FOREST INSECT AND DISEASE CONDITIONS IN VERMONT 2004

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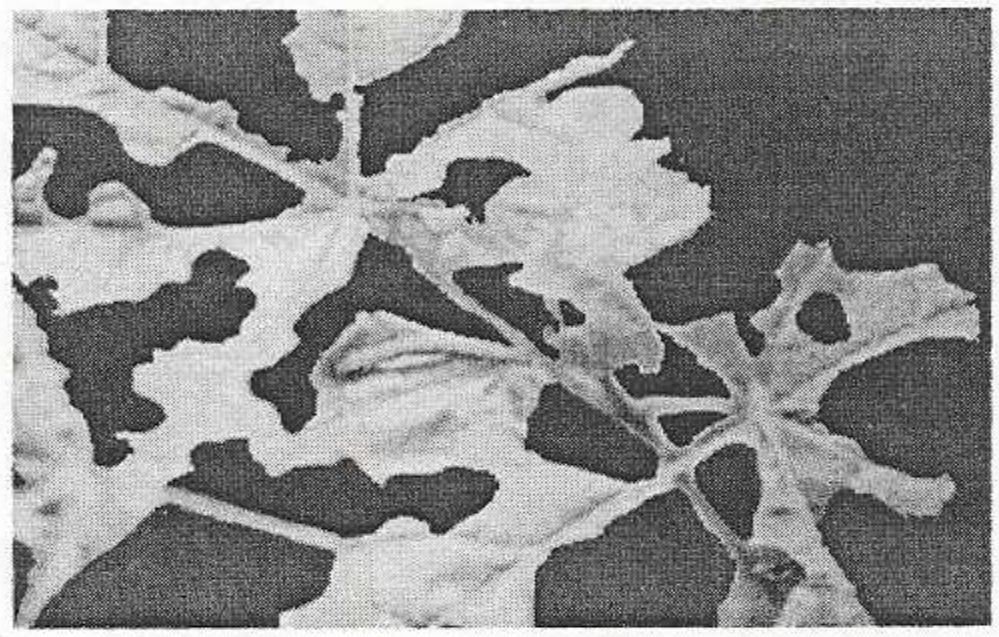
We gratefully acknowledge the financial and technical support provided by the USDA Forest Service, Northeastern Area State and Private Forestry that enables us to conduct the surveys and publish the results in this report. This report serves as the final report for fulfillment of the Cooperative Lands – Survey and Technical Assistance and Forest Health Monitoring programs.

FOREST INSECT AND DISEASE CONDITIONS IN VERMONT

CALENDAR YEAR 2004



BRUCE SPANWORM FEEDING ON SUGAR MAPLE FOLIAGE

PREPARED BY:

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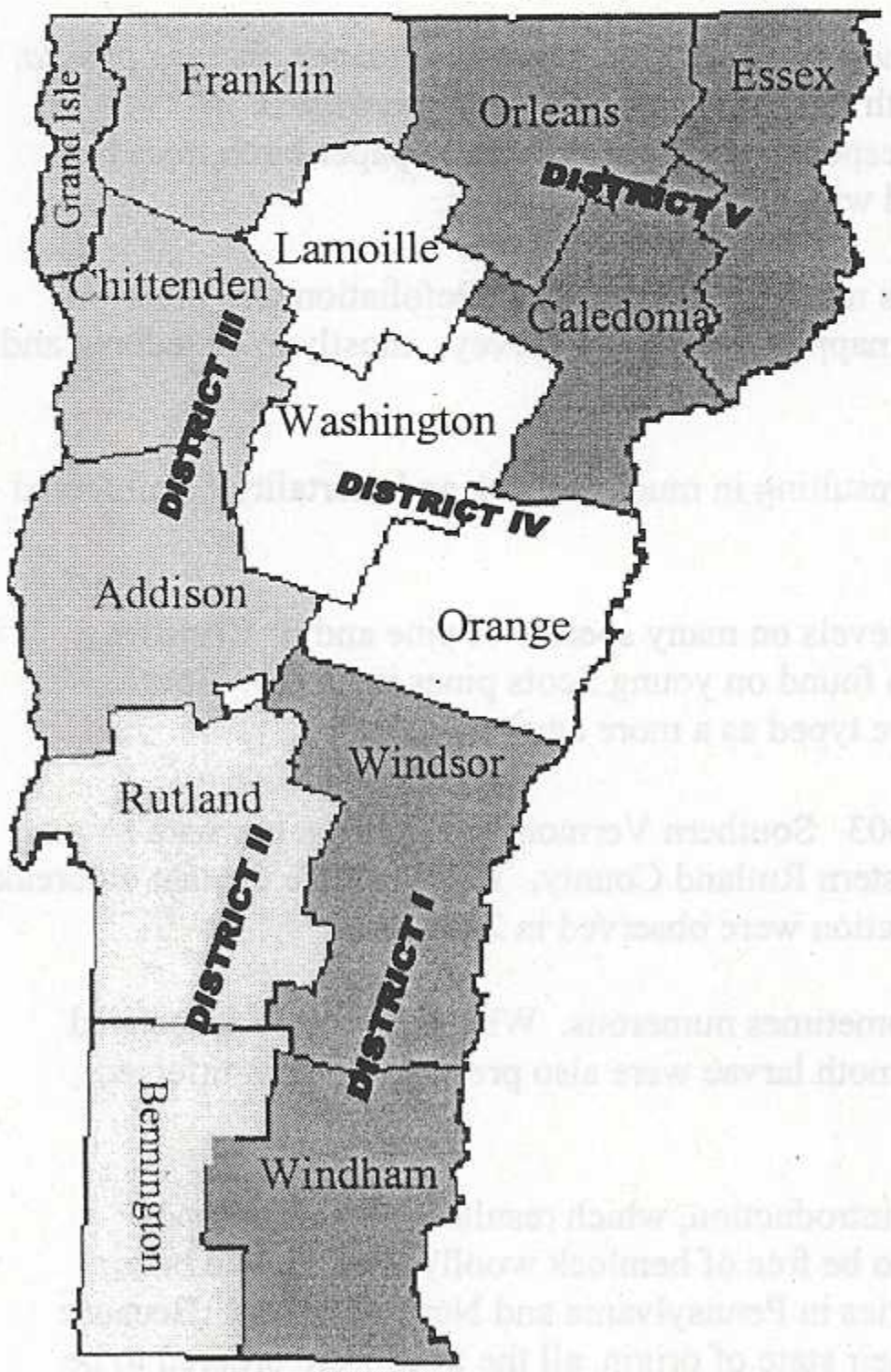

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2004 Vermont Forest Insect and Disease Highlights

Increase in damage by **Arborvitae Leaf Miner** was seen everywhere, but especially in Washington County, where 1,009 acres were mapped. An additional 44 acres were mapped in Addison County. Excessively brown trees looked much greener by the end of the growing season.

Ash dieback was mapped on 96 acres in Chittenden and Addison Counties. Thin ash crowns and chlorotic foliage were common throughout the state, and scattered dieback was more noticeable in 2004. Drought from previous years may account for problems seen on shallow soils or sites with variable moisture.

Balsam Woolly Adelgid populations collapsed due to cold winter temperatures in early 2004. Although no live adelgids were seen in previously infested stands, mortality became increasingly noticeable in these stands. Over 10,000 acres with balsam fir mortality were mapped, compared to only 4,334 acres mapped in the region in 2003. Mortality was observed even in stands where adelgid populations, indicated by white wool, were light in 2003. Other stressors, like drought and root rot, are also likely to be playing a role.

Beech Bark Disease continued to be noticeable in 2004. Acreage mapped from the air increased in southern Vermont but decreased in northern Vermont, for an overall decrease to 77, 983 acres compared to 91,926 acres in 2003.

Birch decline was mapped on 7,836 acres. Most of the decline was observed on upper elevation paper birch. Drought stress from previous years was the likely cause.

Birch defoliation affected over 66,000 acres of forest. Miners, including the **birch leaf miner,** *Fenusa pusilla,* and the **early birch leaf edgeminer,** *Messa nana*, along with the **birch skeletonizer,** *Bucculatrix canadensisella*, and **Septoria leafspot**, *Septoria* sp., were responsible. Upper elevation paper birch trees had widespread dieback and mortality, believed to be associated with recent drought years.

Bruce Spanworm damage was observed statewide, but was mostly at light levels. Defoliation was most prominent on lower foliage and fewer than 400 acres were mapped from aerial surveys, mostly in Caledonia and Orleans Counties.

Butternut Canker remains common throughout the state, resulting in much dieback and mortality. Uninfected trees are rarely observed.

Diplodia Shoot Blight damage remained common at light levels on many species of pine and fir Christmas trees in widely scattered locations. Heavy damage was also found on young Scots pines in Derby. Four *Diplodia* isolates from declining red pine in Shaftsbury were typed as a more aggressive form.

Forest Tent Caterpillar defoliated over 90,000 acres in 2003. Southern Vermont was hardest hit, with about 75,000 acres defoliated, and most of the damage was in western Rutland County. This is where the last outbreak began over 25 years ago, and where isolated areas of defoliation were observed in 2003.

Gypsy Moth larvae were commonly observed, and were sometimes numerous. Where they were associated with significant defoliation, forest tent caterpillars or satin moth larvae were also present. Fungus-infected caterpillars were observed in Putney.

Hartford was the epicenter of the **hemlock woolly adelgid** introduction, which resulted in an emergency eradication project. 741 hemlocks, certified by inspectors to be free of hemlock woolly adelgid, had been shipped to a nursery in Hartford in 6 shipments from nurseries in Pennsylvania and North Carolina. Because some of these trees carried hemlock woolly adelgid from their state of origin, all the trees were ordered to be destroyed. 413 of these were still at the Hartford nursery and burned on site. Additional trees had been shipped to nurseries or outplanted throughout southern Vermont. All of those that could be located were also destroyed.

Larch decline and mortality was mapped on 2,675 acres, compared to 4,606 acres in 2003. Triggered by drought stress prior to 2003, trees continue to decline as eastern larch beetles take advantage of low vigor trees.

Damage by **Maple Leafcutter** larvae decreased from 2003. Noticeable but mostly light defoliation was observed throughout the region. In some stands defoliated by forest tent caterpillar, sugar maple leaves with any unchewed areas were damaged by maple leaf cutter. In Addison and Chittenden Counties, 328 acres of defoliation were mapped.

Oystershell Scale populations on American beech were light in most locations, and dieback was not heavy enough to be detected by aerial survey.

Symptoms of **ozone injury** (stippling on upper leaf surface) were recorded at 28% of the 18 sites visited, although few plants at each site had noticeable injury. Where injury occurred, the severity was light to moderate. No locations had heavy injury. Black cherry plants were most commonly affected this year.

Overwintering populations of **pear thrips** had increased going into the season, especially in central and southern regions of the State. Soil samples collected in the fall of 2003 indicated that thrips populations were higher than the previous year in 39 of the 43 sugarbushes sampled. However, spring leaf development was very rapid in most of the state and only very light, occasional damage to regeneration was observed. There was some noticeable, heavier injury to high elevation sugar maple.

Saddled prominent defoliation was not reported, and no larvae were observed. However, populations maybe increasing, as the moth catch at Spring Lake in Shrewsbury increased from none in 2003 to 2.0 per trap in 2004. Saddled prominent populations often increase simultaneously with other defoliating caterpillars.

Spruce and fir dieback and mortality were mapped on 12,236 acres, similar to 2003, and were attributed to continued effects from drought and winter injury in previous years. Some lower elevation fir had been stressed by drought and balsam woolly adelgid in past years, resulting in current year tree declines.

Wet site conditions remain a common cause of tree decline and mortality. Declines due to wet sites were mapped on 19,039 acres. Damage reported in 2004 included fir Christmas tree mortality, ash dieback, and white pine decline. A very wet summer contributed to an increase in the area affected.

Vermont Forest Health Management Recommendations

The following recommendations summarize information of particular importance to forest managers. Additional information can be found in the full report on Forest Insect and Disease Conditions in Vermont 2004, under specific pests mentioned or in separate summaries for sugarbush and Christmas tree managers in the appendix. 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.

Good growing season weather conditions continued in 2004. With two favorable years in a row, tree condition was generally good, and most mid-summer hillsides were covered with dark green foliage. Stress from previous drought years did continue to cause impacts, particularly to white birch and eastern larch. Changes in foliage chemistry, caused by the drought, may have increased populations of various defoliating caterpillars. Speaking of which…

Where **Maple** is growing, forest tent caterpillar is a concern. Over 90,000 acres of defoliation were mapped in 2004, including forestland in twelve counties. Normally, trees refoliate, and replenish some lost food reserves, but this rarely happened in 2004. Many stands were bare into October because the caterpillars, whose feeding period was prolonged by cool weather, consumed refoliated leaves.

Following a forest tent caterpillar outbreak in Pennsylvania, trees growing on nutrient-rich soils were more tolerant of defoliation. Sites with lower levels of calcium and magnesium, usually those with acid soils, had more sugar maple decline and mortality. This was also the case after Vermont's last outbreak, when most of the maple decline occurred in the more acidic Green Mountain biophysical regions.

These more-forgiving nutrient-rich sites allow more management flexibility. We tested starch in the roots of defoliated maples this fall, and were pleased to find plenty of starch in most trees that had been leafless all summer… *if* they were growing on good sites. Apparently, they had been able to store some reserves in late May and June. This was not necessarily the case for trees on shallow or nutrient-poor sites.

In 2004, defoliation was heavier where sugar maples were exposed to light: sugarbushes, recently thinned stands, and roadsides. One reason: parasites of the forest tent caterpillar are more successful in closed stands. One consequence: outbreaks last longer in recently thinned stands. Thinning also concentrates the same number of caterpillars on fewer trees. In addition, trees are stressed from the recent activity, and root rot fungi have a head start, with many new stumps to spread from.

We recommend delaying timber harvests in defoliated areas. Wait two or three years after the outbreak to minimize additional stress on trees and to see which ones remain healthiest, amending UVA plans if necessary. It's best to mark sales of recently defoliated stands during the growing season, so crown condition can be rated. Even if the caterpillar has not been heavy in the region, be flexible when scheduling timber sales, so they can be postponed if populations build. Historically, outbreaks last 1-3 years in one region, but 3-8 years statewide, as new regions are defoliated.

It is possible to protect foliage by aerial spraying of the biological insecticide, Bt. We do recommend this for active sugarbushes where defoliation is predicted. In unusual situations, it may be cost-effective for timberland.

Movement of **Pine** logs, bark, and unprocessed bark mulch continues to be affected by pine shoot beetle. The whole state of Vermont is now under quarantine, so pine may be moved freely within the state. However, all shipments from anywhere in Vermont to Massachusetts, Connecticut, Rhode Island, or to parts of New York and Maine, are regulated. Quarantine details can be found at www.vtfpr.org/protection/for_protect_forhealth.cfm.

Although **Hemlock** remains threatened by hemlock woolly adelgid, the 2004 eradication effort stands a good chance of being successful. Hemlocks from infested nurseries were distributed to 33 Vermont towns in the spring. Fortunately, most had been on site for just a few weeks before they were removed and destroyed, and all but 14 trees were located. A risk of establishment does exist, however. We will be checking around trees that were removed to be sure adelgid didn't spread to nearby hemlocks.

Encouraging research results: Hemlock woolly adelgids in eastern North America are closely related to adelgids

from warmer parts of Japan, suggesting why they've stalled at cold hardiness zone 5a. Although this zone extends into Vermont, extremely cold periods in recent winters have stopped their northward spread. We're hoping that, once hemlock woolly adelgids are established in Vermont, cold will set them back frequently, reducing their impact, and making it possible to maintain hemlock as a viable species.

The 2004 introduction demonstrated that inspection in the state of origin does not guarantee that nursery trees are free of hemlock woolly adelgid. Vermont is amending its regulations to exclude all hemlock nursery stock from infested counties. The regulations on hemlock logs, lumber with bark, and chips will remain essentially unchanged. These are admissible, from areas under quarantine, to sites with a compliance agreement.

Hemlock management recommendations remain the same. Keep looking for hemlock woolly adelgid, and report any suspects. Encourage vigorous hemlock, which will be less vulnerable if it becomes infested.

Balsam Fir mortality continued from a complex of stressors, including balsam woolly adelgid, drought stress, bark beetles and root pathogens. New mortality areas should be rare, because balsam woolly adelgid populations have crashed after two winters with extreme cold temperatures. Balsam fir may continue to decline in existing mortality areas. With root rots and bark beetles established in those areas, harvesting activities should be done in large groups, patch clearcuts, or other non-selective methods.

The **Beech** Bark Disease outbreak continues to progress, with symptoms also progressing in severity, from thin crowns and chlorosis to dieback and mortality. Clean-stemmed, healthy crowned beech should be favored for retention. More encouraging research results: if resistant trees are retained in the overstory, they produce a larger share of the understory sprouts.

Birch, especially white birch at higher elevations, began to show the impact of multiple recent stresses, including drought and defoliation, on top of a normally short life expectancy. Low elevation trees fared better, and are not expected to decline. They have had fewer recent defoliations and their deeper soils make them less vulnerable to drought.

Conditions for **Oak** have remained favorable. Gypsy moth caterpillars were more noticeable in 2004, and oak stands should be watched for gypsy moth life stages.

White Ash had a tough year, with a variety of factors involved. Heavy seed and forest tent caterpillar, which relishes white ash, caused impacts in some locations. Elsewhere, the drought years have initiated ash problems. Thin crowns and dieback developed on some shallow sites or sites with variable moisture availability. In other cases, drought seems to have made trees more vulnerable to cracking in the winter. In both cases, symptomatic trees are mixed with trees that were not affected. Where these situations occur, the site remains risky. In particular, assume that symptomatic trees will always be prone to problems following periods of drought. They are probably a poor bet for the future.

INTRODUCTION

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

A statewide aerial survey was flown between June 30 and July 29 in district 1,2,3 and part of 4 to target the early defoliators. District 5 and the remainder of District 4 were surveyed between August 25 and September 2 to target late season defoliators and general forest condition. Part of the survey was conducted using the digital sketchmapping tool developed by the US Forest Service.

ACKNOWLEDGMENTS

Thanks to the many individuals who contributed to this report, including Bernie Barton, Mary Burnham, Phil Girton, Tess Greaves, Ellen Hinman, Jay Lackey, Lars Lund, Hollis Prior, Pete Reed, Judy Rosovsky, Allan Sands, Tom Simmons, John St. Arnauld, and John Barrows (retired) from our Forest Resource Protection staff. Assistance in conducting aerial detection surveys and ground checks was provided by members of our Forest Management staff including Aaron Hurst, Mike Johnson, Matt Leonard, Ron Wells, and Dave Wilcox. Diagnostic and pest management assistance were provided by Dale Bergdahl, Shari Halik, Don Tobi, Ross Bell, Margaret Skinner, Scott Costa, Ben Machin and Ann Hazelrigg from the University of Vermont; Jon Turmel, Scott Pfister, Bonnie MacCullogh, Wendy Anderson and Cary Giguere from the Vermont Agency of Agriculture; Dick Dearborn (retired) from the Maine Forest Service; Charlie Burnham from the Massachusetts Division of Forests and Parks; Dick Bradbury from the Maine Forest Service; and Dennis Souto from the USDA Forest Service. Assistance in conducting aerial surveys and processing map data was provided by Bill Frament and Tom Luther from the US Forest Service, Forest Health Protection.

A special thanks to Brent Teillon who served as Forest Resource Protection Chief for the past 30 years. His guidance and dedication enabled the Forest Resource Protection staff to accomplish their duties in protecting the forest resource in the state of Vermont.

We gratefully acknowledge the financial and technical support provided by the USDA Forest Service, Northeastern Area State & Private Forestry that enables us to conduct the surveys and publish the results in this report.

Finally, this document about current forest health, and the diagnostic and survey work required to produce it, would not be possible without support from the State of Vermont and from citizens who find the information useful.

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WEATHER AND PHENOLOGY

2004 weather statistics based on Burlington data are summarized in Figure 1.

Winter

The winter of 2003-2004 was colder than normal. A couple of back-to-back heavy rainstorms in late October 2003 dropped over 4 inches of precipitation at the Essex weather station. With very little time between storms for the ground to dry and the rivers to recede, low-lying areas across the state experienced flooding. These late season rains reversed the recent pattern of low ground water levels in the fall, easing the fears of those dependent on wells for their water. The first powerful, winter-like storm hit on November 13th and 14th. High winds with rain changing to snow came out of the west. Winds in excess of 50 MPH blew down trees and power lines. The Champlain Valley got just a dusting, but Underhill was buried under 10" of heavy, wet snow. Thanksgiving weekend was marked by high winds again, with gusts sweeping down Church Street in Burlington, and toppling the 52' Christmas tree that was just lit up hours before. City workers cut it up and chipped it; they replaced it with a 30' tree.

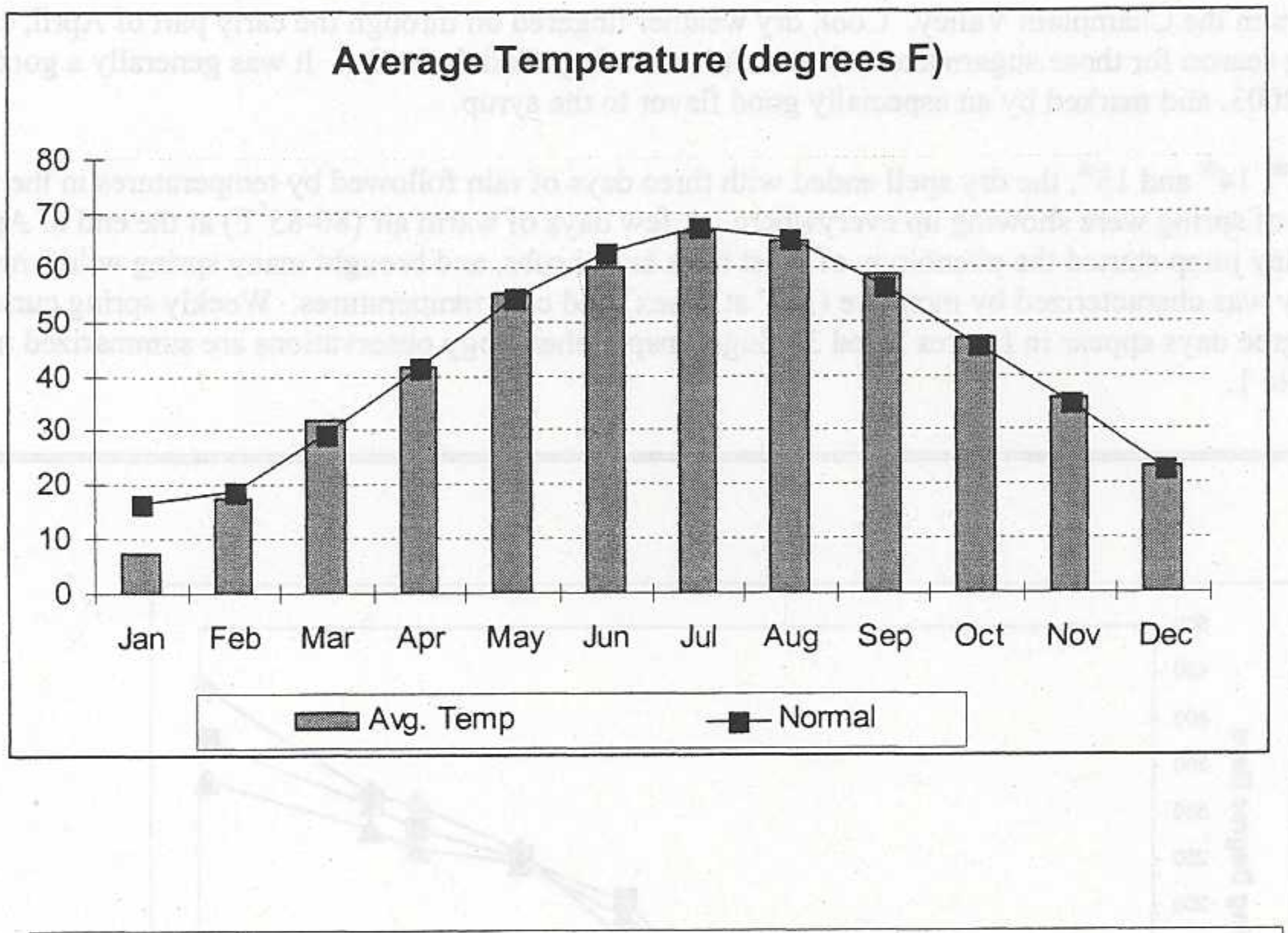
December began with a cold spell more reminiscent of February than December…nearly a full week without the thermometer going above freezing! Light snows, flurries and squalls throughout the period.

A huge storm on December 7-8 dropped the most early season snow on Vermont since 1900. This storm resulted from the consolidation of two storms; one storm coming from Canada pulled a coastal nor'easter back up into Vermont, where it stayed for more than 30 hours. Widespread snow was accompanied by high winds and temperatures in the teens. More snow fell south and east of the Champlain Valley, but, even so, Essex recorded 17.2". Underhill received 33.5 inches. Storm totals from 1-2 feet were common across the state.

Three days later, the next weather system washed much of the snow away, with 0.81" of rain recorded at the Essex station. The following weekend, another nor'easter came up the coast dumping 17.5" of snow in Essex and up to 2 feet elsewhere in a band from Grand Isle County, through central, and into southeastern Vermont. Southern and eastern portions of New England saw the snow change over to rain early on, so the greatest snow accumulations came to Vermont and northern New Hampshire. Two days later there was another rain event, ending with a changeover to snow again—heavy, wet snow that stuck to everything (another 8.7" at Essex). By mid-December most places in the state had already had three or four substantial snowfalls, with rains in between to melt them away. All this precipitation brought Lake Champlain up to 99.4' by late December—only a few inches below flood stage! This is usually the time of year when the lake is nearer to its lowest level.

