asian longhorned beetle are prevention and early detection. To prevent movement of exotic woodborers, we discourage moving firewood more than 50 miles from where it is cut. We have a variety of materials available, and a website www.firewood.vt.gov, to spread this message.

Early detection of the insect, should it find its way to Vermont, is also critical. We urge sugarmakers to become familiar with Asian longhorned beetle, and keep an eye out for potential infestations. (More information is at www.uvm.edu/albeetle/.) We are also distributing information to the public to help locate suspect beetles and are launching a citizen monitoring program for exotic pests.

For more information, contact :

Windsor & Windham Counties……..	Springfield (802) 885-8845
Bennington & Rutland Counties……	Rutland (802) 786-3851
Addison, Chittenden, Franklin, & Grand Isle Counties……....	Essex Junction 802) 879-6565
Orange & Washington Counties……..	Barre (802) 476-0170
Lamoille & Washington Counties……	Morrisville (802) 888-5733
Caledonia, Orleans & Essex Counties……	St. Johnsbury (802) 751-0110