The New Year brought an end to the wild storms of December, but arctic blasts of cold air gave us overnight lows in the minus teens and daytime highs barely over zero. Fortunately, most areas in northern parts of the state had at least a ten-inch blanket of snow to protect them from the bitter cold. The extreme cold did injure some cold-sensitive species and varieties growing at the edge of their hardiness zones in southern Vermont. January was the 6th coldest and the 2nd driest January on record at the Burlington weather station. For thirty days (January 4th to February 2nd), the temperatures did not rise above freezing. A -22°F and a -26°F punctuated the cold period. This cold, dry spell was just what the lake needed, as the level dropped back to 97' by early February. Finally, a 6" snowfall on the 4th brightened up the landscape with a fresh coat of white.

February continued the generally cold and dry trend…still below zero at night, but warming to near freezing during the bright, sunny days. One stretch of clear, cold days (February 23rd-28th) brought six consecutive days of 100% of possible sunshine. The first real break in the cold weather did not occur until the last weekend of February. The overnight low on March 3rd was above freezing—the first time since Christmas!



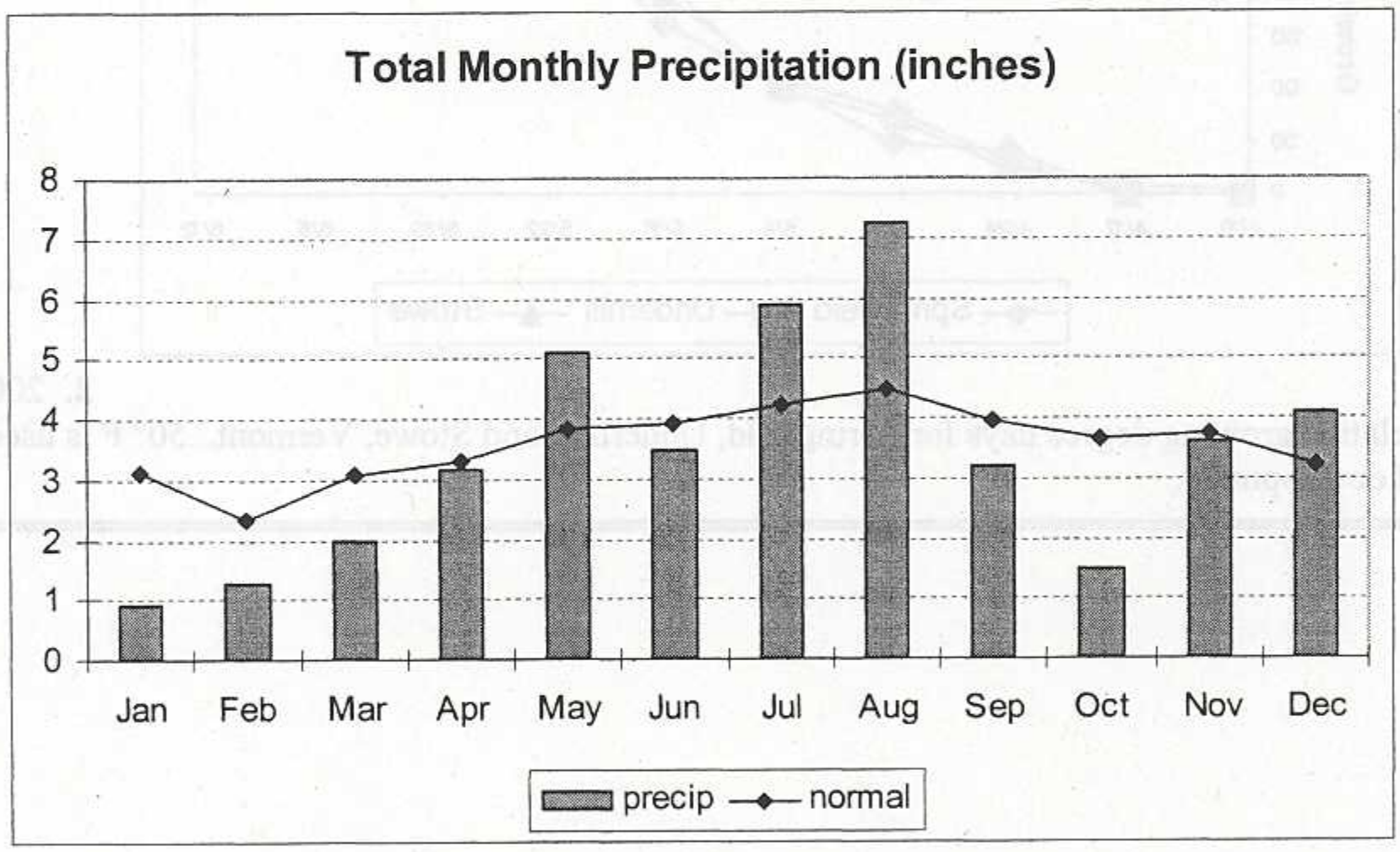


Figure 1. Monthly average temperature and monthly total precipitation in 2004, compared to normal, for Burlington, Vermont. Data from the Northeast Regional Climate Center (http://met-www.cit.cornell.edu).

Spring

The first sap runs for maple sugaring did not come until the last weekend in February. The season got off to a great start with nearly ideal temperatures for the first twelve days of March—overnight lows in the mid-twenties and daytime highs in the upper 30's and low 40's. Only three nights failed to drop below 32°F during the stretch. The taps dried up with the return of cold weather in late March…March 22nd seeming more like January 22nd with a temperature of 4°F and wind chills below zero. By April 2nd, the sugaring season was over for many

sugar makers in the Champlain Valley. Cool, dry weather lingered on through the early part of April, extending the sugaring season for those sugarmakers who hadn't already pulled their taps. It was generally a good year—better than 2003, and marked by an especially good flavor to the syrup.

On April 13th, 14th and 15th, the dry spell ended with three days of rain followed by temperatures in the 50's and 60's. Signs of spring were showing up everywhere. A few days of warm air (80-85° F) at the end of April and into early May jump started the phenology of most trees and shrubs, and brought many spring wildflowers into bloom. May was characterized by moisture (5¼" at Essex) and cool temperatures. Weekly spring cumulative growing degree days appear in figures 2 and 3. Sugar maple phenology observations are summarized in figures 4-5 and Table 1.

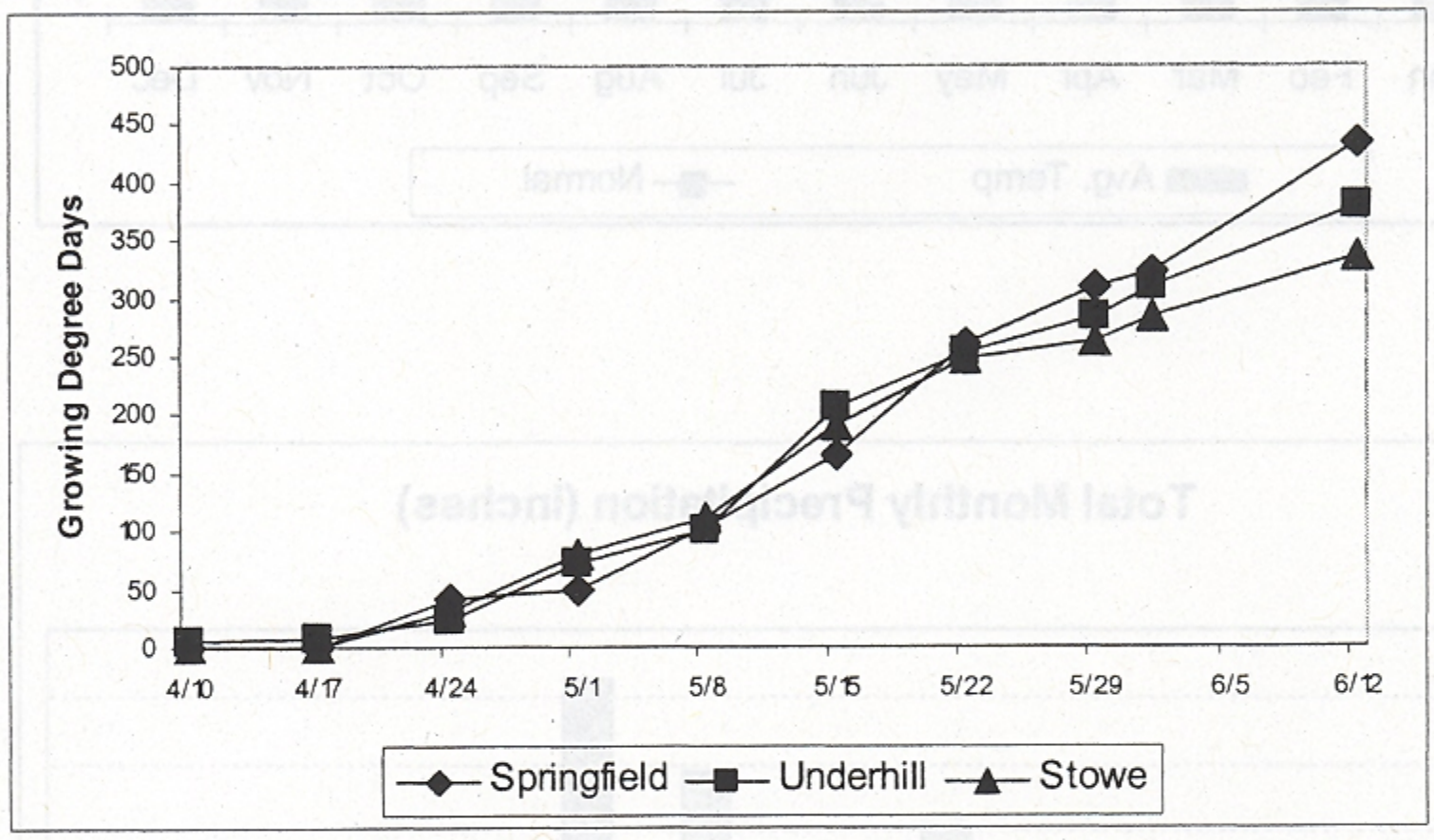
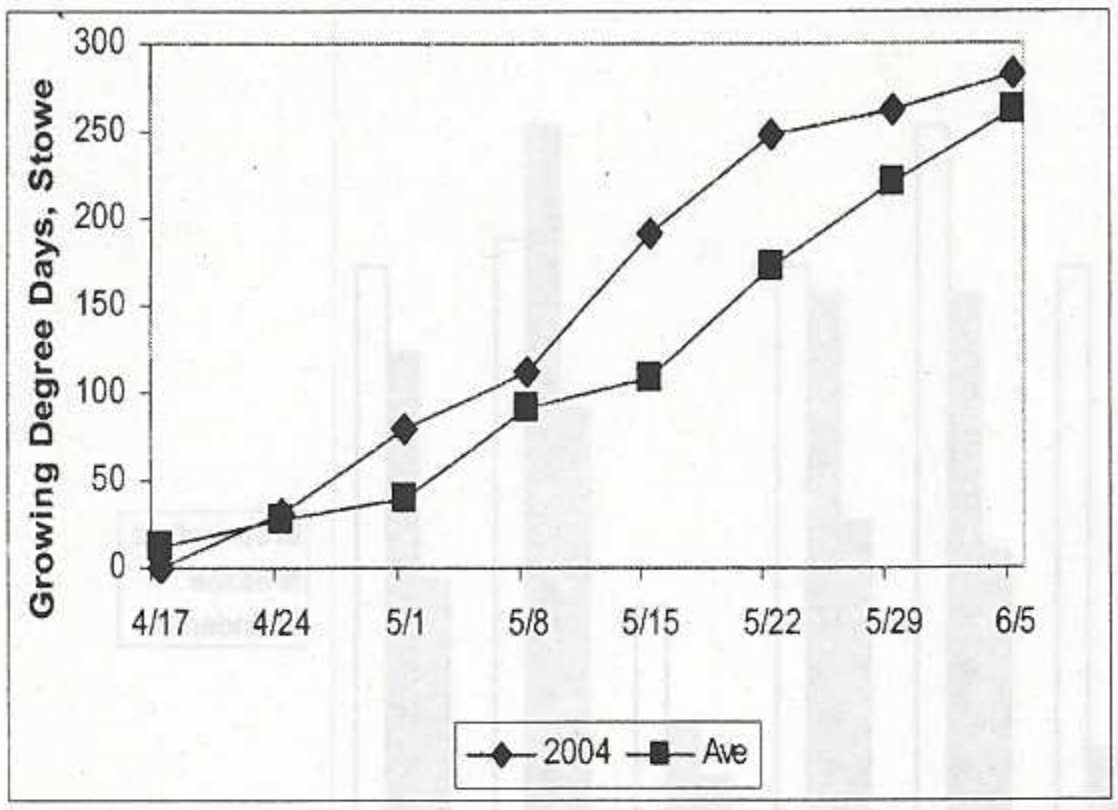
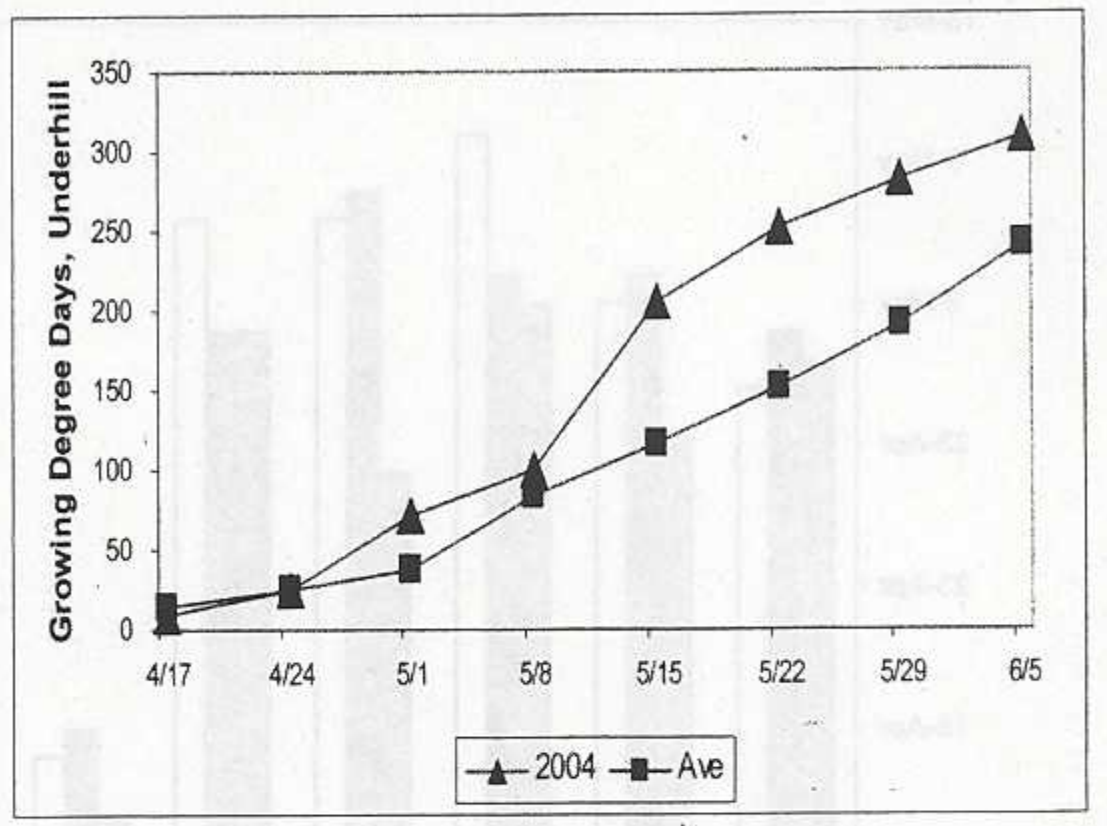


Figure 2. 2004 weekly spring cumulative growing degree days for Springfield, Underhill, and Stowe, Vermont. 50° F is used as the threshold of development.





Figures 3. Weekly spring cumulative growing degree days for Stowe and Underhill, Vermont in 2004 compared with mean 1993-2004 accumulations. 50° F is used as the threshold of development.

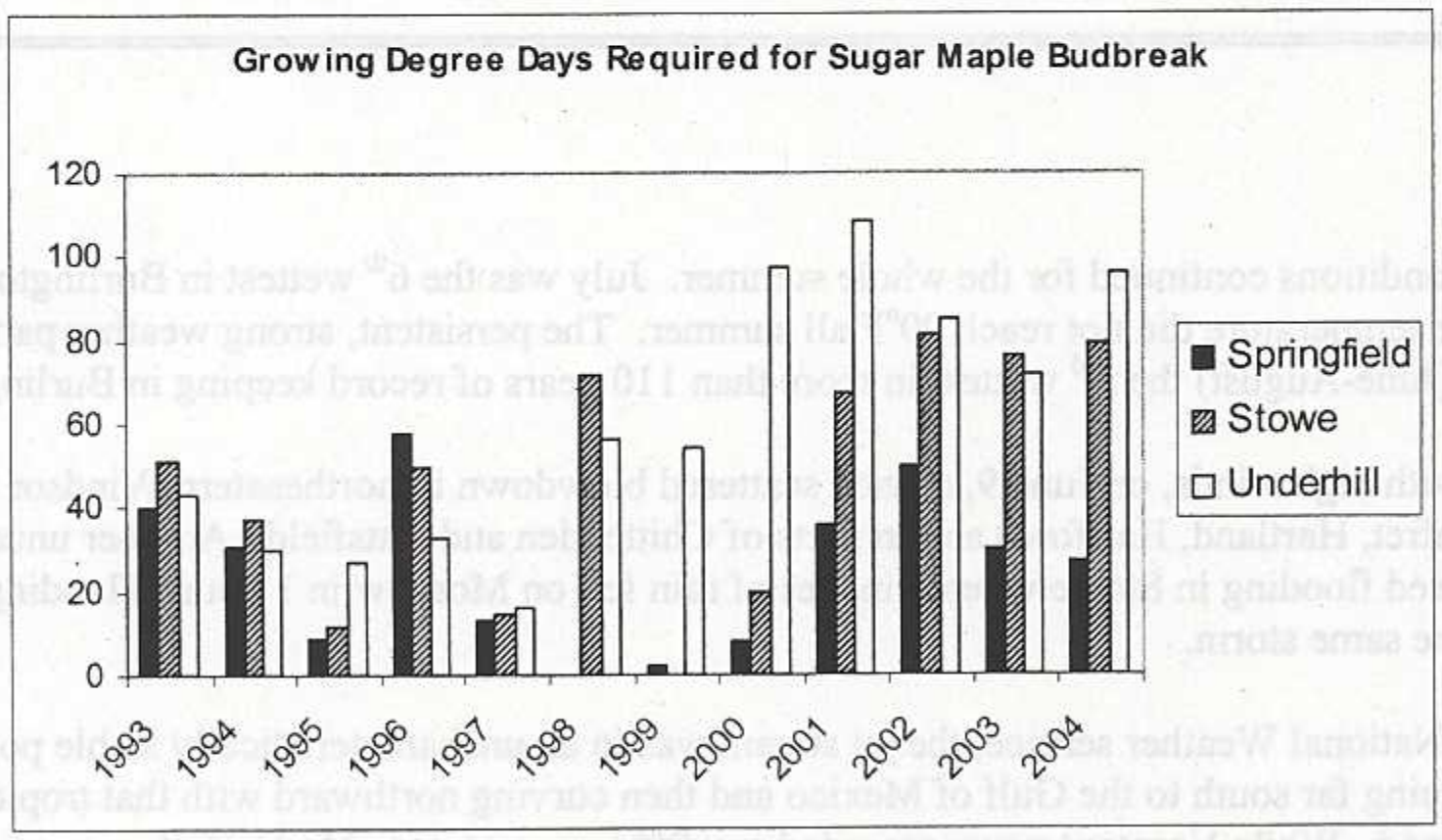


Figure 4. Growing degree days for sugar maple budbreak in Springfield, Stowe and Underhill 1993-2004.

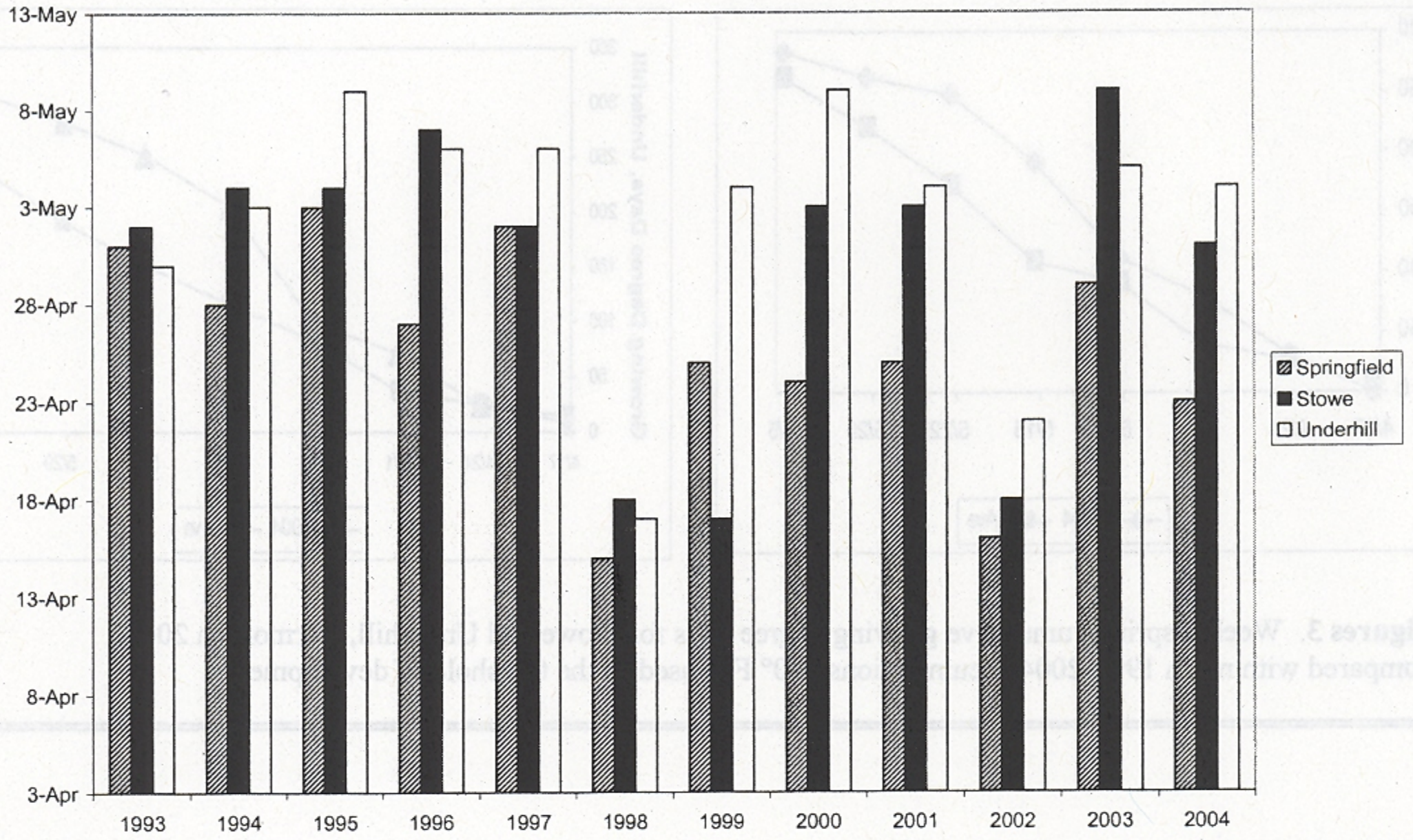


Figure 5. Dates of sugar maple budbreak in Springfield, Underhill and Stowe, Vermont, 1993-2004.

Summer

The moist, cool conditions continued for the whole summer. July was the 6th wettest in Burlington; August was the 4th wettest; the temperature did not reach 90°F all summer. The persistent, strong weather pattern made the summer of 2004 (June-August) the 3rd wettest in more than 110 years of record keeping in Burlington.

A thunderstorm with high winds, on June 9, caused scattered blowdown in northeastern Windsor County (Woodstock, Pomfret, Hartland, Hartford) and in parts of Chittenden and Pittsfield. Another unusual thunderstorm caused flooding in Stowe when 4 inches of rain fell on Moscow in 1 hour. Flooding also occurred in Canaan from the same storm.

According to the National Weather service, the jet stream was in an uncharacteristically stable position most of the summer, dropping far south to the Gulf of Mexico and then curving northward with that tropical moisture toward New England. While Vermont never recorded any 90° temperatures, Alaska did!

Table 1. 2004 First observation dates of phenological development and growing degree day accumulation from three sites in Vermont 50°F is used as the threshold of development.

Biological Indicator	Springfield	Stowe	Underhill
PLANT DEVELOPMENT			
Showing Green			
Fir, Balsam		5/1 (79)	5/7 (99)
Fir, Fraser		5/15 (191)	
Budbreak			
Apple	4/23 (0)		
Apple, MacIntosh		4/23 (31)	
Ash, White	4/24 (41)	5/7 (111)	5/1(128)
Beech			
Cherry, Black	4/18 (1)		
Elm, America	4/23 (27)		
Fir, Balsam		5/2 (95)	5/14 (190)
Hemlock	4/18 (1)	5/14 (173)	5/18 (230)
Maple, Red	4/22 (27)	4/26 (33)	
Maple, Sugar	4/23 (27)	5/1 (79)	5/4 (96)
Oak, Red	4/30 (43)		
Flowers			
Apple, Dolgo Crab		5/14 (173)	
Aspen, Quaking	4/9 (1)	4/13 (0)	
Crocus	4/6 (1)		
Dandelion	4/19 (4)		
Honeysuckle, Tartarian		5/18 (223)	
Lilac		5/16 (202)	5/20 (247)
Maple, Red	4/15 (1)	4/19 (15)	4/22 (24)
Maple, Silver	3/30 (1)		
Maple, Sugar		4/28 (33)	5/4 (96)
Plum, Canada		5/6 (105)	
Shadbush		5/5 (101)	5/7 (99)
Full Green Up	6/7 (357)		

INSECT DEVELOPMENT			
Balsam shootboring sawfly adult		4/29 (0)	
Eastern tent caterpillar (first nest)	4/22 (27)	5/2 (95)	5/3 (59)
European snout beetle		5/27 (258)	
Maple leafcutter (adults)			5/12 (146)
Maple leafcutter (first cuts)		6/30 (473)	
Pear thrips (first adults)		4/12 (0)	4/15 (19)
Pear thrips (first larvae)			5/28 (283)
OTHER OBSERVATIONS			
Spring peepers calling		4/13 (0)	

This situation did provide a very beneficial mix of sun and rain…no oppressive heat and never more than 3 or 4 days until the next good rain. Most plants responded with lush foliage, especially when compared to the recent droughty summers. Farmers did not fare so well, however. Many lost entire fields when seed rotted or washed away. Even the corn that did come up grew poorly due to the cool soil temperatures. Suburban lawns and the surrounding woodlots and forests put out luxuriant growth. The table was set for a variety of insect pests that appeared to feast on the leaves. Fall cankerworms, eastern tent caterpillars, viburnum leaf beetles and forest tent caterpillars were just a few of the most numerous (see defoliator section). Over 90,000 acres of forest was moderately to heavily defoliated in Vermont by forest tent caterpillars (mostly in Rutland and Addison counties).

The last few days of August were nothing short of spectacular for rainfall—5.66" of rain fell in about 54 hours in the Champlain Valley! Roads washed out, and corn crops were lost on low-lying fields. Lake Champlain swelled with the runoff, rising to over 98' above sea level in early September…the highest level it ever reached in that month of the year. Rain from the remnants of 3 hurricanes: Bonnie (August 13-14); Francis (September 9-10); and Ivan (September 18-19) made their way to Vermont adding to the already impressive rainfall totals (Figure 6).

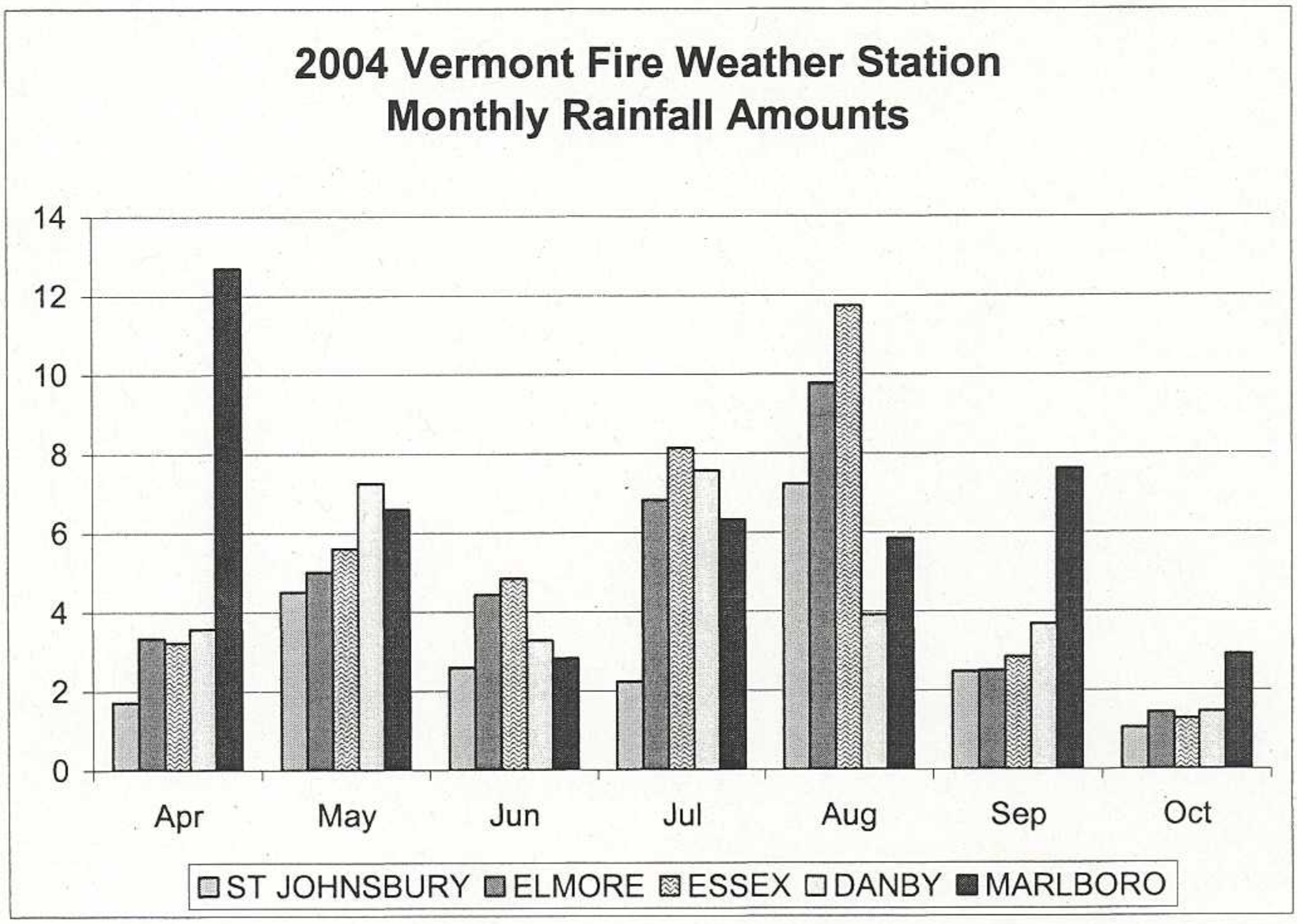


Figure 6. Monthly rainfall amounts (in inches) at Vermont fire weather observation stations through fire season, April – October 2004.

Except for the rain from the hurricanes, September arrived with a welcome break in the weather pattern. The sun's energy was waning, and that affected the jet stream. Mostly dry weather from the west and north moved over Vermont throughout September and October. Some foliage appeared to turn color a little early (especially the red maples—and not necessarily only those on water stressed sites). Apple growers boasted a good crop—the apples were big and early (7-10 days) but wild apples were not as abundant due to early season blights. Acorn and beechnut production was light as well.

There wasn't a widespread hard frost until mid-October. Mosquitoes were still bothersome in the woods well into October. Many pleasant, mild days allowed leaf peepers the opportunity to view the spectacular fall foliage. Those stands of trees that were defoliated by forest tent caterpillars were the rare exceptions to an otherwise beautiful fall.

HARDWOOD DEFOLIATORS

Birch Defoliation

Birch defoliation affected over 66,000 acres of forest (Table 2). Actual acreage was greater since some regions were surveyed in July, before the damage occurred. Miners, including the **birch leaf miner,** *Fenusa pusilla,* and the **early birch leaf edgeminer,** *Messa nana*, along with the **birch skeletonizer,** *Bucculatrix canadensisella*, and **Septoria leafspot**, *Septoria* sp., were responsible. Upper elevation paper birch trees had widespread dieback and mortality, believed to be associated with recent drought years.

Table 2. Mapped acres of damage by birch defoliation by birch leaf miners, birch skeletonizer, Septoria leafspot and other agents in Vermont in 2004.

County	Acres
Addison	2945
Bennington	
Caledonia	6728
Chittenden	6281
Essex	4937
Franklin	4326
Grand Isle	
Lamoille	14814
Orange	3881
Orleans	6157
Rutland	
Washington	15851
Windham	
Windsor	750
Total	66669

Bruce Spanworm

Bruce Spanworm, *Operophtera bruceata,* damage was observed statewide, but was mostly at light levels. Defoliation was most prominent on lower foliage and fewer than 400 acres were mapped from aerial surveys, mostly in Caledonia and Orleans Counties.

Late fall trapping in 2003 (Table 3) had indicated that Bruce spanworm populations would be as high or higher in south central Vermont than elsewhere in the state. The highest populations statewide were in Killington, in a stand where defoliation occurred in 2003. This stand was also defoliated in 2004. Other sites in the region were also moderately defoliated including locations in Plymouth and Mt. Holly. In these sites, beech and sugar maple were fed upon equally, while white ash wasn't touched.

Moth activity in the fall was noticeable in sugarbushes throughout the region, although no heavy populations were reported.

For the third year, egg-laying traps were placed in sugarbushes of concerned landowners. Counts from four locations in 2002 yielded 270 to 992 eggs per trap and averaged 570, while resulting defoliation in these sites in 2003 ranged from 5% to 27% and averaged 16 percent. In 2003, 14 traps were deployed and egg counts ranged from 0 in Greensboro to 1061 in Killington, and averaged 223. The Killington site received the most defoliation in 2004. Traps were deployed at five sites in 2004, and no eggs were found on any of the traps (Table 3).

Table 3. Number of Bruce spanworm eggs on traps deployed in late fall of 2002-2004, and percent defoliation in trap areas in 2003.

Town	Number of eggs in 2002	% defoliation in 2003	Number of eggs in 2003	Number of eggs in 2004
Sheldon	270	5	52	
Cabot	680	14	484	
Derby	339	27	18	
Derby	992	18	6	
Richford			282	
Underhill			40	0
Cabot			333	
Belvidere			367	
Greensboro			0	
Vershire			158	
Vershire			24	
Killington			1,061	0
Pittsfield			272	0
Shaftsbury			24	0
Huntington				0
Total	2,281	64	3,121	0
Average	570	16	223	0

Forest Tent Caterpillar

Forest Tent Caterpillar, *Malacosoma disstria,* defoliated over 90,000 acres in Vermont (Table 4, Figures 7). Southern Vermont was hardest hit, with about 75,000 acres defoliated, and the most damage was in western Rutland County. This is where the last outbreak began over 25 years ago, and where isolated areas of defoliation were observed in 2003.

Table 4. Mapped acres of damage by forest tent caterpillar in 2004.

County	Acres
Addison	8275
Bennington	13767
Caledonia	86
Chittenden	3491
Essex	
Franklin	2164
Grand Isle	
Lamoille	210
Orange	288
Orleans	197
Rutland	39789
Washington	754
Windham	8122
Windsor	13413
Statewide	**90556**

Caterpillars became noticeable in the spring, with dramatic numbers hanging on threads from host trees in mid-May. By early June many sugar maples, white ash, red oak, and basswood were heavily defoliated. Gypsy moth caterpillars were commonly observed with forest tent caterpillars in defoliated stands, although at lighter levels. Sugar maple stands with lower basal areas received heavier defoliation than more densely stocked stands. Defoliation in mixed beech/sugar maple stands was lighter than in pure sugar maple stands.

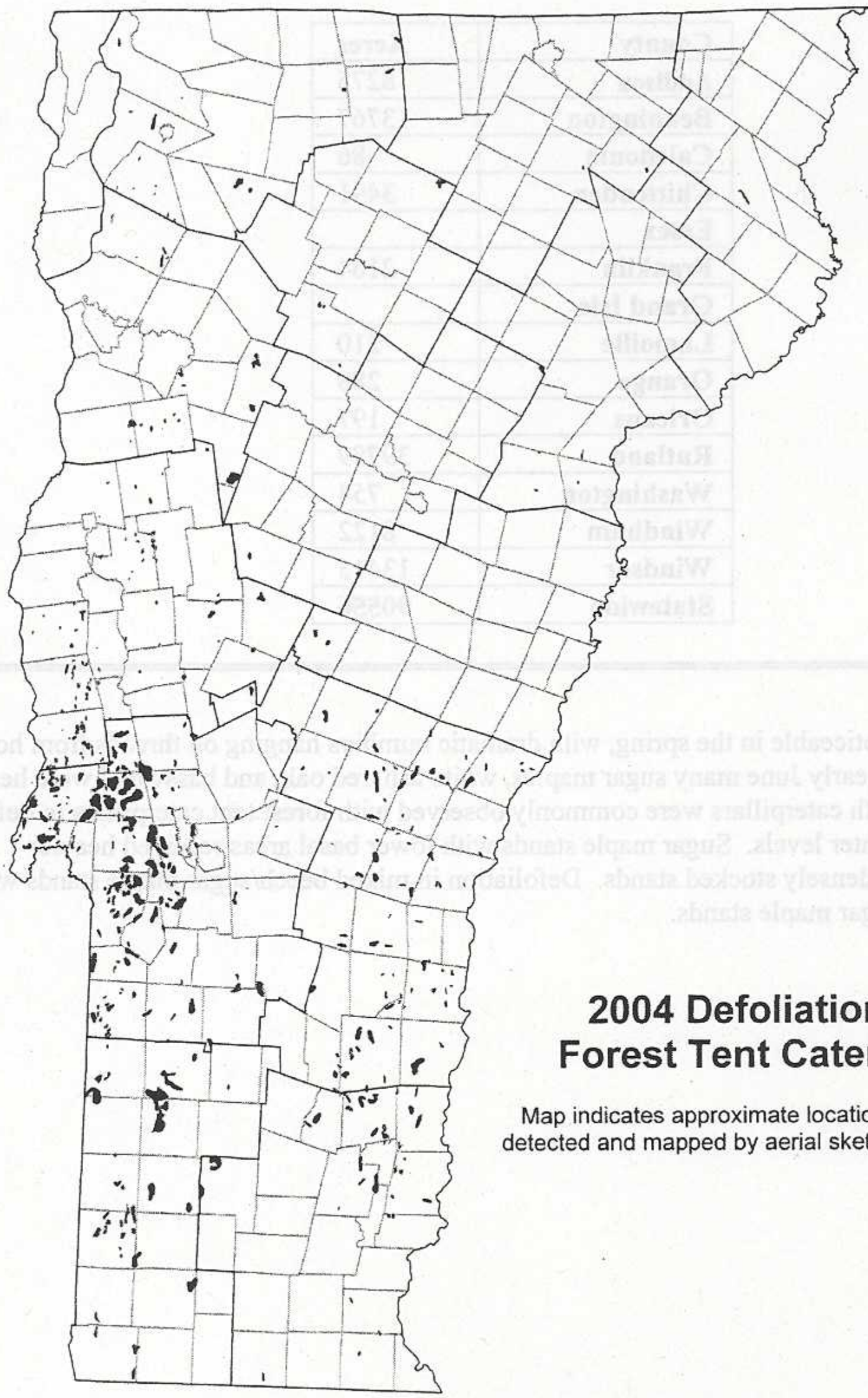


Figure 7. 2004 defoliation by forest tent caterpillar in Vermont.

By late June, trees that were defoliated had begun to refoliate, and the new refoliation was apparently consumed by caterpillars. One defoliated sugarbush in Ira was observed to have partially greened up, and was bare again by early July.

In early July, pupation was well underway in defoliated areas. However landowners reported that caterpillar feeding was observed for an additional four weeks. Trees that were green in early July were defoliated by the end of the caterpillar feeding period. We believe that cool summer temperatures prolonged egg hatch and/or caterpillar feeding, extending the time period over which defoliation occurred, and leading to refoliation failure in most defoliated stands.

In October, four heavily defoliated stands that remained bare, and one moderately defoliated stand, were examined by cutting down selected trees. Upper crowns in heavily defoliated stands had good shoot growth early in the season, with up to two additional short lengths of terminal growth, as indicated by the presence of bud scale scars. Some of these short shoots had stubs of apparently chewed petioles. Some trees had scattered clusters of small, deformed leaves in the upper crown. These trees still had not dropped their leaves in late November. In fact, casual observation suggests that they had expanded somewhat by that time. Anthracnose was not observed to be a factor in refoliation failure.

Lower crowns were most likely to have some partially chewed leaves from the first (May) flush, and no evidence of refoliation. Lecanium scale was heavy in many sugarbushes on lower crown twigs.

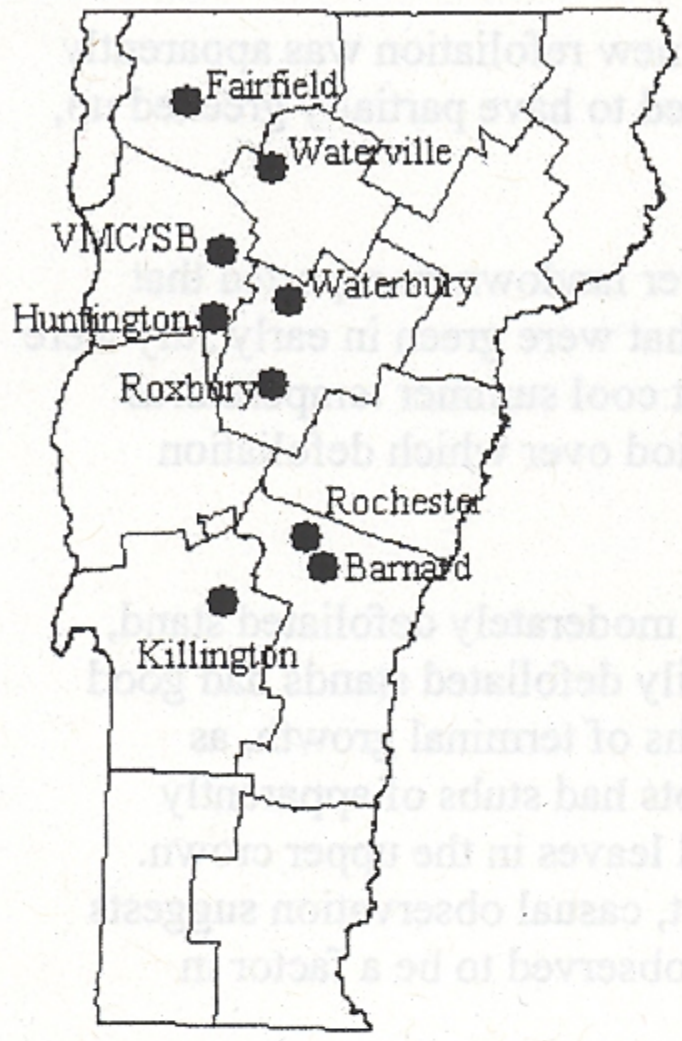
Starch reserves in defoliated sugarbushes were rated as part of a Forest Health Evaluation Monitoring project, funded in part by the US Forest Service. By late November, looking at data from 30 trees in three heavily defoliated sugarbushes, all of the non-refoliated trees growing on good sites were high or medium in starch. The only trees with low or depleted starch ratings were trees that had green refoliation present on the trees in November or defoliated, bare trees growing on shallow soils. Apparently trees were able to put away adequate food reserves, even though they were bare from mid-June on, as long as they didn't spend a lot of energy trying to grow a fresh batch of leaves, and they didn't have major site limitations.

Because many of the defoliated stands are in the more calcareous Taconic range and Waits River formation, most of the heavy damage occurred on sites with good cation availability. This is expected to help in tree recovery. However, bud mortality is expected in shoots that refoliated late in the season.

There is evidence that populations may be collapsing in some areas. Larval mortality and fungus-coated cadavers were observed in some stands being defoliated for the second year in a row. Pupal parasitism was common, with up to 50% parasitism in one heavily defoliated sugarbush. Moths and egg masses were small in many defoliated stands, and egg masses were often incompletely formed.

Egg sampling is being done in sugarbushes, and other areas of concern, to determine if they are likely to be defoliated in 2005. Preparations are being made for foliage protection in sugarbushes where defoliation is predicted.

Moth counts in southern Vermont traps increased from 2003 (Figure 8-9). These traps are all placed in the north and central part of the state, much of which did not receive significant defoliation in 2004. Damage may be more noticeable in the Green Mountain range in 2005.



Average # of moths caught/trap

	2002	2003	2004
Barnard	4.6	12.3	23.0
Fairfield	----	1.3	1.7
Huntington	9.2	6.7	5.0
Huntington (NAMP 027)	6.0	6.7	10.0
Killington	6.8	9.7	20.0
Rochester (Bethel)	5.9	4.7	9.0
Roxbury	16.0	14.7	13.3
SB 2200	3.8	11.7	18.3
VMC 1400	3.6	3.0	0.3
VMC 2200	3.0	7.0	6.3
VMC 3800	1.0	2.7	10.3
Waterbury	2.0	0.7	2.0
Waterville	0.0	1.3	1.3
Average	**5.2**	**6.9**	**10.0**

Figure 8. Average number of forest tent caterpillar moths caught in pheromone traps, 2002-2004. There were 4-5 traps per location in 2002 and 3 traps per location in 2003-2004.

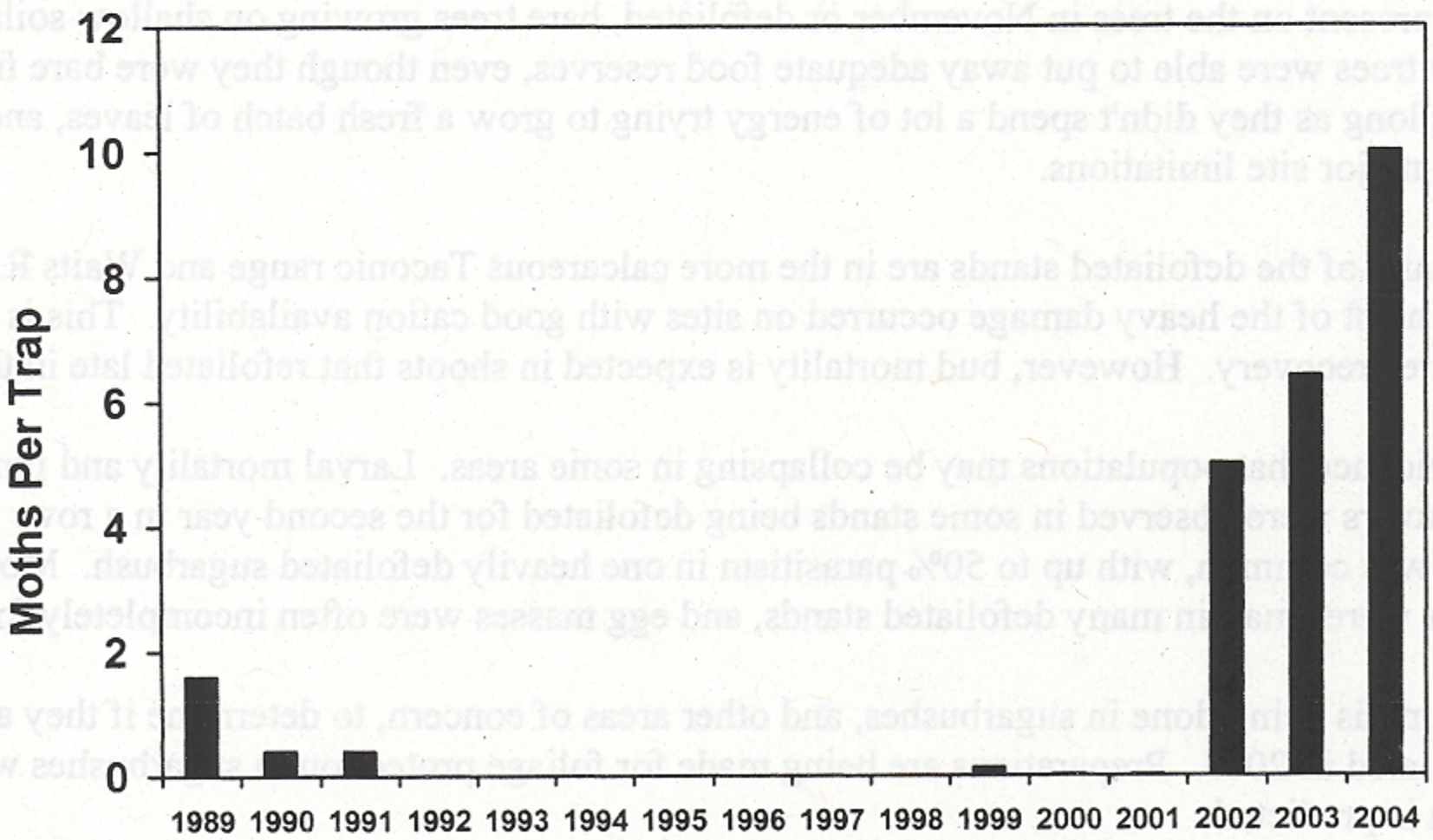
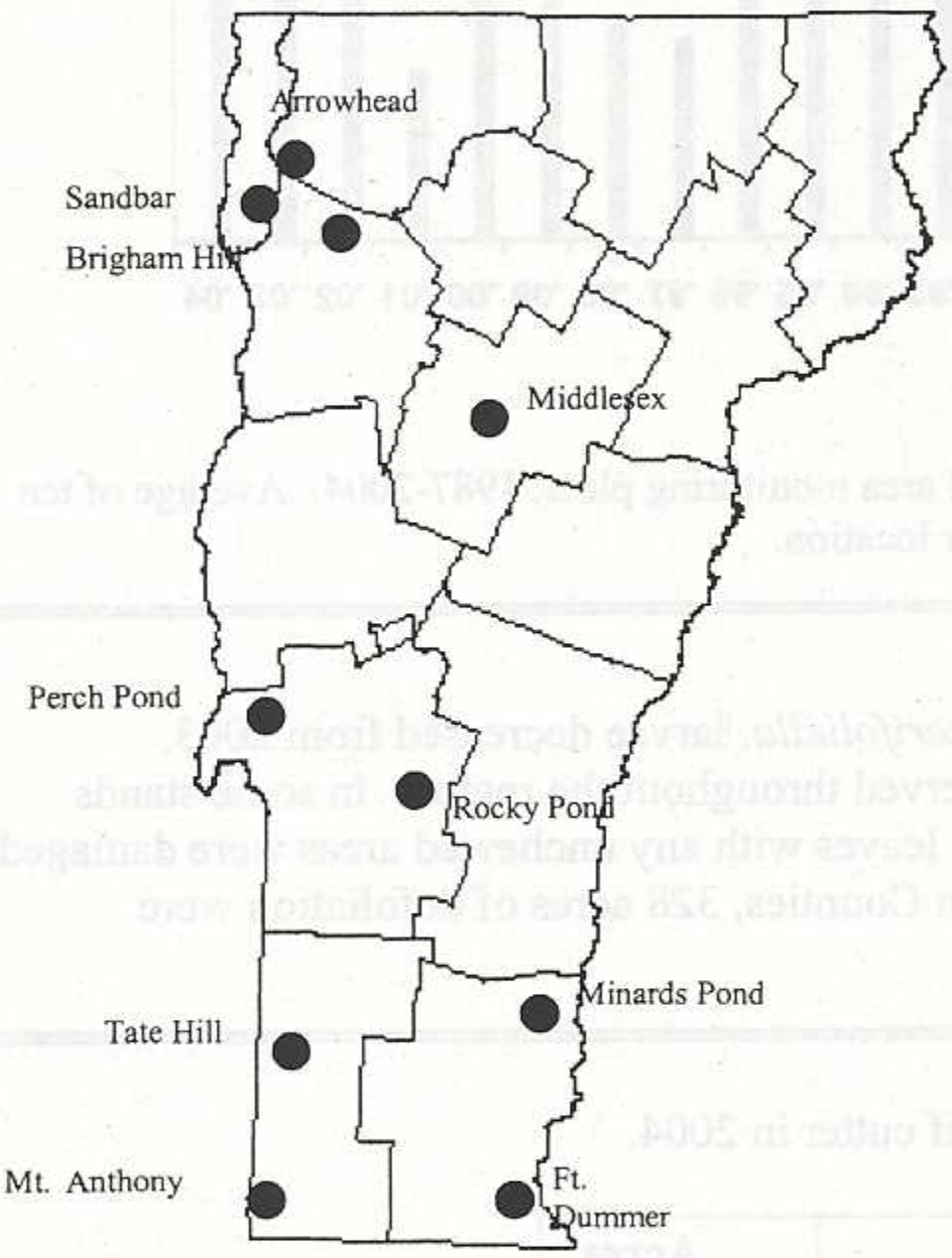


Figure 9. Average number of forest tent caterpillar moths caught in pheromone traps 1989-2004. Five multi-pher traps per site baited with RPC 2-component lures through 2001. PheroTech lures were used in 2002-2004. Three traps per site in 2003-2004.

Gypsy Moth

Gypsy Moth, *Lymantria dispar*, larvae were commonly observed, and were sometimes numerous. Where they were associated with significant defoliation, forest tent caterpillars or satin moth larvae were also present. Gypsy moth larval development was slower than normal. They were only in the 2nd or 3rd instar by the 2nd week of June. Fungus-infected caterpillars were observed in Putney.

Egg masses in focal area monitoring plots and control plots increased from 2003 (Figures 10-11). Scattered defoliation is expected in 2005.



# of Gypsy Moth Egg Masses per 1/25th Acre Plot:

	2003	2004
Arrowhead	1.5	2.5
Brigham Hill	2.5	2.0
Ft. Dummer	0	-----
Middlesex	0	2.0
Minards Pond	0.5	2.0
Mount Anthony	1.5	0
Perch Pond	0	0
Rocky Pond	0	0
Sandbar	3.0	1.5
Tate Hill	0	30.0
Average	**1.0**	**4.4**

Figure 10. Gypsy moth egg mass counts from focal area monitoring plots, 2004. Average of two 15 meter diameter burlap-banded plots per location.

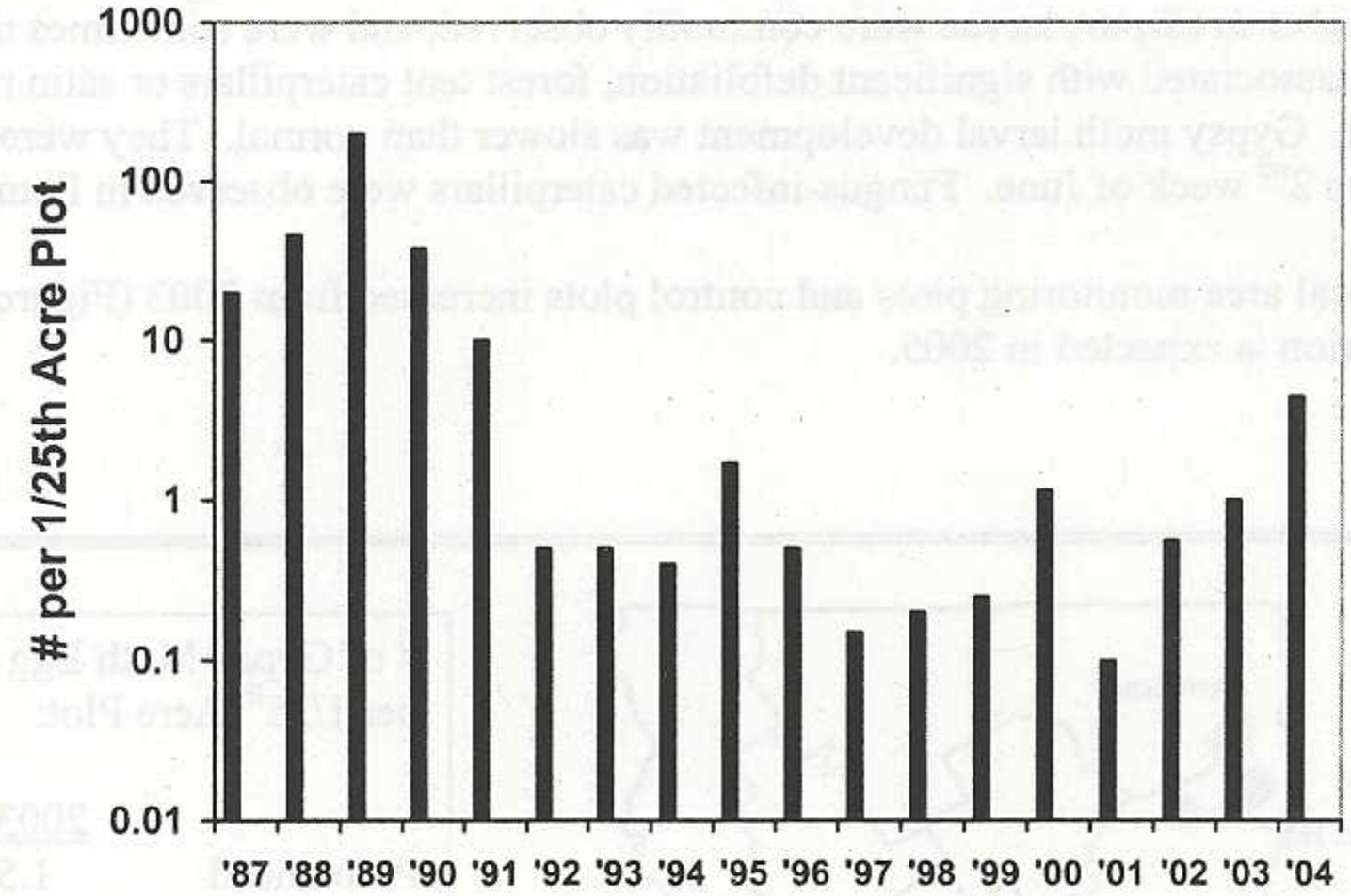


Figure 11. Gypsy moth egg mass counts from focal area monitoring plots, 1987-2004. Average of ten locations, two 15m diameter burlap-banded plots per location.

Maple Leaf Cutter

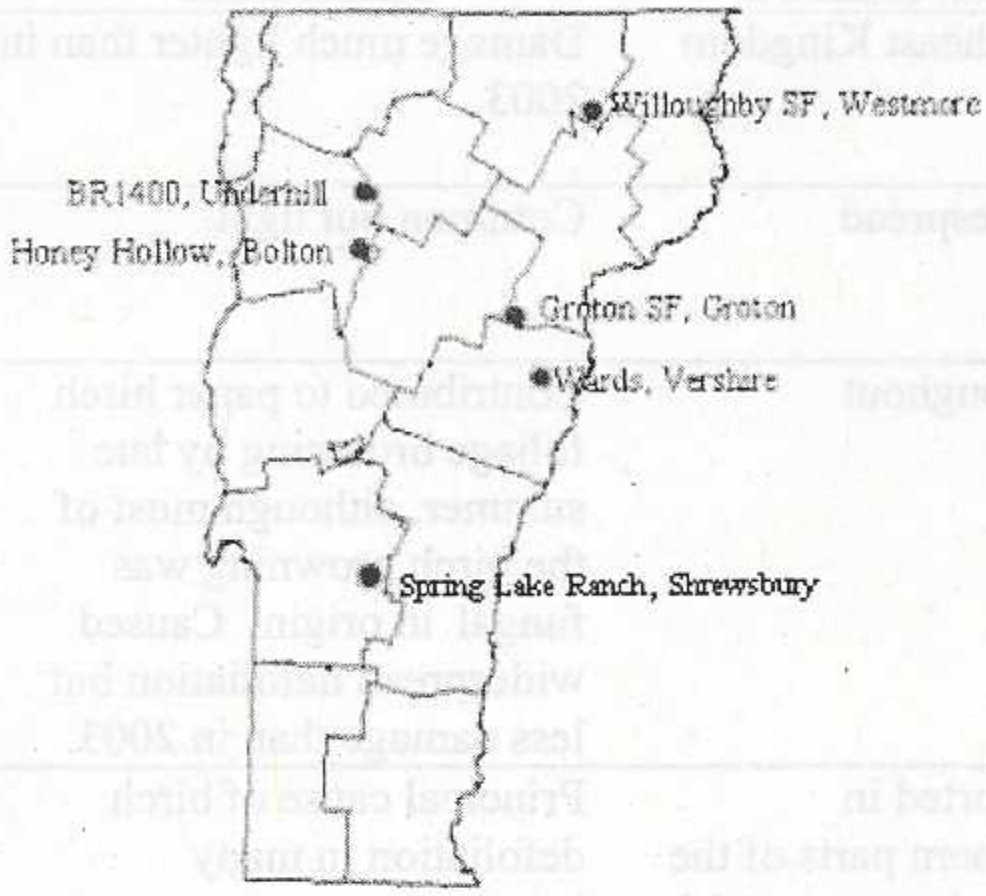
Damage by maple leaf cutter, *Paraclemensia acerifoliella*, larvae decreased from 2003. Noticeable but mostly light defoliation was observed throughout the region. In some stands defoliated by forest tent caterpillar, sugar maple leaves with any unchewed areas were damaged by maple leaf cutter. In Addison and Chittenden Counties, 328 acres of defoliation were mapped (Table 5).

Table 5. Mapped acres of damage by maple leaf cutter in 2004.

County	Acres
Addison	120
Chittenden	207
Total	328

Saddled Prominent

Defoliation by the saddled prominent, *Heterocampa guttivata*, was not reported, and no larvae were observed. However, populations may be increasing, as average moth catch increased from 0.1 in 2003 to 0.9 in 2004 and catch at Spring Lake in Shrewsbury increased from none in 2003, to 2.0 per trap in 2004 (Figures 12-13). Saddled prominent populations often increase simultaneously with other defoliating caterpillars.



Average # of moths caught per trap	
	2004
BR1400	0
Groton SF	2.3
Honey Hollow	0.3
Spring Lake Ranch	2.0
Wards	1.0
Willoughby SF	0
Average	0.9

Figure 12. Average number of saddled prominent moths caught in pheromone traps in Vermont in 2004.

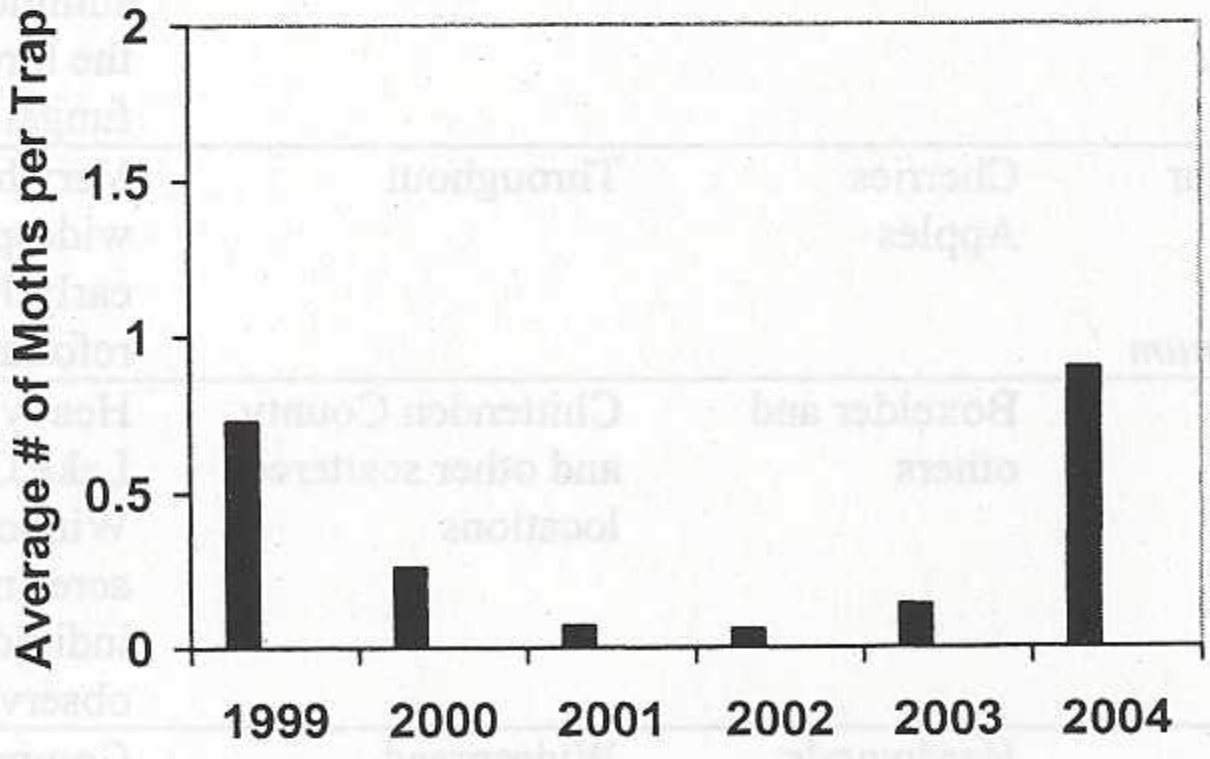


Figure 13. Average number of saddled prominent moths caught in pheromone traps 1999-2004. Average of 3-4 multi-pher traps per location, and 5-6 locations per year.

OTHER HARDWOOD DEFOLIATORS

INSECT	HOST(S)	LOCALITY	REMARKS
Alder Flea Beetle *Altica ambiens*	Alder	Northeast Kingdom	Damage much lighter than in 2003.
Birch Leaf Folder *Ancylis discigerana*	Yellow birch	Widespread	Common but light.
Birch Leaf Miner *Fenusa pusilla*	Paper birch	Throughout	Contributed to paper birch foliage browning by late summer, although most of the birch browning was fungal in origin. Caused widespread defoliation but less damage than in 2003.
Birch Skeletonizer *Bucculatrix canadensisella*	Paper birch Yellow birch	Reported in northern parts of the state, but not notable in southern VT	Principal cause of birch defoliation in many locations.
Bruce Spanworm *Operophtera bruceata*			See narrative.
Cherry Scallop Shell Moth *Hydria prunivorata*	Cherry	Widely scattered	Occasional nests on saplings.
Early Birch Leaf Edgeminer *Messa nana*	Paper birch	Throughout	Contributed to paper birch foliage browning by late summer, although most of the birch browning was fungal in origin.
Eastern Tent Caterpillar *Melacosoma americanum*	Cherries Apples	Throughout	Very heavy levels causing widespread defoliation of by early June. Defoliated trees refoliated successfully.
Fall Cankerworm *Alsophila pometaria*	Boxelder and others	Chittenden County and other scattered locations	Heavy defoliation in the Lake Champlain and Winooski River Valleys; 62 acres mapped. Elsewhere, individual larvae commonly observed.
Fall Webworm *Hyphantria cunea*	Hardwoods	Widespread	Common at low levels, similar or slightly down from 2002 and 2003.
Forest Tent Caterpillar *Malacosoma disstria*			See narrative.

INSECT	HOST(S)	LOCALITY	REMARKS
Green Fruitworm Probably *Lithophane antennata*	Hardwoods	Southern Vermont	Individual larvae frequently observed on hardwoods in May.
Gypsy Moth *Lymantria dispar*			See narrative.
Half Winged Geometer *Phigalia titea*	Boxelder	Champlain Valley and other scattered locations	Some larvae associated with fall cankerworm defoliation.
Japanese Beetle *Popillia japonica*	Many	Throughout	Population levels similar to 2003 or down somewhat. No significant damage reported.
Large Aspen Tortrix *Choristoneura conflictana*	Quaking aspen	Rockingham	Associated with defoliation in Rockingham area.
Locust Leaf Miner *Odontata dorsalis*	Black locust	Widely scattered	Common where locust occurs but damage sharply reduced from 2003, with only moderate defoliation observed in stands with heavy recent damage. However, mortality continues in some of these stands.
Maple Leaf Cutter *Paraclemensia acerifoliella*			See narrative.
Maple Leafblotch Miner *Cameraria aceriella*	Sugar maple	Lamoille County	Light damage; down from 2003.
Maple Trumpet Skeletonizer *Epinotia aceriella*	Sugar maple	Widely scattered	Light damage. Only occasionally observed this ear.
Maple Webworm *Tetralopha asperatella*	Sugar maple	Widespread	Very noticeable late in the year. Commonly observed causing heavy damage to remaining leaves in stands already defoliated by forest tent caterpillar. Particularly common in leaves occupied by tent caterpillar pupae. Increasing. Many adult moths seen in Groton.

INSECT	HOST(S)	LOCALITY	REMARKS
Mountain Ash Sawfly *Pristiphora geniculata*	Mountain ash	St. Johnsbury	Ornamentals.
Oak Leaf Tier *Croesia semipurpurana*	Red Oak	Chittenden County	Decreasing.
Oak Skeletonizer *Bucculatrix ainsliella*	Red Oak	Scattered	Occasionally observed causing only light damage.
Pear Slug Sawfly *Caliroa cerasi*	Shadbush Paper birch	Stowe Jeffersonville	Ornamentals.
Rose Chafer *Macrodactylus subspinosus*	Many	Widespread	Ornamentals.
Saddled Prominent *Heterocampa guttivata*			See narrative.
Satin Moth *Leucoma salicis*	Poplars	Widely scattered	Thought to be decreasing in many locations, however I ncreasing in the Champlain Valley. In addition, caused heavy defoliation of small stands of quaking aspen in Rockingham and Springfield. Cocoons of the parasite, *Cotesia melanoscelus*, were collected by the Agricultural Research Service from one defoliated site.
Viburnum Leaf Beetle *Pyrrhalta viburni*	Viburnum	Statewide	Moderate to heavy damage n ornamental and ative viburnum.
Willow Flea Beetle *Rhychaenus rufipes*	Black willow	Champlain Valley	Common at stable levels.

SOFTWOOD DEFOLIATORS

INSECT	HOST(S)	LOCALITY	REMARKS
Arborvitae Leaf Miner *Argyresthia thuiella*	Northern white cedar	Widespread	Increase in damage seen everywhere, but especially in Washington County, where 1,009 acres were mapped. An additional 44 acres were mapped in Addison County. Excessively brown trees looked much greener by the end of the growing season.
Green Hemlock Needle Miner *Coleotechnites apicitripunctella*	Hemlock	Southern Vermont	Commonly observed in the spring.
Introduced Pine Sawfly *Diprion similis*	White pine	Springfield	Noticeable larval activity in mature stand in late May.
Larch Casebearer *Coleophora laricella*	Larch	Scattered	Damage remains very low.
Red-marked Caterpillar *Feralia jocosa*	Hemlock	Norwich	Single larva observed.
Spruce Bud Moth *Zeiraphera canadensis*	Blue spruce	Lamoille County	Light damage.
Spruce Budworm *Choristoneura fumiferana*	Balsam fir White spruce	Widespread	Populations remain low, with no visible defoliation.
Yellow-Headed Spruce Sawfly *Pikonema alaskensis*	Blue spruce White spruce	Orleans, Caledonia and Lamoille Counties	Heavy damage to ornamentals. Many homeowner calls.

SAPSUCKING INSECTS, MIDGES AND MITES

Balsam Woolly Adelgid

Balsam Woolly Adelgid, *Adelges piceae,* populations collapsed due to cold winter temperatures in early 2004. Although no live adelgids were seen in previously infested stands, mortality became increasingly noticeable in these stands. Over 10,000 acres with balsam fir mortality were mapped, compared to only 4,334 acres mapped in 2003 (Table 6, Figure 14).

Mortality was observed even in stands where adelgid populations, indicated by white wool, were light in 2003. We know that high numbers of adelgids are not necessary to cause fir mortality. Nonetheless, it is possible that the insect was not detected in the first year(s) of the infestation. Other stressors, like drought and root rot, are also likely to be playing a role.

Table 6. Mapped acres of damage by balsam woolly adelgids in 2004.

County	Acres
Addison	1,572
Bennington	52
Rutland	5,150
Windham	1,386
Windsor	2,695
Total	**10,854**

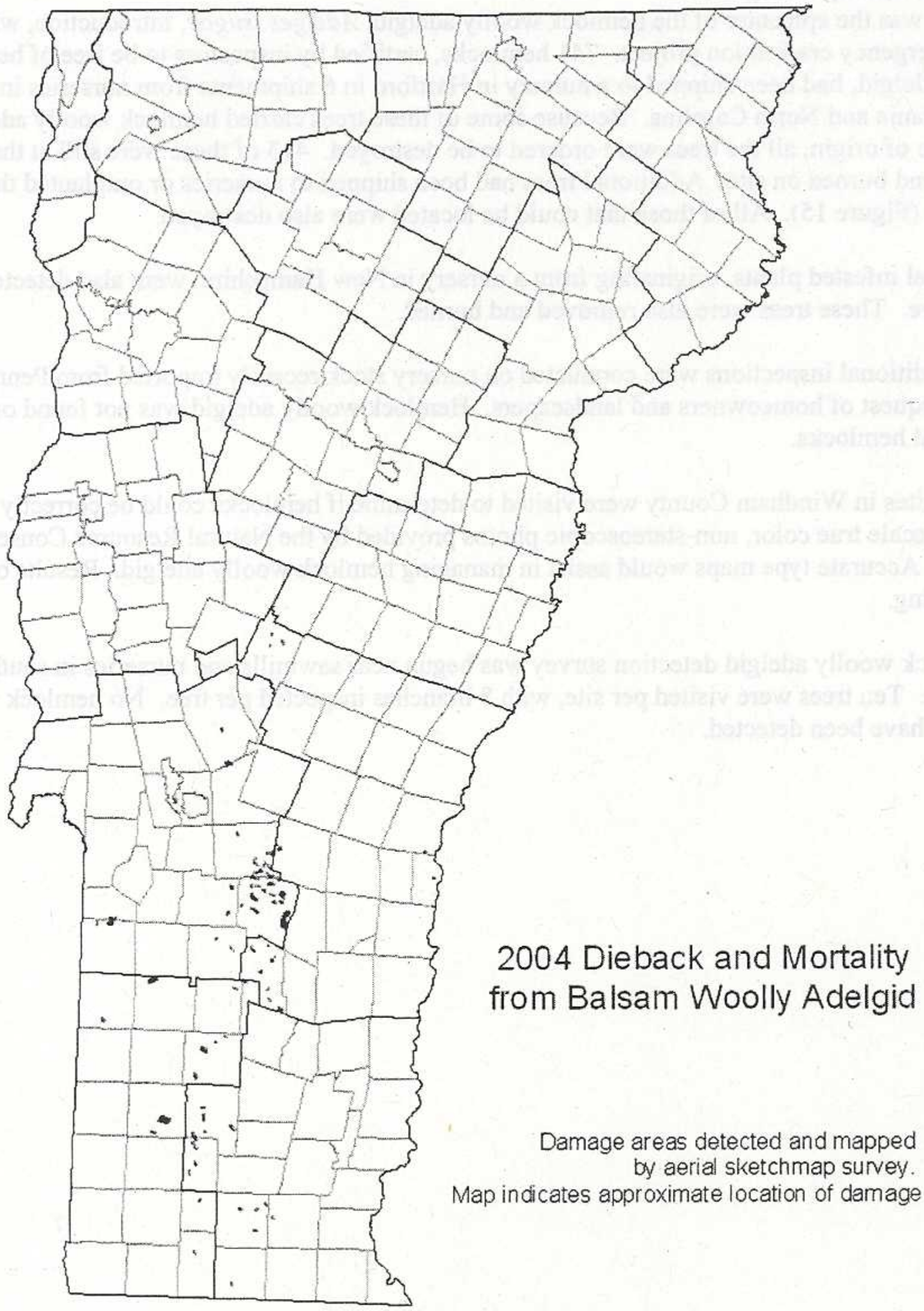


Figure 74. 2004 damage by balsam woolly adelgid. Mapped area is 10,802 acres.

Hemlock Woolly Adelgid

Hartford was the epicenter of the hemlock woolly adelgid, *Adelges tsugae*, introduction, which resulted in an emergency eradication project. 741 hemlocks, certified by inspectors to be free of hemlock woolly adelgid, had been shipped to a nursery in Hartford in 6 shipments from nurseries in Pennsylvania and North Carolina. Because some of these trees carried hemlock woolly adelgid from their state of origin, all the trees were ordered to be destroyed. 413 of these were still at the Hartford nursery and burned on site. Additional trees had been shipped to nurseries or outplanted throughout Vermont (Figure 15). All of those that could be located were also destroyed.

Additional infested plants, originating from a nursery in New Hampshire, were also detected in Chester and Stowe. These trees were also removed and burned.

Many additional inspections were conducted on nursery stock recently imported from Pennsylvania and by request of homeowners and landscapers. Hemlock woolly adelgid was not found on any additional hemlocks.

Several sites in Windham County were visited to determine if hemlocks could be correctly identified on large-scale true color, non-stereoscopic photos provided by the Natural Resource Conservation Service. Accurate type maps would assist in managing hemlock woolly adelgid. Results of the visits are pending.

A hemlock woolly adelgid detection survey was begun near sawmills and nurseries in southern Vermont. Ten trees were visited per site, with 8 branches inspected per tree. No hemlock woolly adelgids have been detected.

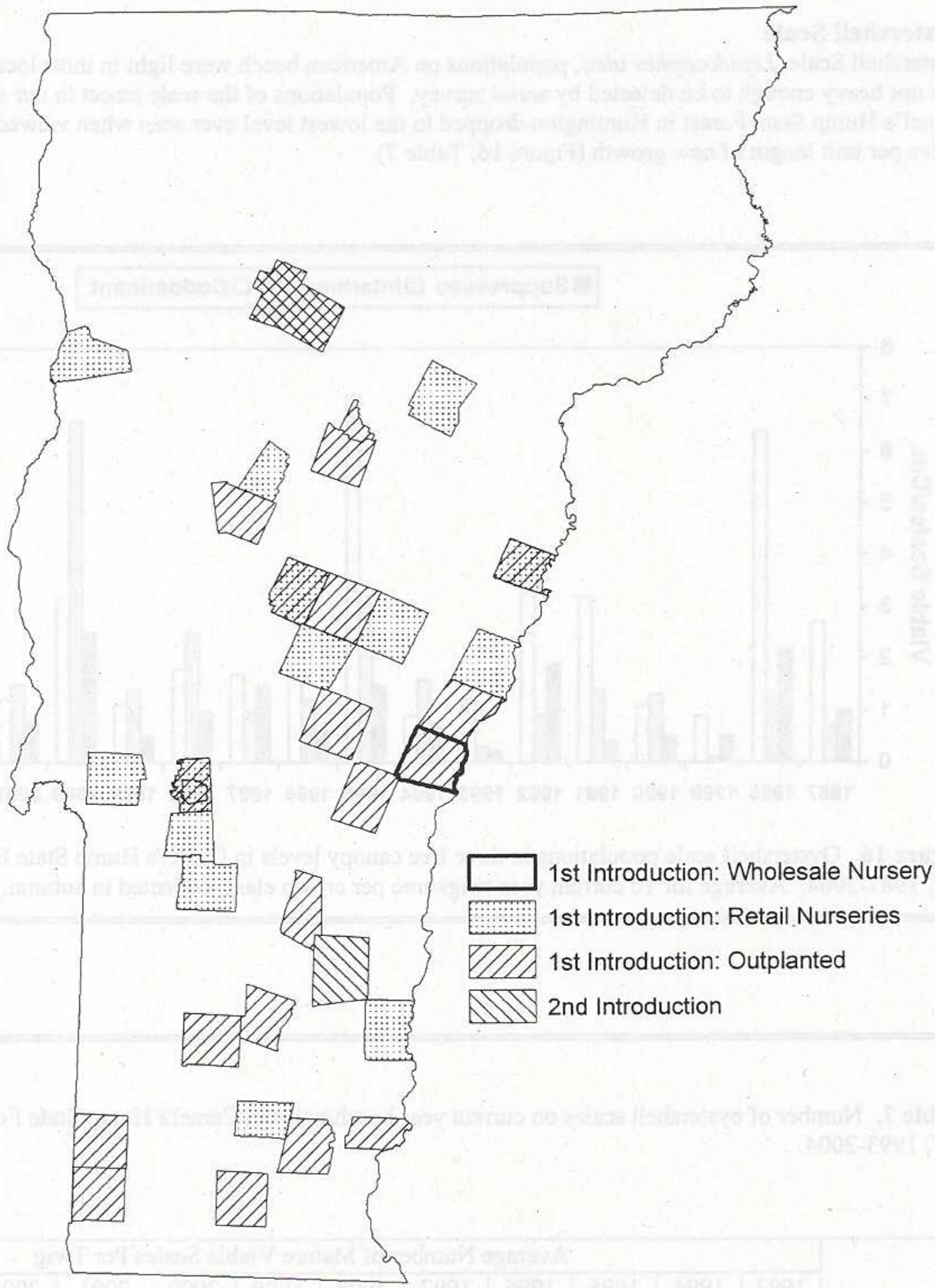


Figure 15. Locations where trees infested with hemlock woolly adelgid were introduced into Vermont in 2004.

Oystershell Scale

Oystershell Scale, *Lepidosaphes ulmi*, populations on American beech were light in most locations, and dieback was not heavy enough to be detected by aerial survey. Populations of the scale insect in our survey plot in Camel's Hump State Forest in Huntington dropped to the lowest level ever seen when viewed as number of scales per unit length of new growth (Figure 16, Table 7).

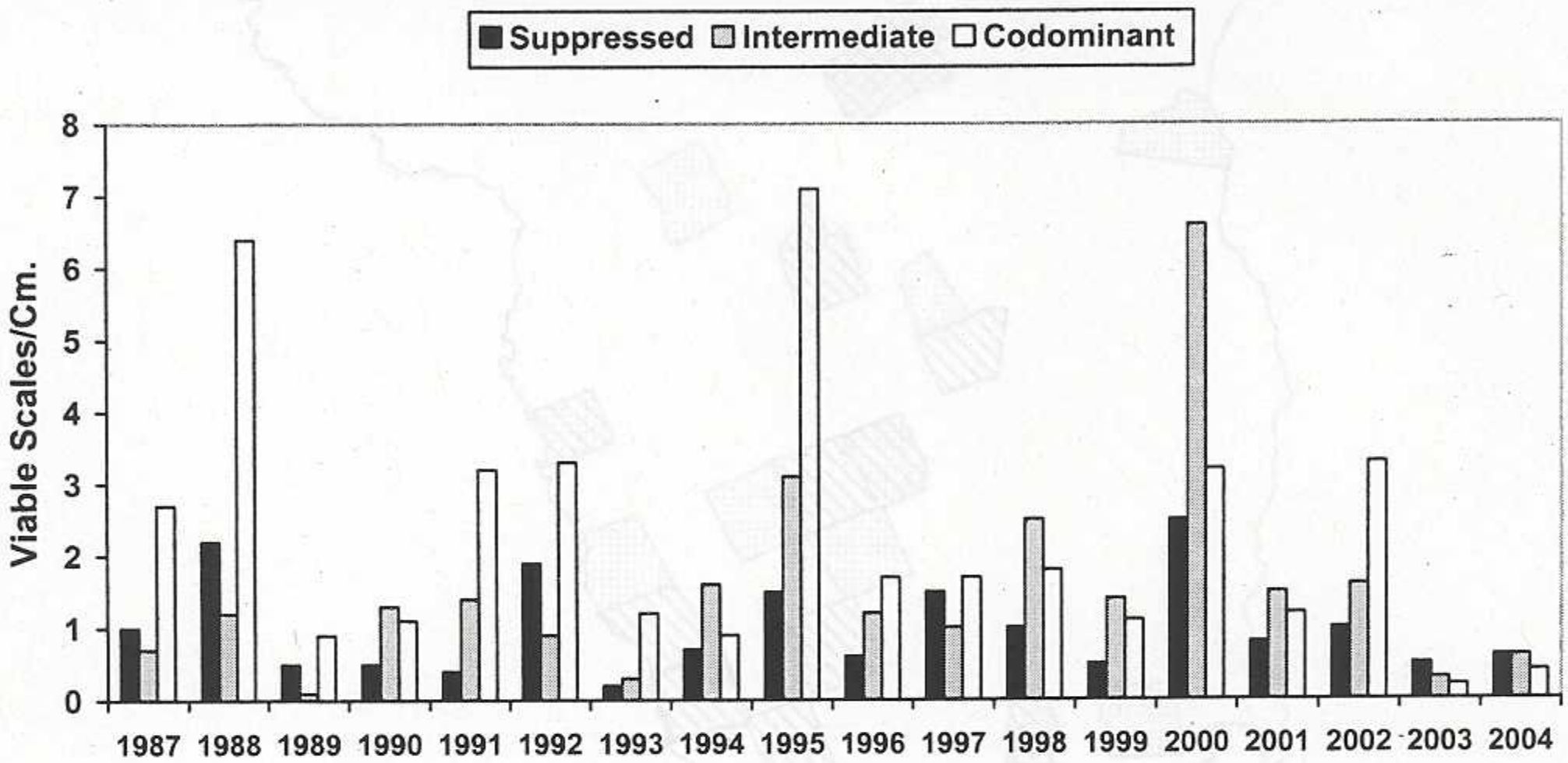


Figure 16. Oystershell scale populations in three tree canopy levels in Camel's Hump State Forest, Huntington VT, 1987-2004. Average for 10 current year twigs/tree per crown class, collected in autumn.

Table 7. Number of oystershell scales on current year beech twigs in Camel's Hump State Forest, Huntington VT, 1993-2004.

	Average Number of Mature Viable Scales Per Twig											
	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Suppressed	1.2	2.1	9.0	0.6	2.1	4.0	0.7	2.9	4.2	11.0	2.1	1.4
Intermediate	1.4	8.4	16.8	1.2	2.6	3.3	2.8	12.1	10.4	14.7	1.2	3.4
Codominant	4.8	3.4	11.3	0.2	4.5	4.2	2.7	7.3	1.4	4.0	0.7	2.0

Pear Thrips

Overwintering populations of pear thrips, ***Taeniothrips inconsequens,*** had increased going into the season, especially in central and southern regions of the State. Soil samples collected in the fall of 2003 indicated that thrips populations were higher than the previous year in 39 of the 43 sugarbushes sampled, with a mean number of 1.23 thrips per sample (Figure 17). Yellow sticky traps that were used to evaluate emerging spring populations at Proctor Maple Research Center in Underhill showed an average of 10.7 thrips per trap over the 9-week survey period (Figure 18), with the majority of thrips emerging during the week of April 15-22. During that week, 62% of the thrips taken on sticky traps emerged. However, spring leaf development was very rapid in most of the state and only very light, occasional damage to regeneration was observed. There was some noticeable, heavier injury to high elevation sugar maple. Overwintering thrips populations for 2004-2005 were higher in 9 of the 41 sugarbushes sampled. However, the mean number of thrips per sample (0.68) was less than last year's overwintering average of 1.23 thrips per sample.

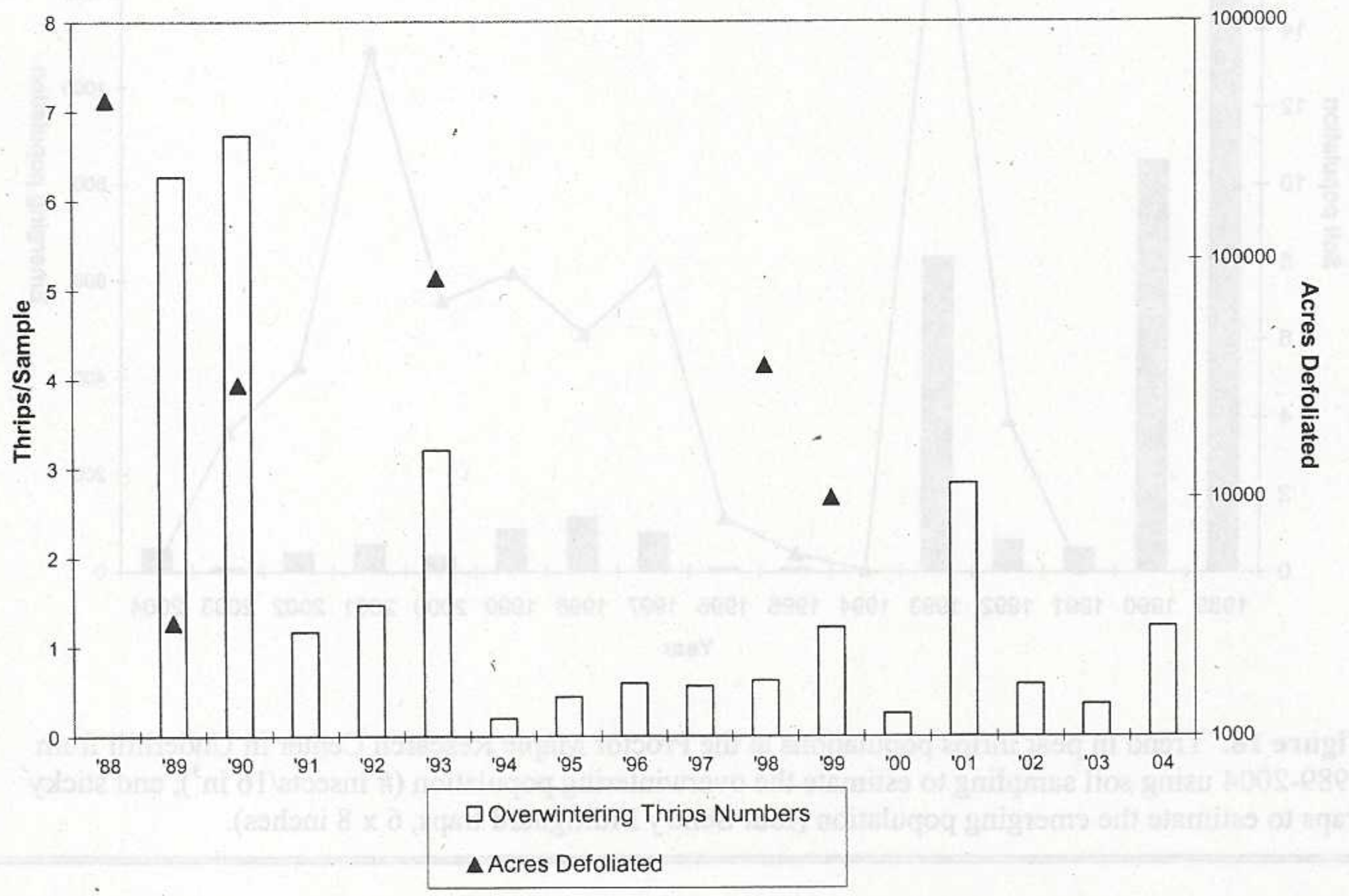


Figure 17. Average counts of overwintering pear thrips in soil samples (# insects/16 in^3), compared to acres of thrips damage mapped statewide the following summer. Overwintering thrips numbers determined by extraction in 1989-93, and by forced emergence in 1994-2004. 43 sites were sampled to determine populations in the winter of 2004-2005.

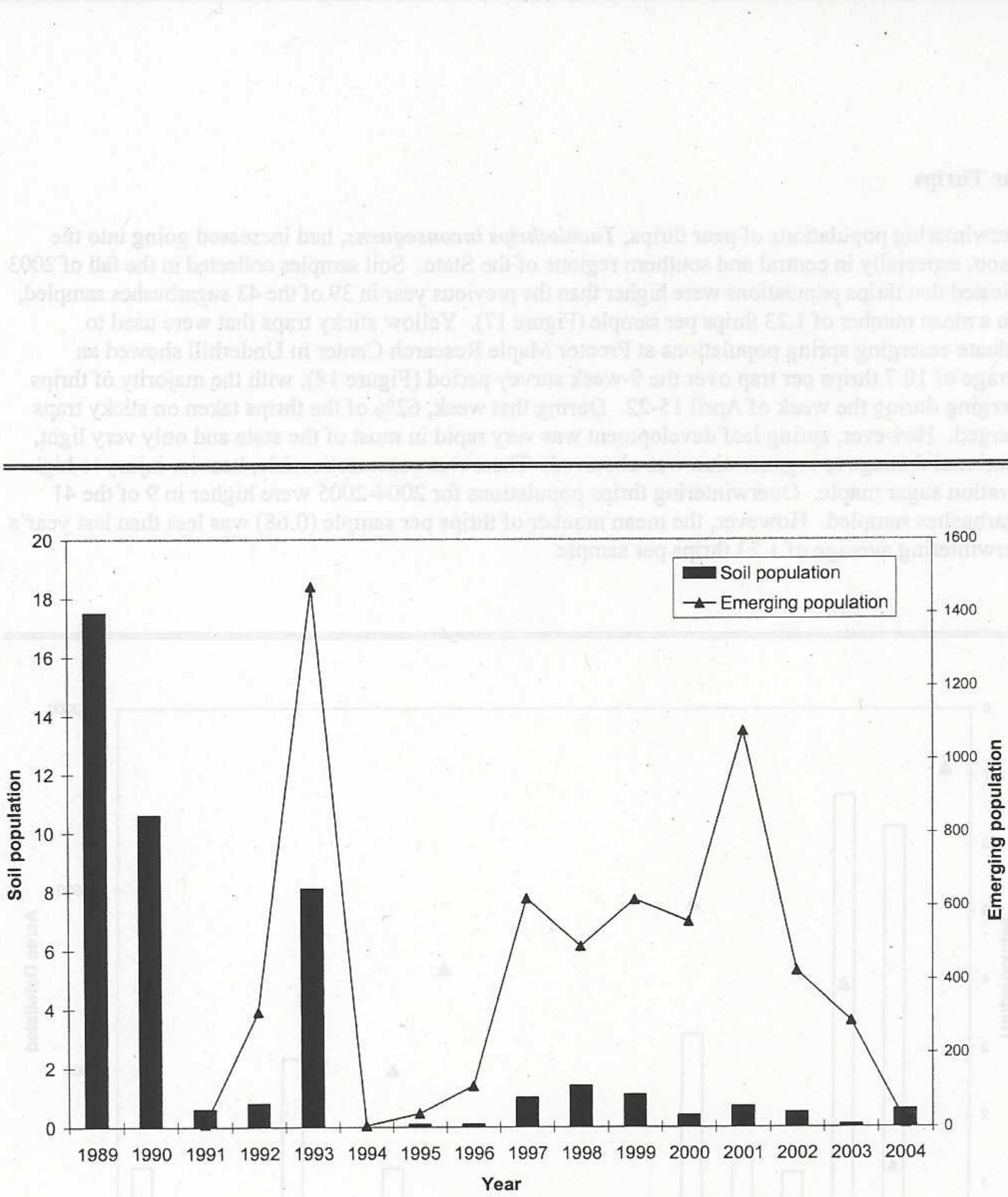


Figure 18. Trend in pear thrips populations at the Proctor Maple Research Center in Underhill from 1989-2004 using soil sampling to estimate the overwintering population (# insects/16 in^3), and sticky traps to estimate the emerging population (four Sentry Multiguard traps, 6 x 8 inches).

OTHER SAPSUCKING INSECTS, MIDGES, AND MITES

INSECT	HOST(S)	LOCALITY	REMARKS
Balsam Gall Midge *Paradiplosis tumifex*	Balsam fir	Cabot	Heavy damage in one Christmas tree plantation. Populations elsewhere extremely low.
Balsam Twig Aphid *Mindarus abietinus*	Balsam fir Fraser fir	Throughout	Only light damage for second consecutive year. Lighter than previous year. Growers who applied pesticides achieved good control.
Balsam Woolly Adelgid *Adelges picea*			See narrative.
Beech Scale *Cryptococcus fagisuga*			See beech bark disease.
Cooley Spruce Gall Aphid *Adelges cooley*	Blue spruce Douglas fir	Scattered	Populations down. Spruce galls difficult to find this year but some insects seen on Douglas fir.
Cottony Maple Scale *Pulvinaria innumerabilis*	Sugar maple	Montpelier	Common on trees at state capitol.
Eastern Spruce Gall Adelgid *Adelges abietis*	White spruce	Throughout	Remains common on ornamentals and Christmas trees at mostly light levels.
Erineum Gall Mite *Aceria elongatus*	Sugar maple	Throughout	Remains light, similar to 2003.
Hemlock Woolly Adelgid *Adelges tsugae*			See narrative.
Lecanium Scale *Lecanium sp.*	Sugar maple and other hardwoods	Widespread	Heavy populations in many sugar maple stands, including those defoliated by forest tent caterpillar. Also reported on ash and red oak ornamentals. The impact of this insect remains unknown.
Linden Gall Mite and Linden Wart Gall Midge *Phytoptus abnormis* *Cecidomyia verrucicola*	Basswood	Newport	Ornamental.
Maple Bladder Gall Mite *Vasates quadripedes*	Sugar maple Red maple	Widespread	Remains common but light.

INSECT	HOST(S)	LOCALITY	REMARKS
Maple Spindle Gall Mite *Vasates aceris-crummena*	Sugar maple Red maple	Throughout	Remains common but light.
Oystershell Scale *Lepidospaphes ulmi*	American beech Apple Euonymus Lilac	Widespread Weathersfield	Occasionally heavy on ornamentals but forest populations currently light.
Pear Thrips *Taeniothrips inconsequens*	Sugar maple	Statewide	See narrative.
Pine Bark Adelgid *Pineus strobi*	White pine	Widespread	Populations generally light but heavy on widely scattered trees.
Pine Leaf Adelgid *Pineus pinifoliae*	White pine	Widespread	Moderate damage to a few trees.
Pine Needle Scale *Chionapsis pinifoliae*	Scots pine White pine	Morrisville	Light population levels.
Pine Spittlebug *Aphrophora parallela*	White pine Other conifers	Widespread	Widely observed at mostly light levels. Heavy population reported in Danville area.
Ragged Spruce Gall Aphid *Pineus similis*	Red spruce	Throughout	Remains common.
Root Aphid *Prociphilus americanus*	Balsam fir Fraser fir	Essex Springfield	Associated with dieback and mortality of young Christmas trees in Essex. Heavy numbers observed on root systems of green and chlorotic balsam fir Christmas trees in Springfield. Possibly also responsible for flower-like twig growth on a nearby white ash, its alternate host.
Spruce Spider Mite *Oligonychus ununguis*	Fraser fir Balsam fir Spruces	Throughout	Damage remained light to moderate on Christmas trees and ornamentals. Populations had increased noticeably by the end of the season. Mites remained active throughout the growing season due to the lack of extreme heat. Heavy damage was seen on widely scattered fir, spruce and hemlock. Damage may increase in 2005; eggs are easy to find in infested plantings.
Woolly Alder Aphid *Paraprociphilus tessellatus*	Silver maple Alder	Champlain Valley NE Kingdom Springfield	Generally low but noticeable populations. May be increasing in Champlain Valley.

BUD AND SHOOT INSECTS

Pine Shoot Beetle

With the previous detection of multiple Pine Shoot Beetle adults (*Tomicus piniperda*) in the Vermont counties of Essex, Orleans and Caledonia, plus Washington County in 2003, a delimiting survey was conducted in surrounding counties of Vermont in 2004. Addison County was trapped for the first time, since it is adjacent to Washington County. All other counties except Washington were trapped in 2001-2003 with negative results (Table 8).

Ten Lindgren funnel traps baited with alpha-pinene lure and UHR ethanol were placed in Franklin, Orange, Lamoille, Chittenden and Washington counties. An additional five traps were placed in Grand Isle County. Scots pine sites near major roads received the highest priority for trapping, followed by red pine. One site in Chittenden County was comprised of jack pine. Traps were placed in the field March 9 - 16, well before temperatures rose above 50 degrees F. Trap contents were emptied every two weeks until the end of June.

Three pine shoot beetle specimens were recovered from traps in 2004, and each beetle represented a new county record. One specimen was taken in a trap in the town of Ferrisburg in Addison County between April 26 and May 5. Two specimens were collected in traps between April 7 and April 20. These beetles were taken in Isle La Motte in Grand Isle County and Wolcott in Lamoille. All other traps in previously negative counties remained negative for *T. piniperda* in 2004. A total of 6,009 other Scolytid beetles were collected in the traps (Table 9). In September 2004, the entire state of Vermont was quarantined for the pine shoot beetle. Trap locations, dates, stand types, numbers of visits to trap sites and trap catches for 1999 –2004 are summarized in Table 10.

Table 8. Number of sites per county surveyed for the pine shoot beetle, *Tomicus piniperda*, with pheromone-baited Lindgren funnel traps, 1999-2004.

County	Number of Sites Trapped					
	1999	2000	2001	2002	2003	2004
Addison	--	--	--	--	--	10
Caledonia	--	10	1	--	--	--
Chittenden	--	10	10	10	10	10
Essex	7	--	--	--	--	--
Franklin	--	10	9	10	10	10
Grand Isle	--	--	5	5	5	5
Lamoille	--	10	10	10	10	10
Orange	--	--	9	10	10	10
Orleans	3	8	--	1	--	--
Washington	--	10	10	10	10	--
Total	10	58	54	56	55	55

Table 9. Summary of 2004 pine shoot beetle pheromone trapping.

County	# Traps	Date Out	Date In	# Trap Checks	# *Tomicus piniperda*	# Other Scolytids
Addison	10	3/9/04	7/1/04	80	1	447
Chittenden	10	3/10/04	6/30/04	78	0	495
Franklin	10	3/15/04	6/24/04	70	0	1,521
Grand Isle	5	3/10/04	6/22/04	35	1	571
Lamoille	10	3/16/04	6/29/04	80	1	997
Orange	10	3/10/04	6/21/04	70	0	1,978
Total	55			413	3	6,009

Table 10. Number of adult pine shoot beetles caught in Lindgren funnel traps by location and trap date.

			1999		2000		2001		2002		2003		2004	
County	**Town**	**Stand Type**	**Trap Dates**	**# of PSB**	**Trap Dates**	**# of PSB**	**Trap Dates**	**# of PSB**	**Trap Dates**	**#of PSB**	**Trap Dates**	**# of PSB**	**Trap Dates**	**# of PSB**
Essex	Brighton	Red pine	27 Apr-12 May	2										
	Canaan	Red pine	27 Apr-12 May	5										
			26 May - 8 June	2										
Orleans	Morgan	Red pine	27 Apr-12 May	1	2-15 May	1								
	Derby	Scotch pine			6-24 April	7			12-19 Apr	38				
					25 Apr-2 May	1			17-31 May	2				
					2-5 May	4			31 May-11 June	7				
									11-18 June	2				
									18 June-12 July	2				

			1999		2000		2001		2002		2003		2004	
County	**Town**	**Stand Type**	**Trap Dates**	**# of PSB**	**Trap Dates**	**# of PSB**	**Trap Dates**	**# of PSB**	**Trap Dates**	**# of PSB**	**Trap Dates**	**# of PSB**	**Trap Dates**	**# of PSB**
Orleans (cont')	Derby Line	Scotch pine			24 Apr-2 May	2								
					15-26 May	1								
	Barton	Scotch pine			15-26 May	1								
					26 May-12 June	1								
					12-21 June	1								
Caledonia	Kirby	Scotch pine			4-18 Apr	1	27 Apr-11 May	2						
Washington	Barre Town	Scotch									17 Apr-1 May	1		
Addison	Ferrisburg	Red and Scotch pine mixed											26 Apr-5 May	1
Lamoille	Wolcott	Scotch pine											7-20 Apr	1
Grand Isle	Isle La Motte	Red pine											7-20 Apr	1
Total				10		20		2		51		1		3

OTHER BUD and SHOOT INSECTS

INSECT	HOST(S)	LOCALITY	REMARKS
Balsam Shootboring Sawfly *Pleroneura brunneicornis*	Fraser fir Balsam fir	Widespread	Damage more noticeable than in 2003 but still light.
Oak Twig Pruner *Elaphidionoides parallelus*	Red oak	Champlain Valley Washington and Chittenden Counties	Remains common at light levels.
Pine Gall Weevil *Podapion gallicola*	Red pine	Scattered	Occasionally seen. Common in selected plantations.
Pine Shoot Beetle *Tomicus piniperda*			See narrative.
White Pine Weevil *Pissodes strobi*	White pine Spruces	Throughout	Common and widely observed, but mid-summer wilting lighter than normal. Populations appear to be stable.

BARK AND WOOD INSECTS

Emerald Ash Borer

Emerald Ash Borer, *Agrilus planipennis*, has not been found in Vermont, but continues to expand from sites in Michigan where it was introduced. In 2004, Vermont surveyed ash trees at locations at high risk for introductions (nurseries with ash stock, sawmills processing ash, areas of high public use) or areas where ash decline had been observed. During surveys of 595 trees at 65 sites, no emerald ash borer insects were found and no symptoms of infestation were confirmed. Surveys were done in 12 of the 14 counties (Table 11); no surveys were done in Essex and Windham Counties. Most of the surveys concentrated on high risk sites: adjacent to nurseries (35 sites), high public use (14 sites), adjacent to sawmills (8 sites), and areas of ash decline (6 sites) (Table 12). Symptoms from other ash boring insects were also recorded (Table 13). The data were collected using national survey protocols and were added to the US Forest Service national database.

Table 11. Number of sites surveyed for emerald ash borer in counties in Vermont.

County	Number of sites
Addison	6
Bennington	10
Caledonia	2
Chittenden	6
Franklin	4
Grand Isle	4
Lamoille	5
Orange	4
Orleans	1
Rutland	15
Washington	5
Windsor	3
Total	65

Table 12. Number of sites surveyed for emerald ash borer in Vermont in each risk category.

Site Risk Categories	Number of sites
Adjacent to nursery	35
Adjacent to sawmill	8
Ash decline site	6
General survey	2
High public use	14
Total	65

Table 13. Number of trees surveyed by ash species, health category, and signs of other borers.

Ash Species	Number of trees
Black	3
Green	235
Other	17
White	340
Health	Number of trees
Dead	5
Branch dieback	179
Epicormic sprouting	139
Yellow leaves	4
Total Declining	322
Healthy	268
Other Borers	Number of trees
Galleries	193
None	402
Total number trees	**595**

OTHER BARK AND WOOD INSECTS

INSECT	HOST(S)	LOCALITY	REMARKS
Allegheny Mound Ant *Formica exsectoides*	Christmas trees	Widely scattered	Continues to cause scattered damage and mortality in Christmas tree plantations.
Ash and Lilac Borer *Podesia syringae*	Lilac	Weathersfield	Heavy damage.
Asian Longhorned Beetle *Anoplophora glabripennis*			Not observed or known to occur in Vermont.
Bronze Birch Borer *Agrilus anxius*	Paper birch White birch	Widely scattered, including the Champlain Valley Washington and Lamoille Counties	Fairly common on ornamentals.
Brown Spruce Longhorned Beetle *Tetropium fuscum*			Not observed or known to occur in Vermont.
Carpenter Ant *Camponotus spp.*	Many	Throughout	Common.
Eastern Larch Beetle *Dendroctonus simplex*	Eastern larch	Throughout	Populations still increasing and killing drought-stressed trees. See also larch decline.
Elm Bark Beetle *Hylurgopinus rufipes* and *Scolytus multistriatus*			See Dutch elm disease.
Emerald Ash Borer *Agrilus planipennis*			See narrative.
Hemlock Borer *Melanophila fulvoguttata*	Eastern hemlock	Guilford	Associated with hemlock mortality in a recently cut stand. Elsewhere, populations decreasing as trees recover from drought years.
Japanese Cedar Longhorned Beetle *Callidiellum rufipenne*			Not observed or known to occur in Vermont.
Locust Borer *Megacyllene robiniae*	Black locust	Scattered	Commonly associated with dieback and mortality in stands heavily damaged by locust leaf miner in previous years. In other sites, damage occasionally seen.

INSECT	HOST(S)	LOCALITY	REMARKS
Pigeon Tremex *Tremex columba*	Sugar maple	Scattered	Occasionally observed in decayed or dying trees.
Pine Engraver *Ips pini*	Red pine	Scattered	Populations decreasing as trees recover from drought years. Causing mortality of some drought-stressed trees.
Red Turpentine Beetle *Dendroctonus valens*	White pine	Londonderry Weston	Associated with site-related decline of sawtimber-sized trees in Londonderry and dying ornamentals with white pine blister rust stem cankers in Weston.
Round-headed Apple Tree Borer *Saperda candida*	Apples	Worcester Kirby Danville Jamaica	Damaging orchard and landscape trees. In Jamaica, attacking scattered trees injured by cold temperature.
Sugar Maple Borer *Glycobius speciosus*	Sugar maple	Throughout	Remains a common cause of defect on slow-growing maples. Borer damaged trees frequently snap in severe summer windstorms.
Warehouse Beetles Various species			Three traps, baited with exotic bark beetle lure, alpha-pinene and ethanol, respectively, were placed at each of three warehouses that receive imported commodities from high risk countries. Traps were deployed between April 1 and 27 and were removed between September 6 and October 4, 2004. No exotic beetles were collected.
Whitespotted Sawyer *Monochamus scutellatus*	Balsam fir White pine	Throughout	Adults less commonly observed than in recent years. Larvae present in weakened and dying conifers.

ROOT INSECTS

INSECT	HOST(S)	LOCALITY	REMARKS
Black Vine Weevil *Otiorynchus sulcatus*	Many	Londonderry	Adults invading home.
June Beetles *Phyllophaga* spp.	Many	Widespread	Light damage.

FRUIT, NUT AND FLOWER INSECTS

INSECT	HOST(S)	LOCALITY	REMARKS
Asiatic Garden Beetle *Autoserica castanea*	Many flowers	Bradford Northeast Kingdom	Light populations. Fewer reports than in 2002 and 2003.
Rose Chafer *Macrodactylus subspinosus*	Many flowers	Throughout	Generally observed at light levels.
Western Conifer Seed Bug *Leptoglossus occidentalis*	Conifers	Throughout	Reports of sightings in homes continue, but not as numerous as other recent years.

MISCELLANEOUS INSECTS

Non-Target Moths

Non-target moths caught in pheromone traps used in surveys for saddled prominent and forest tent caterpillar were identified and are listed below (Tables 14-15).

Table 14. Non-target moths caught in 2004 in pheromone traps baited with lure for saddled prominent moths. Data are from 6 locations statewide.

Family	Species (Author)	Total Number Caught
Geometridae	*Besma endropiaria* (G. & R., 1867)	5
	Besma quercivoraria (Gn., 1857)	2
	Campaea perlata (Gn., 1857)	4
	Euchlaena serrata (Drury, 1770)	1
	Euchlaena tigrinaria(Gn., 1857)	1
	Homochlodes disconventa (Wlk., 1860)	29
	Homochlodes sp.	14
	Metarranthis duaria (Gn., 1857)	1
	Plagodis serinaria H.-S., 1855	1
	Probole amicaria (H.-S.,1855)	1
	Other Geometrids, species undetermined	5
Arctiidae	*Halysidota tessellaris* (J.E. Smith)	1
Noctuidae	*Zanglognatha laevigata* (Grt.,1872)	4
	Zanclognatha sp.	2
	Bomolocha sp.	3
	Enargia sp.	1
	Zale sp.	1
	Other Noctuids, species undetermined	3
Pyralidae		1
Tortricidae	*Clepsis persicana* (Fitch, 1856)	2
	Other Tortricids, species undetermined	1
Undetermined microlepidoptera		31
Other undetermined species of moths		5

Table 15. Non-target moths caught in 2004 in pheromone traps baited with lure for forest tent caterpillar. Data are from 11 locations statewide.

Family	Species (Author)	Total Number Caught
Geometridae	*Anacamptodes* sp.	1
	Campaea perlata (Gn., 1857)	1
	Caripeta divisata Wlk., 1863.	3
	Homochlodes disconventa (Wlk., 1860)	1
	Homochlodes lactispargaria (Wlk., 1861)	1
	Homochlodes sp.	23
	Lambdina fiscellaria (Gn., 1857)	4
	Rheumaptera hastata (L., 1758)	1
	Idia sp.	3
	Other Geometrids, species undetermined	2
Arctiidae	*Halysidota tessellaris* (J.E. Smith)	1
Lymantriidae	*Lymantria* (=*Porthetria*) *dispar* (L., 1758)	150
Noctuidae	*Zanglognatha laevigata* (Grt.,1872)	4
	Zanclognatha ochreipennis (Grt., 1872).	3
	Zanclognatha sp.	9
	Bomolocha edictalis (Wlk., 1859)	2
	Xestia smithii (Snell., 1896)	1
Pyralidae	*Anageshna primordialis* (Dyar, 1907)	1
Tortricidae	*Clepsis persicana* (Fitch, 1856)	2
	Other Tortricids, species undetermined	4
Pterophoridae		3
Undetermined microlepidoptera		49
Other undetermined species of moths		6

Other Moth Records

Michael Sabourin, a lepidopterist in Barnet, Vermont, provided the following moth records for 2004.

Gelechiodea:
Dichomeris leuconotella, male, Caledonia Co., Ewells Mills, 7/19/04, state record

Tortriciodea:
Apotomis apateticana, female, Essex Co., Lunenburg, 6/17/04, state record
Olethreutes brunneopurpuratus, female, Caledonia Co, Ewells Mills, 7/28/04, county record, first state report
Epinotia corylana, female, Essex Co, Victory Basin WMA, 7/2/04, state record
Sparganothis umbrana, male, Windsor Co., N. Hartland Dam, 6/25/04, first report in two decades

Geometridae:
Eupithecia anticaria, female, Caledonia Co., Ewells Mill, 6/8/04, state record

FOREST DISEASES

STEM DISEASES

Beech Bark Disease

Beech Bark Disease, caused by *Cryptococcus fagisuga* and *Nectria coccinea var. faginata,* continued to be noticeable in 2004. Acreage mapped from the air increased in southern Vermont but decreased in northern Vermont, for an overall decrease to 77, 983 acres compared to 91,926 acres in 2003 (Table 16, Figure 19). Cankers and Nectria fruiting were much more noticeable this year but live scale insects were difficult to find in the colder areas of the state, probably due to two very cold winters in a row.

Table 16. Mapped acres of damage by beech bark disease in 2004.

County	Acres Mapped
Addison	991
Bennington	35912
Caledonia	76
Chittenden	546
Essex	1627
Franklin	0
Grand Isle	0
Lamoille	106
Orange	532
Orleans	435
Rutland	9299
Washington	547
Windham	16196
Windsor	11716
Total	77,983

Buckthorn Canker

Two fungi, a species of *Phomopsis* and a fungus that is not yet identified, were isolated from cankers on dead and dying glossy buckthorn in Westminster by the forest pathology lab at the University of Vermont, where proof of pathogenicity trials are underway. Similar symptoms were also observed at a 2nd site in the town of Westminster. Several dry years may have predisposed these stems to heavy infections leading to mortality.

Butternut Canker

Butternut Canker, caused by *Sirococcus clavigignenta-juglandacearium*, remains common throughout the state, resulting in much dieback and mortality. Uninfected trees are rarely observed.

Diplodia Shoot Blight

Diplodia Shoot Blight, caused by *Diplodia pinea* (formerly *Sphaeropsis*), damage remained common at light levels on many species of pine and fir Christmas trees in widely scattered locations. Heavy damage was also found on young Scots pines in Derby. Four *Diplodia* isolates from declining red pine in Shaftsbury were typed

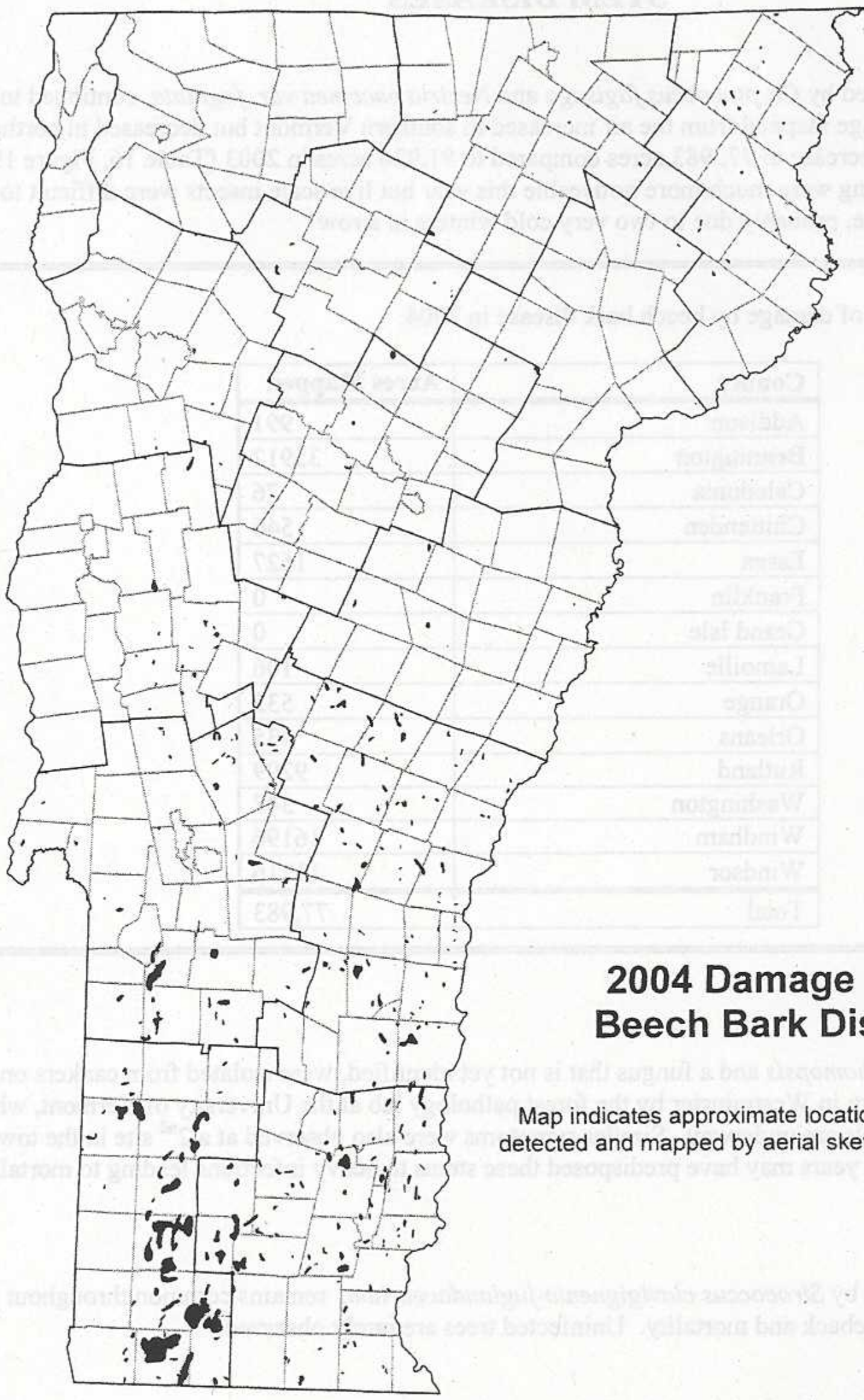


Figure 19. Mapped acres of damage by beech bark disease in 2004.

as "A" or "B" group by Glen Stanosz at the University of Wisconsin. All four tested out to be the more aggressive "A" type. This is the first confirmation of the "A" type in the northeast.

Ramorum Blight (Sudden Oak Death)

Currently, the agent *Phytophthora ramorum*, which causes Ramorum Blight or Sudden Oak Death disease, has not been detected in Vermont. During the summer of 2004, detection surveys were conducted adjacent to 12 high risk nurseries for the presence or absence of *Phytophthora ramorum*. These surveys were conducted using field staff trained in the USDA Forest Service standard survey protocol.

Many of the host species are common in our forests, and are used extensively in urban plantings. Susceptible trees and shrubs were inspected for evidence of sudden oak death symptoms. All suspect plant tissue was collected and samples were sent to a certified lab for verification. A total of 69 samples were taken, all were negative for *P. ramorum* (Table 17).

Table 17. Samples submitted for testing for presence of *Phytophthora ramorum* in Vermont.

Tissue Type	County	Town	Genus	P. ramorum
Leaf	Addison	Bristol	*Hamamelis*	-
Twig	Addison	Bristol	*Viburnum*	-
Leaf	Addison	Bristol	*Lonicera*	-
Leaf	Chittenden	Charlotte	*Lonicera*	-
Leaf	Chittenden	Charlotte	*Acer*	-
Leaf	Chittenden	Charlotte	*Lonicera*	-
Leaf	Chittenden	Charlotte	*Viburnum*	-
Leaf	Chittenden	Charlotte	*Acer*	-
Leaf	Chittenden	Charlotte	*Lonicera*	-
Leaf	Addison	Bristol	*Viburnum*	-
Leaf	Windsor	White River Junction	*Acer*	-
Leaf	Windsor	White River Junction	*Acer*	-
Leaf	Windsor	White River Junction	*Lonicera*	-
Leaf	Windsor	White River Junction	*Syringae*	-
Leaf	Windsor	White River Junction	*Acer*	-
Leaf	Windsor	White River Junction	*Acer*	-
Leaf	Windsor	White River Junction	*Acer*	-
Leaf	Windsor	White River Junction	*Lonicera*	-
Leaf	Windsor	White River Junction	*Hamamelis*	-
Leaf	Windsor	White River Junction	*Acer*	-
Leaf	Orange	Thetford	*Lonicera*	-
Leaf	Orange	Thetford	*Acer*	-
Leaf	Orange	Thetford	*Acer*	-
Leaf	Orange	Thetford	*Lonicera*	-
Leaf	Orange	Thetford	*Lonicera*	-
Bark	Orange	Thetford	*Quercus*	-
Leaf	Orange	Thetford	*Acer*	-
Leaf	Orange	Thetford	*Lonicera*	-
Leaf	Orange	Williamstown	*Acer*	-
Leaf	Orange	Williamstown	*Lonicera*	-
Leaf	Orange	Williamstown	*Acer*	-
Leaf	Orange	Williamstown	*Acer*	-

Leaf	Orange	Williamstown	*Lonicera*	-
Leaf	Orange	Williamstown	*Acer*	-
Leaf	Orange	Williamstown	*Lonicera*	-
Leaf	Orange	Williamstown	*Acer*	-
Leaf	Caledonia	Lyndon	*Lonicera*	-
Leaf	Caledonia	Lyndon	*Lonicera*	-
Leaf	Caledonia	Lyndon	*Lonicera*	-
Leaf	Caledonia	Lyndon	*Acer*	-
Leaf	Washington	Waterbury	*Lonicera*	-
Leaf	Washington	Waterbury	*Lonicera*	-
Leaf	Washington	Waterbury	*Lonicera*	-
Leaf	Washington	Waterbury	*Lonicera*	-
Leaf	Grand Isle	South Hero	*Lonicera*	-
Leaf	Grand Isle	South Hero	*Lonicera*	-
Leaf	Grand Isle	South Hero	*Acer*	-
Leaf	Grand Isle	South Hero	*Lonicera*	-
Leaf	Grand Isle	South Hero	*Lonicera*	-
Leaf	Grand Isle	South Hero	*Acer*	-
Leaf	Franklin	Swanton	*Acer*	-
Leaf	Franklin	Swanton	*Lonicera*	-
Leaf	Franklin	Swanton	*Acer*	-
Leaf	Franklin	Swanton	*Acer*	-
Leaf	Franklin	Swanton	*Acer*	-
Leaf	Bennington	Manchester	*Lonicera*	-
Leaf	Bennington	Dorset	*Lonicera*	-
Leaf	Bennington	Dorset	*Acer*	-
Leaf	Bennington	Dorset	*Acer*	-
Leaf	Bennington	Dorset	*Lonicera*	-
Leaf	Bennington	Dorset	*Lonicera*	-
Leaf	Bennington	Manchester	*Lonicera*	-
Leaf	Bennington	Manchester	*Acer*	-
Leaf	Bennington	Manchester	*Acer*	-
Leaf	Bennington	Manchester	*Lonicera*	-
Leaf	Bennington	Manchester	*Lonicera*	-
Leaf	Bennington	Manchester	*Acer*	-
Leaf	Bennington	Dorset	*Acer*	-
Leaf	Bennington	Dorset	*Acer*	-

Scleroderris Canker

Scleroderris Canker, caused by *Asocalyx abietina*, has not been found in any new towns since 1986.

OTHER STEM DISEASES

DISEASE	HOST	LOCALITY	REMARKS
Annual Canker *Fusarium sp.*			Not reported.
Ash Yellows *Mycoplasma-like organism*	White Ash	Throughout	Witches brooms common in warmer hardiness zones. The disease contributed to much of the decline seen.
Beech Bark Disease *Cryptococcus fagisuga* and *Nectria coccinea var. faginata*			See narrative.
Black Knot *Dibotryon morbosum*	Black Cherry	Throughout	Remains common but less noticeable than in 2003.
Botryosphaeria Blight *Botryosphaeria sp.*	Red Oak	Chester	Associated with heavy mortality of lower and mid-crown branches.
Butternut Canker *Sirococcus clavigignenta-juglandacearum*			See narrative.
Caliciopsis Canker *Caliciopsis pinea*	White Pine	Widespread	No new reports.
Chestnut Blight *Cryphonectria parasitica*	American Chestnut	Shaftsbury	Cankered tree bearing chestnuts.
Cytospora Canker *Leucostoma kunzei*	Blue spruce	Widely scattered	Stable.
Delphinella Tip Blight of Fir *Delphinella balsamae*	Balsam Fir White Fir	Wolcott Barton	Decreasing on Christmas trees.
Diplodia Shoot Blight *Diplodia pinea (Sphaeropsis pinea)*			See narrative.
Dutch Elm Disease *Ceratocystis ulmi*	American Elm	Throughout	Remains common. Symptoms suddenly very noticeable in the end of June.
Eastern Dwarf Mistletoe *Arceuthobium pusillum*			Not reported.

DISEASE	HOST	LOCALITY	REMARKS
Fir Canker *Ascocalyx* (maybe *abietis*)	Balsam Fir	Weston	Asexual fruiting of *Bothrodiscus*, as determined by George Hudler of Cornell University.
Fir Canker *Fusarium sp.*	Fraser Fir Balsam Fir		Not a common problem in a survey of 12 plantations by Dale Bergdahl (see Phytophthora root rot).
Fireblight *Erwinia amylovora*	Apple	Widely scattered especially in southern Vermont	Many blighted apples in the spring. Contributed to fruit reduction but foliage recovered.
Hypoxylon Canker *Hypoxylon pruinatum*	Aspen	Throughout	Remains common. Trees subject to breakage. Summer windstorms in Windsor County snapped many trees.
Lilac Blight *Pseudomonas syringae*	Lilac	Widespread	Moderate to heavy damage in more locations than in 2003.
Maple Canker *Steganosporium spp.*	Sugar Maple	Widely scattered	Fruiting on previously stressed or damaged branches.
Nectria Canker *Nectria galligena*	Hardwoods	Throughout	No change reported.
Oak Wilt *Ceratocystis fagacearum*			Not observed or known to occur in Vermont. No suspect areas seen during aerial surveys.
Phomopsis Twig Blight *Phomopsis sp.*			Not reported.
Red Ring Rot *Phellinus pini*	White Pine	Widely scattered	Occasionally observed, especially on sites that are poorly drained or otherwise limiting.
Sapstreak *Ceratocystis coerulescens*			Not reported.
Scleroderris Canker *Ascocalyx abietina*	Scots Pine Red Pine		See narrative.
Sirococcus *Sirococcus strobilinius*			Not reported.
Tomentosus Butt Rot *Inonotus tomentosus*			Not reported.

DISEASE	HOST	LOCALITY	REMARKS
Verticillium Wilt *Verticillium albo-atrum*			Not reported.
White Pine Blister Rust *Cronartium ribicola*	White Pine	Throughout	Remains common especially on polesized trees planted for screening and on Christmas trees.
Woodgate Gall Rust *Endocronartium harknessii*	Scots Pine	Widely scattered	Commonly seen on unmanaged trees.
Yellow Witches Broom Rust *Melampsorella caryophyllacearum*	Balsam Fir	Widely scattered	Scattered light damage on Christmas and forest trees.

FOLIAGE DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Anthracnose *Apiognomonia spp.* *Gloeosporium spp.*	Sugar Maple	Widespread	Common at mostly light levels. Increasing in the Champlain Valley and Northeast Kingdom.
Apple Scab *Venturia inaequalis*	Apple	Throughout	Heavy damage common this year due to frequent rainfall.
Brown Spot Needle Blight *Scirrhia acicola* *Mycosphaerella dearnessii*			Not reported.
Cedar-Apple Rust *Gymnosporangium spp.*	Crabapple Apple	Northeast Kingdom	Moderate damage. Foliar lesions common.
Coccomyces Leaf Spot *Blumeriella jaapii*			Not reported.
Cyclaneusma Needlecast (formerly Naemacyclus) *Cyclaneusma minus*	Scots Pine	Throughout	Remains a common cause of needle loss.
Dogwood Anthracnose *Discula destructiva*			Not reported.
Dothistroma Needlecast *Dothistroma pini*			Not reported.
Fir Fern Rust *Uredinopsis mirabilis*	Balsam Fir	Throughout	More common than in 2003 on Christmas trees but mostly light damage.
Lophodermium Needlecast *Lophodermium seditiosum*	Scots Pine	Scattered	Sometimes seen on ornamentals and Christmas trees.
Phyllosticta Leafspot *Phyllosticta sp.*			Not reported.
Poplar Leaf Blight *Marssonina spp.*	Balsam Poplar	Champlain Valley	Common.
Powdery Mildew *Eryiphaceae* *Erysiphe polygoni*	Many	Widespread	Common on some trees and shrubs, especially lilac.

DISEASE	HOST	LOCALITY	REMARKS
Rhizosphaera Needle Blight *Rhizosphaera pini*	Balsam Fir	Scattered	Mostly light damage to Christmas trees. Recently identified in two Springfield plantations
Rhizosphaera Needlecast of Spruce *Rhizosphaera kalkhoffi*	Blue Spruce White Spruce	Widespread	Heavy on many ornamentals
Sooty Mold *Perisporiacae*	Sugar Maple	Widespread	Very noticeable on trees infested with Lecanium scale
Swiss Needlecast *Phaeocryptopus gaeumannii*	Douglas-fir	Widely scattered	The most common cause of needle loss
Sycamore Anthracnose *Gnomonia platanii*	Sycamore	Scattered	Not as heavy as in other years
Tar Spots *Rhytisma acerinum* *Rhytisma punctatum*	Sugar Maple Red Maple Norway Maple Striped Maple	Widespread	Commonly seen
White Pine Needle Blight *Canavirgella banfieldii*			Not reported

ROOT DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Annosus Root Rot *Heterobasidion annosum*			Not reported
Phytophthora Root Rot *Phytophthora sp.*	Fraser Fir	Widely scattered	Dale Bergdahl, Forest Pathologist from UVM, isolated Phytophthora from two of four plantations with dying Fraser Fir
Shoestring Root Rot *Armillaria spp.*	Many	Throughout	Commonly found on drought-stressed trees and interplanted Christmas trees. Associated with mortality of some balsam woolly adelgid infested trees

DIEBACKS, DECLINES, AND ENVIRONMENTAL DISEASES

Ash Dieback

Thin ash crowns and chlorotic foliage were common throughout the state, and scattered dieback was more noticeable in 2004. Areas of ash dieback were mapped on 96 acres in Chittenden and Addison Counties. Drought from previous years may account for problems seen on shallow soils or sites with variable moisture. Heavy seed or ash yellows were important factors in other cases.

Birch Decline

Birch decline was mapped on 7,836 acres, (Figure 20, Table 18). Most of the decline was observed on upper elevation paper birch. Drought stress from previous years was the likely cause.

Table 18. Mapped acres of birch dieback in 2004.

County	Acres
Addison	446
Bennington	317
Caledonia	142
Chittenden	2,191
Essex	0
Franklin	1,735
Grand Isle	0
Lamoille	1,102
Orange	0
Orleans	218
Rutland	173
Washington	1,336
Windham	0
Windsor	177
Statewide	**7,836**

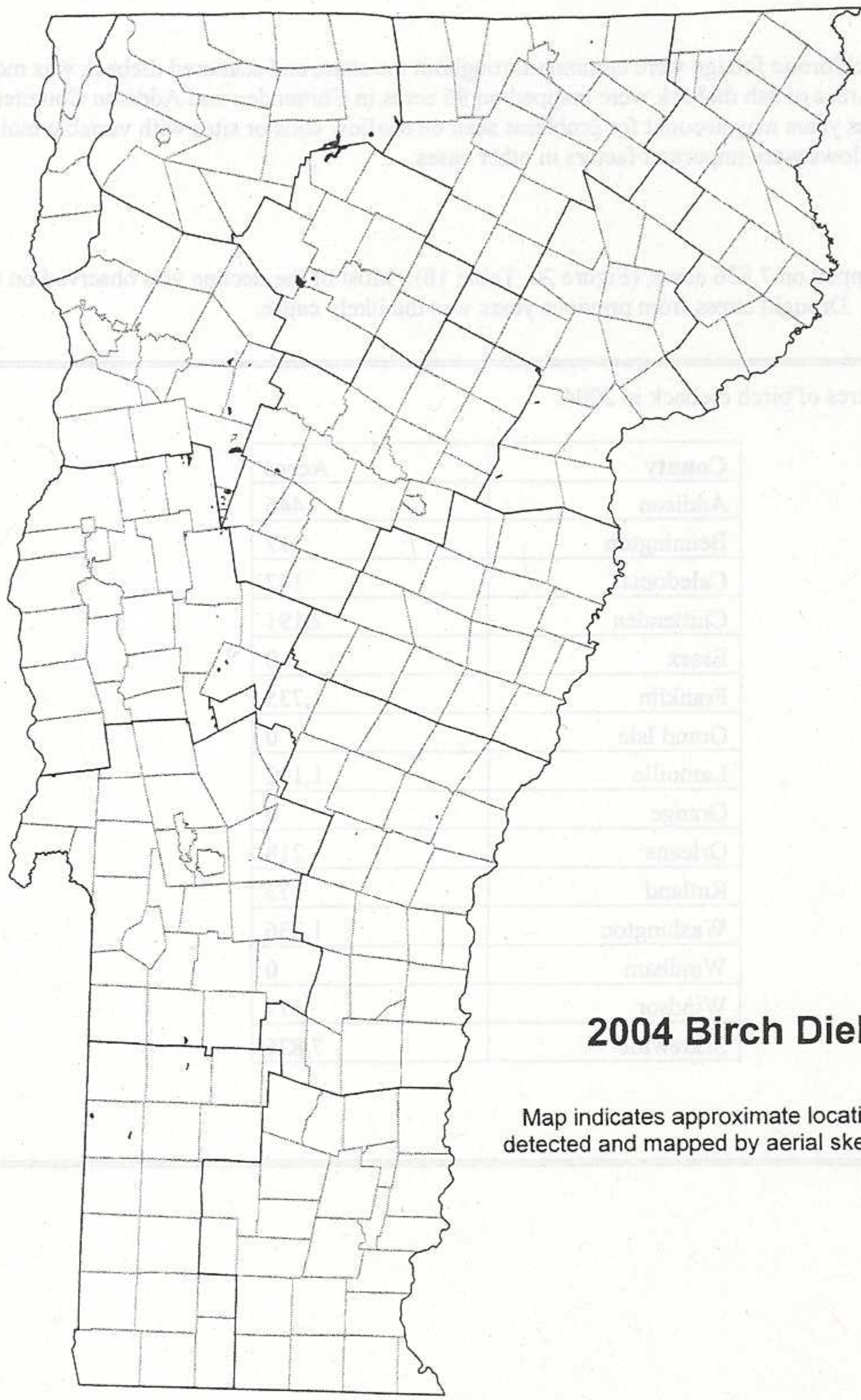


Figure 20. Birch dieback in 2004. Mapped area is 7,836 acres.

Drought

While recovery was noticed in some areas, stress from drought prior to 2003 continued to be observed. Dieback and mortality were seen on a wide variety of species especially those at upper elevations or on drought-sensitive sites. Ash and birch declines, increased incidence of beech bark disease, and a build up of defoliating caterpillars were all attributed to drought. Mapped acres of drought damage were 824. Damage was especially obvious in Windsor County.

Hardwood Decline and Mortality

Heavy beech bark disease and recent drought both contributed to hardwood decline mapped on 31,583 acres (Table 19). Southern Vermont counties showed substantial areas of decline (Figure 21). The acreage dropped slightly from 2003, but this may be attributed to the early timing of aerial survey in 2004.

Table 19. Mapped acres of hardwood decline and mortality in 2004.

County	Acres
Addison	2,229
Bennington	285
Caledonia	2,389
Chittenden	3,267
Essex	2,091
Franklin	3,012
Grand Isle	19
Lamoille	2,891
Orange	272
Orleans	3,033
Rutland	3,300
Washington	1,213
Windham	2,892
Windsor	4,688
Statewide	**31,583**

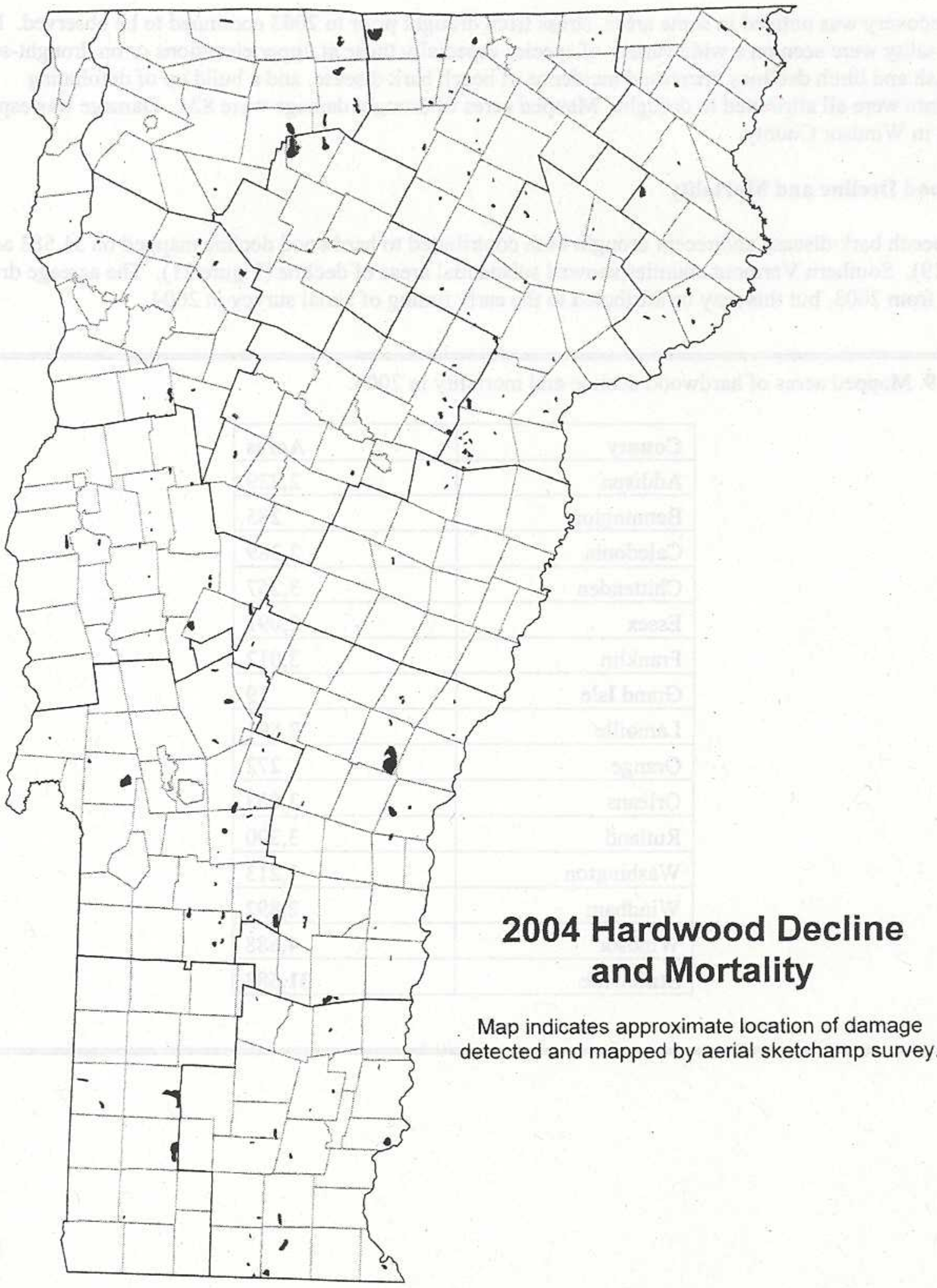


Figure 21. Hardwood decline and mortality in 2004. Mapped areas is 31,583.

Larch Decline

Larch decline and mortality were mapped on 2,675 acres, compared to 4,606 acres in 2003 (Table 20). Triggered by drought stress prior to 2003, trees continue to decline as eastern larch beetles take advantage of low vigor trees. While there was a decrease in acreage mapped, symptoms in some stands were more severe (Figure 22).

Table 20. Mapped acres of larch decline in 2004.

County	Acres
Addison	0
Bennington	111
Caledonia	785
Chittenden	36
Essex	132
Franklin	361
Grand Isle	0
Lamoille	66
Orange	0
Orleans	525
Rutland	615
Washington	44
Windham	0
Windsor	0
Statewide	**2,675**

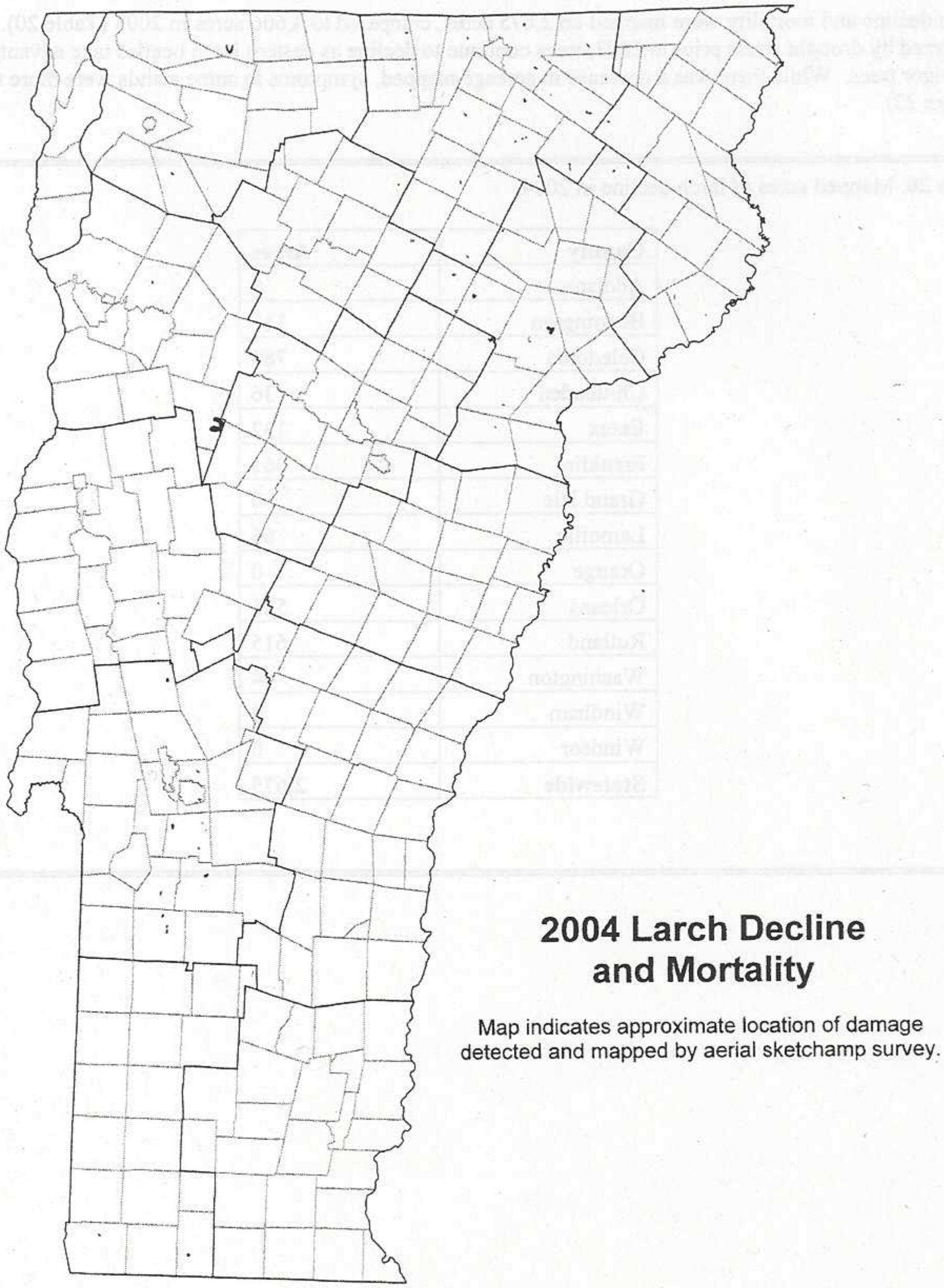


Figure 22. Larch decline in 2004. Mapped area is 2,675 acres.

Logging-related Decline

Logging-related dieback and mortality were mapped on 1,368 acres in 2004 and were widely distributed across counties (Table 21). The total area affected was similar to 2003, but locations varied.

Table 21. Mapped acres of logging-related decline and mortality in 2004.

County	Acres
Addison	0
Bennington	332
Caledonia	236
Chittenden	144
Essex	294
Franklin	0
Grand Isle	0
Lamoille	0
Orange	0
Orleans	162
Rutland	179
Washington	0
Windham	21
Windsor	0
Statewide	**1,368**

Ozone Injury

In 2004, 18 locations were visited in late summer, when ozone symptoms are at their peak. Symptoms of ozone injury (stippling on upper leaf surface) were recorded at 28% of the sites, although few plants at each site had noticeable injury (Table 22). Where injury occurred, the severity was light to moderate. No locations had heavy injury. Black cherry plants were most commonly affected this year. Symptoms of ground level ozone injury to sensitive plant species is collected annually as part of the National Forest Health Monitoring Program. No symptoms of ozone injury were observed during other routine forest observations of Vermont forests.

Table 22. Ozone bioindicator sites visited in 2004 and severity of ozone injury (light=<25% of affected leaves with ozone injury, moderate=25-50% of affected leaves with ozone injury).

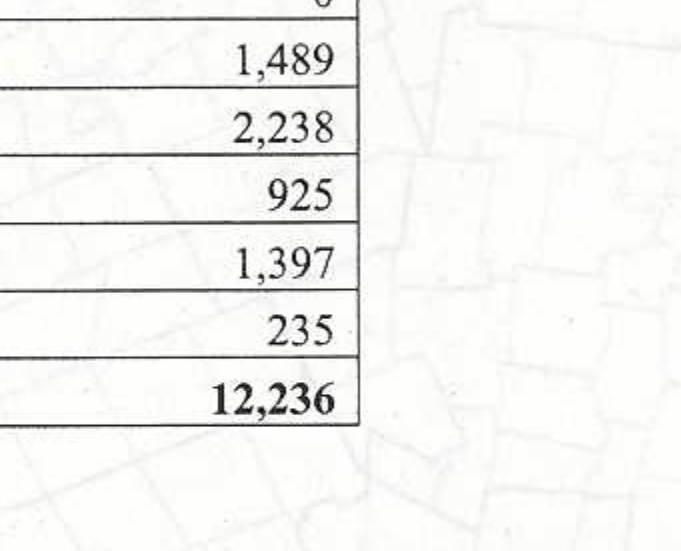
Town	Site Number	Severity of Injury
Bakersfield	4407277	None
Clarendon	4307268	Moderate
Dover	4307215	Moderate
Grafton	4307226	None
Groton	4407222	Light
Hancock	4307287	None
Hyde Park	4407255	None
Lunenburg	4407168	None
Newark	4407177	None
Orange	4407223	None
Rupert	1050002	Moderate
Springfield	4307244	None
Sudbury	4307372	Moderate
Sunderland	1050004	None
Underhill	1050001	None
Waterbury	4407246	None
Waterford	4407137	None

Spruce-Fir Dieback and Mortality

Spruce and fir dieback and mortality were mapped on 12,236 acres, similar to 2003, and were attributed to continued effects from drought and winter injury in previous years (Table 23 and Figure 23). Some lower elevation fir had been stressed by drought and balsam woolly adelgid in past years, resulting in current year tree declines.

Table 23. Mapped acres of spruce-fir dieback and mortality in 2004.

County	Acres
Addison	279
Bennington	1,550
Caledonia	1,072
Chittenden	63
Essex	2,377
Franklin	586
Grand Isle	25
Lamoille	0
Orange	0
Orleans	1,489
Rutland	2,238
Washington	925
Windham	1,397
Windsor	235
Statewide	**12,236**



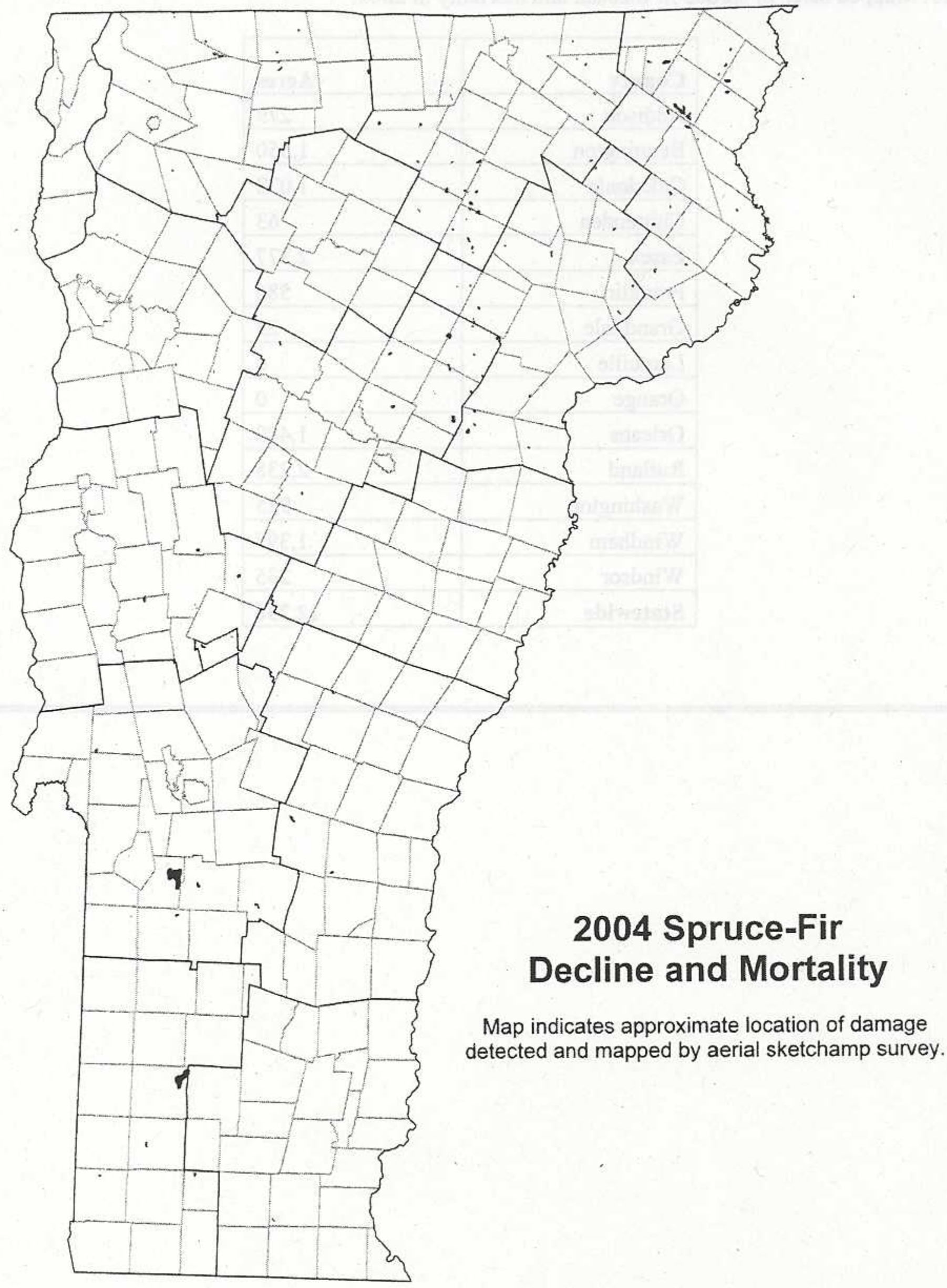


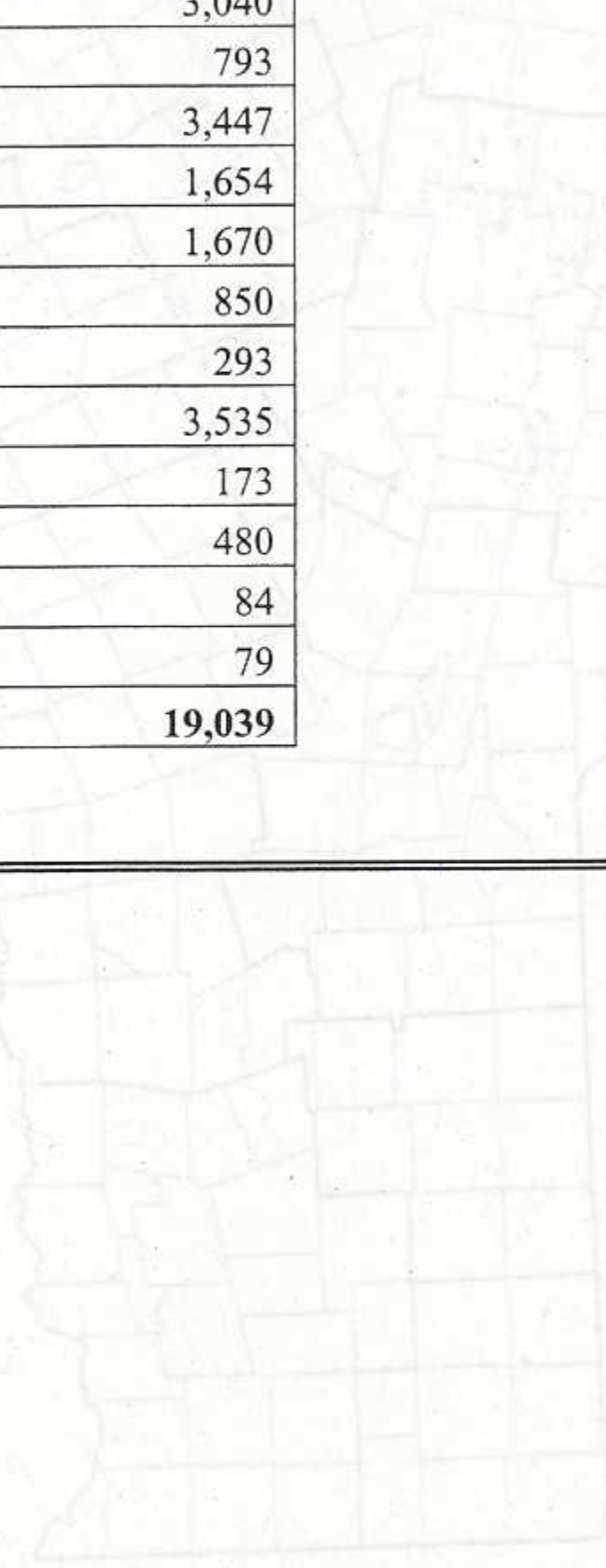
Figure 23. Spruce-fir dieback and mortality mapped in 2004. Mapped areas is 12,236 acres.

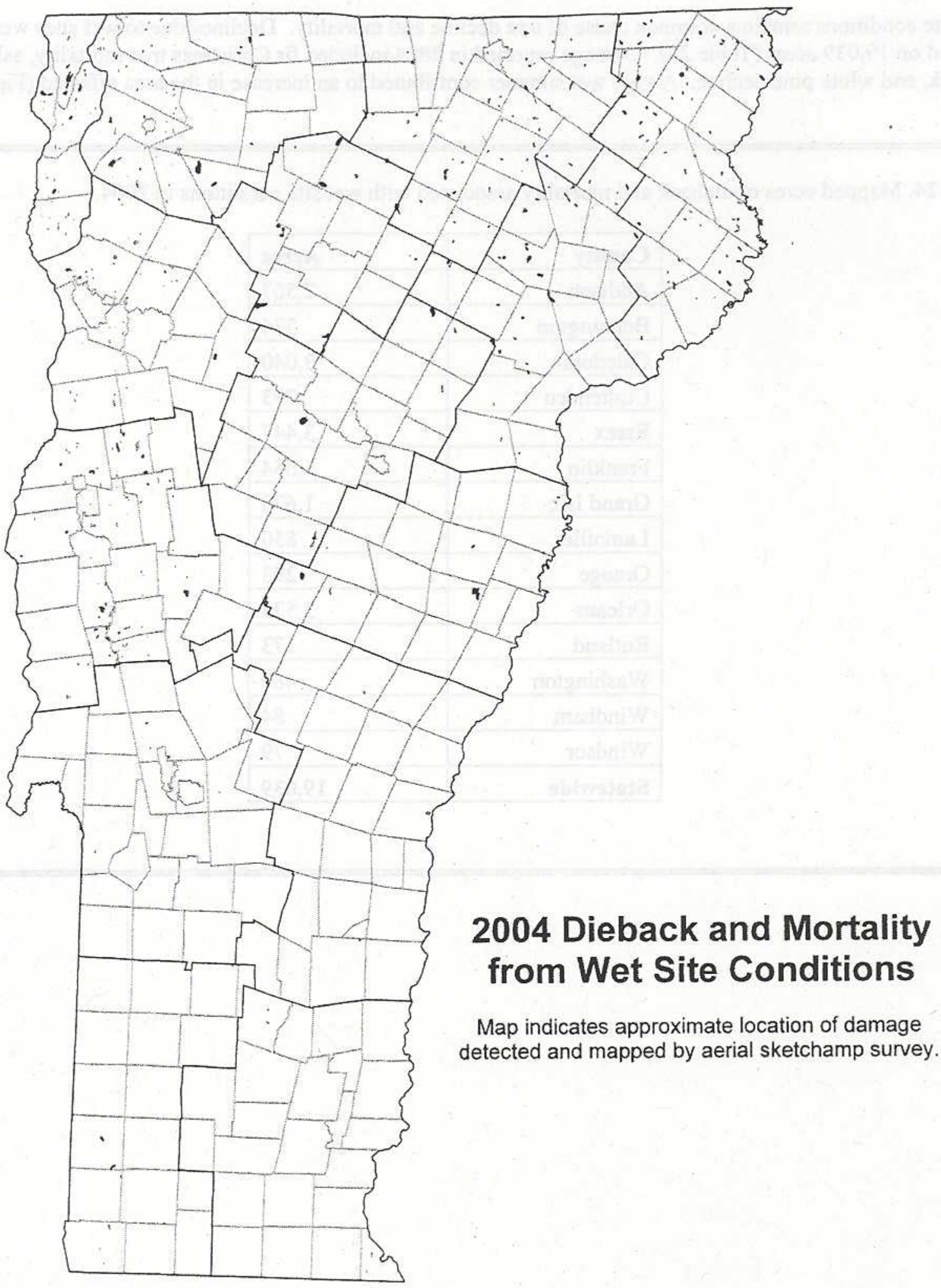
Wet Sites

Wet site conditions remain a common cause of tree decline and mortality. Declines due to wet sites were mapped on 19,039 acres (Table 24). Damage reported in 2004 included fir Christmas tree mortality, ash dieback, and white pine decline. A very wet summer contributed to an increase in the area affected (Figure 24).

Table 24. Mapped acres of dieback and mortality associated with wet site conditions in 2004.

County	Acres
Addison	2,567
Bennington	374
Caledonia	3,040
Chittenden	793
Essex	3,447
Franklin	1,654
Grand Isle	1,670
Lamoille	850
Orange	293
Orleans	3,535
Rutland	173
Washington	480
Windham	84
Windsor	79
Statewide	**19,039**





2004 Dieback and Mortality from Wet Site Conditions

Map indicates approximate location of damage detected and mapped by aerial sketchamp survey.

Figure 24. Declines associated with wet site conditions in 2004. Mapped area is 19,039 acres.

Winter Injury

Severe winter temperatures in late January caused scattered symptoms, especially to trees on the edge of their hardiness zones. Bud kill was reported on Douglas fir Christmas trees in Bennington County, particularly on north sides of the trees. Dieback occurred on privet and forsythia. Flower bud kill of Callery pear and flowering crab were also observed. A small apple orchard in Jamaica had widespread stem cracks; dead, cracked, or blistery bark near ground level; dieback; and sudden wilting this summer. Cracking was reported on black birch in Rutland County, and several inquiries were made about the loud cracking in the woods on cold days. High elevation spruce trees continue to show decline due to winter injury several years ago.

OTHER DIEBACKS, DECLINES, AND ENVIRONMENTAL DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Air Pollution Injury			See narrative for Ozone Injury
Ash Dieback			See narrative
Birch Decline			See narrative
Delayed Chlorophyll Development			Not reported
Edema	Red oak	Shipped trees	Blistery bark on trees shipped to Vermont from Pennsylvania and returned may have been an edema.
Fertilizer Injury		Southern Vermont	High soil pH created chlorosis in one Christmas tree plantation.
Fire Damage		Southern Vermont	Several wind-driven spring fires.
Frost Damage			Trace to moderate damage on Christmas trees, especially in colder areas of north.
Girdling Roots			Common cause of decline in planted trees.
Hardwood Decline and Mortality			See narrative
Heavy Seed	White ash, red maple		See narrative Ash Dieback
Ice Damage			Not reported
Improper Planting			Scattered reports
Interior needle drop	Firs		Unusually light on fir Christmas trees in the fall
Larch Decline			See narrative
Lightening		Southern Vermont	Shattered trees occasionally observed from severe thunderstorms in 2004.
Logging-related Decline			See narrative
Maple Decline			See narrative Hardwood Decline and Mortality
Salt Damage			Less common along roadsides.
Snow Breakage			Not reported
Spruce/Fir Dieback and Mortality			See narrative
Tree Shelters	Red oak seedlings	Enosburg	Tree shelters contributed to abnormal amount of top dieback after extremely cold winter.

Vacuum System	Spruce	Stowe	Central home vacuum system vented hot air over the winter months caused excessive winter injury adjacent to the vent.
Wet Site			See narrative
White Pine Needle Blight			Not reported
White Pine Mortality	White Pine	Windsor, Windham, Rutland Counties	Mapped mortality was 746 acres.
Wind Damage	Mostly northern hardwoods and aspens.	Windsor and Rutland Counties	Severe windstorm June 9th caused patches of breakage and blowdown. Individual trees and small areas up to one acre were tipped over. Blowdowns mapped on 14 acres.
		Franklin and Grand Isle Counties	
Winterburn	Canaan fir	Springfield	Light injury
Winter Injury			See narrative

ANIMAL DAMAGE

ANIMAL	SPECIES DAMAGED	LOCALITY	REMARKS
Beaver	Many	Widespread	Continues to contribute to the wet site mortality mapped
Deer	Many	Throughout	Impact on regeneration and replacement of desirable species with exotics and undesirables is a concern, especially in southern VT
Moose	Many		Widely scattered but especially Essex County
Mouse			Winter girdling reduced from 2003-2004
Porcupine	Many	Scattered	Some damage seen
Sapsucker	Paper Birch Apple Hemlock	Scattered	Commonly observed
Squirrel			Not Reported

INVASIVE PLANTS

A noxious weed quarantine was enacted in April 2002 to reduce the risk of introduction and spread of non-native plants. The quarantine includes 13 terrestrial species in addition to 19 aquatic plants. While it is legal to possess plants on the list which already occur in Vermont, such as common and glossy buckthorns, Japanese honeysuckle and Japanese barberry, they cannot be moved or sold. The quarantine text is available at http://www.vermontagriculture.com/CAPS/industry/weedsquar.htm.

Forestry staff continue to gather information regarding the presence of exotic invasive plants on the quarantine as well as the attached watch list species. Although this is not a formal survey, reporting can provide needed information regarding the distribution of these plants. The report form below can be used for reporting the presence of these exotic plant species.

Invasive Plant Report Form

Return to: Kathy Decker, Forestry Specialist, Dept of Forests, Parks & Recreation, 1229 Portland Street, Suite 201, St. Johnsbury VT 05819

Reported By: Telephone #:
Address:

Date: Town:
Location: (GPS Coordinates, Topo map, or description)

Species:_____ Abundance:_____

Species:_____ Abundance:_____

Species:_____ Abundance:_____

Species:_____ Abundance:_____

Invasive Species Watch List for Vermont

VT Invasive Exotic Plant Committee

Introduction

This is a list of non-native plants that have some potential to become invasive in Vermont based on their behavior in northeastern states. Since not enough is known about the distribution or abundance of these species in Vermont, or their potential to become invasive in Vermont, we hope this list encourages people to observe, assess and report where these species occur and how rapidly they may be spreading.

About one-third of the plant species found in Vermont are not native to our state. Many of these introductions are beneficial and economically important (e.g., red clover, our state flower) and many others are neutral in their impact (e.g., mullein or Queen Anne's lace.) A small percentage of the non-native plants, about 8%, have the potential to create environmental and economic harm due to their ability to grow rapidly, profusely and widely. It is these non-native invasive plant species that the Vermont Invasive Exotic Plant Committee is monitoring.

Definition

An invasive species is defined by the National Invasive Species Council as a species that is

1) non-native (or alien) to the ecosystem under consideration **and**
2) whose introduction causes or is likely to cause economic or environmental harm or harm to human health. (Executive Order 13112; http://www.invasivespecies.gov/)

Invasive species can be plants, animals, and other organisms (e.g., microbes). Human actions are the **primary** means of invasive species introductions.

Watch List versus the Noxious Weed Quarantine

This Watch List is different from the Noxious Weed Quarantine Rule created in 2002 by the Vermont Agency of Agriculture, Food and Markets. The Watch List is intended for public information and as a way to enlist volunteers to monitor potentially harmful plants in Vermont. The Watch List has no regulatory force.

The Noxious Weed Quarantine Rule has the force of law. It was created to regulate the importation, movement, sale, possession, cultivation and/or distribution of 32 invasive plants. For more information about the Noxious Weed Quarantine Rule see http://www.state.vt.us/agric/invasive.htm. The rule plus additional information is also posted at http://www.uvm.edu/mastergardener/. Click the yellow circle at the bottom for Invasive Plant Info.

Purpose of the Watch List

The purpose of this Watch List is to alert and inform people about some plants that may become invasive in Vermont. We've included species known to be invasive elsewhere but their status in Vermont is uncertain. The listed plants are primarily those that may spread into Vermont's natural habitats; this list does not include plants that may be pests of agricultural lands or disturbed habitats such as roadsides. Some of these plants are not yet here as far as we know. Others are here but no one knows how extensively they occur or whether they are spreading. We hope that by making this list public, people will be motivated to help track the occurrence, distribution and rate of spread of the listed plants throughout Vermont.

Criteria
For inclusion on the Watch List, a plant must meet at least #1 and #2, and either #3 or #4.

1. The taxon[1] is nonindigenous[2] to northeastern North America.

2. The taxon may negatively affect native species or natural communities.

3. In Vermont, the taxon has the potential, based on its biology and its colonization history in the northeast or elsewhere, for rapid and widespread dispersal and establishment over spatial gaps away from the site of introduction.

4. The taxon is acknowledged to be invasive in northeastern North America but its Vermont status is unknown or unclear. This may result from lack of field experience with the taxon or from difficulty in taxonomic determination.

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[1] A taxon can be a species, a subspecies or variety
[2] Indigenous means native to an area.

List of Watch Species

Scientific Name	Common Name	Type
Acer ginnala Maxim.	Amur maple	Upland
Acer platanoides L.	Norway maple	Upland
Alnus glutinosa (L.) Gaertner	European black alder	Upland
Amorpha fruticosa L.	False indigo	Upland
Ampelopsis brevipedunculata (Maxim.) Trautv.	Porcelainberry	Upland
Anthriscus sylvestris (L.) Hoffm.	Wild chervil	Upland
Berberis thunbergii DC.	Japanese barberry	Upland
Berberis vulgaris L.	Common barberry	Upland
Callitriche stagnalis Scop.	Pond water-starwort	Aquatic
Cardamine impatiens L.	Narrowleaf bittercress	Upland
Centaurea maculosa L. Syn.: *Centaurea biebersteinii* DC	Spotted knapweed	Upland
Elaeagnus angustifolia L.	Russian olive	Upland
Elaeagnus umbellata Thunb.	Autumn olive	Upland
Euonymus alata (Thunb.) Sieb.	Winged euonymus	Upland
Euphorbia cyparissias L.	Cypress spurge	Upland
Glyceria maxima (Hartman) Holmberg	Reed mannagrass	Upland
Hesperis matronalis L.	Dame's rocket	Upland
Iris pseudacorus L.	Yellow iris	Upland
Ligustrum obtusifolium Sieb. & Zucc.	Border privet	Upland
Lonicera xylosteum L.	Dwarf honeysuckle	Upland
Lysimachia vulgaris L.	Garden Loosestrife	Upland
Marsilea quadrifolia L.	European waterclover	Aquatic
Microstegium vimineum (Trin.) A. Camus	Japanese stilt grass	Upland
Najas minor Allioni	Brittle waternymph	Aquatic
Paulownia tomentosa (Thunb.) Sieb & Zucc. Ex Steud.	Princess tree	Upland
Phalaris arundinacea L.	Reed canary grass	Upland
Polygonum perfoliatum L.	Mile-a-minute vine	Upland
Polygonum sachalinense F. Schmidt ex Maxim. Syn: *Fallopia sachalinensis* (F. Schmidt ex Maxim.) Dcne.	Giant knotweed	Upland
Populus alba L.	White poplar	Upland
Robinia pseudoacacia L.	Black locust	Upland
Rorripa nasturtium-aquaticum (L.) Hayek Syn: *Nasturtium officinale* Ait. f.	Watercress	Aquatic
Rosa multiflora Thunb. ex Murr.	Multiflora rose	Upland

Invasive Species Impacts

Invasive non-native species are the second greatest worldwide threat to native species and ecosystems after direct habitat destruction[3]. In the United States invasive non-native plants spread on public lands at the rate of 4,600 acres per day, or one-tenth the size of an average Vermont town.[4] Invasive non-native plants can displace native species, disrupt ecosystem relationships, degrade wildlife habitat, impede recreation and cause economic damage to forests, agricultural crops and other managed lands. Invasive species cost the American public an estimated $138 billion each year[5] and negatively impact about 42% of the plant and animal species listed by the Federal government as threatened or endangered[6].

What You Can Do

We encourage you to identify, observe, map or measure, and report on the status of any of these plants you find in your vicinity. By making this Watch List public, we hope that people will pay more attention to the plants around them, help in the effort to collect data and watch these species for signs of invasiveness. A more comprehensive list of plant species that can become invasive throughout New England is on the website of the Invasive Plant Atlas of New England (IPANE) at http://invasives.eeb.uconn.edu/ipane/.

Please send us, the Vermont Invasive Exotic Plant Committee, information on these plants and consider becoming a volunteer for IPANE (see box on the following page.)

To report invasive non-native terrestrial plants:
Kathy Decker, Vermont Department of Forests, Parks and Recreation
802-751-0117
kathy.decker@anr.state.vt.us

To report invasive non-native aquatic plants:
Ann Bove, Vermont Department of Environmental Conservation
802-241-3782
ann.bove@anr.state.vt.us

For identification help, see these websites:
http://invasives.eeb.uconn.edu/ipane/
http://tncweeds.ucdavis.edu/

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[3] Randall, J. 1996. Weed Control for the Preservation of Biological Diversity. Weed Technology 10: 370-383.
[4] Westbrooks, R. 1998. Pulling Together: National Strategy for Invasive Plant Management. Federal Interagency Committee for Management of Noxious and Exotic Weeds.
[5] Pimental, D., L. Lach, R. Zuniga, D. Morrison. 2000. Environmental and Economic Costs Associated with Non-Indigenous Species in the United States. BioScience 50:53-65.
[6] Wilcove, D.S., D. Rothstein, J. Bubow, A. Phillips, E. Losos. 1998. Quantifying Threats to Imperiled Species in the United States. BioScience 48(8):607-615.

About VTIEPC

The Vermont Invasive Exotic Plant Committee is comprised of representatives from state and federal government, non-profit organizations, private industry, and concerned individuals. The Committee meets semi-annually to assemble and disseminate information about invasive exotic plants. The goal of the Committee is to "provide coordination and guidance on invasive exotic plant issues so as to protect natural communities, native species, agricultural and forestry interests, and human use and enjoyment of Vermont's natural resources."

About IPANE

The Invasive Plant Atlas of New England's (IPANE) mission is to create a comprehensive web-accessible database of invasive and potentially invasive plants in New England that will be continually updated by a network of professionals and trained volunteers. The database will facilitate education and research that will lead to a greater understanding of invasive plant ecology and support informed conservation management. An important focus of the project is the early detection of, and rapid response to, new invasions. To learn how to volunteer go to **http://invasives.eeb.uconn.edu/ipane/.**

TRENDS IN FOREST CONDITION

Sugar Maple Health Statewide

Trends in sugar maple health from survey sites across the state (North American Maple Project plots) indicate stable conditions despite assaults from defoliating insects. Over 90% of sugar maple trees on survey plots remained healthy (low dieback) in 2004 (Figure 25), and mortality was low (0.8%). While dieback remained stable, the trend towards thinner foliage (higher foliage transparency) continued (Figure 26). Forest tent caterpillar, Bruce spanworm and maple leaf cutter caused significant defoliation at nearly half of these sites, and 17% of trees statewide experienced moderate to heavy defoliation (Figure 27). Some refoliation was observed. Improved crown vigor indicated a slight recovery from previous drought years.

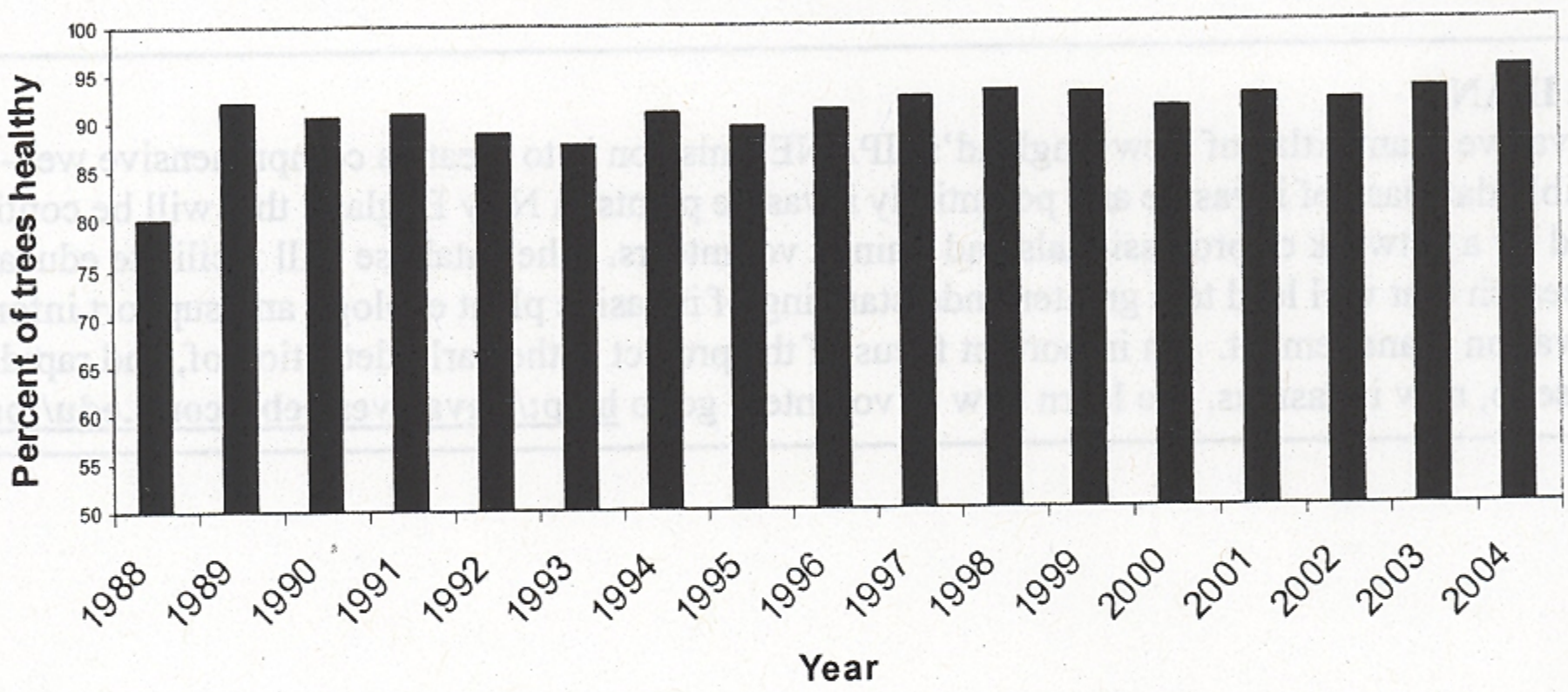


Figure 25. Percent of overstory sugar maple trees healthy (less than 16% dieback) on 38 North American Maple Project plots in Vermont, 1988-2004.

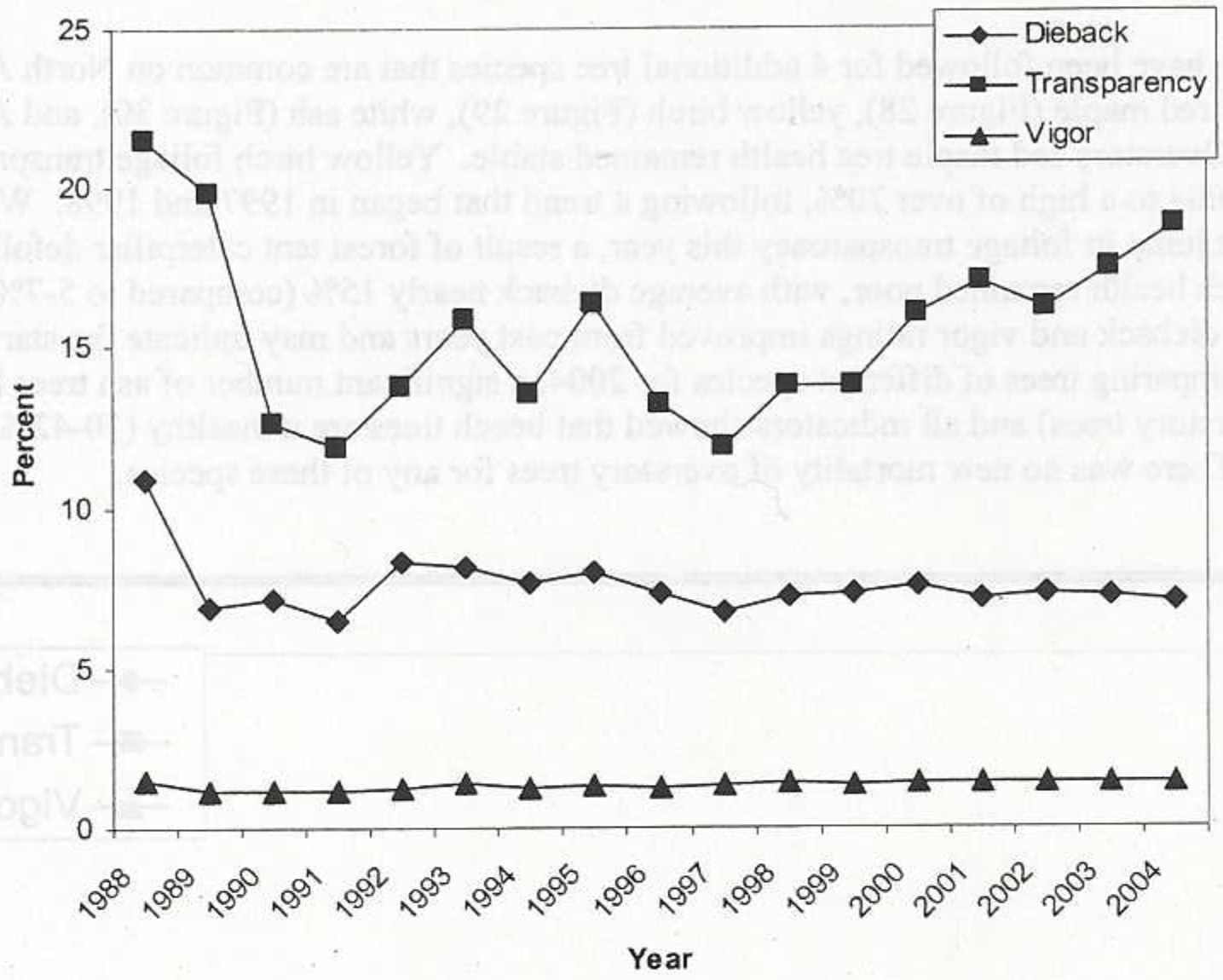


Figure 26. Trend in overstory sugar maple condition as measured by average dieback, foliage transparency and vigor on 38 North American Maple Project plots in Vermont, 1988-2004.

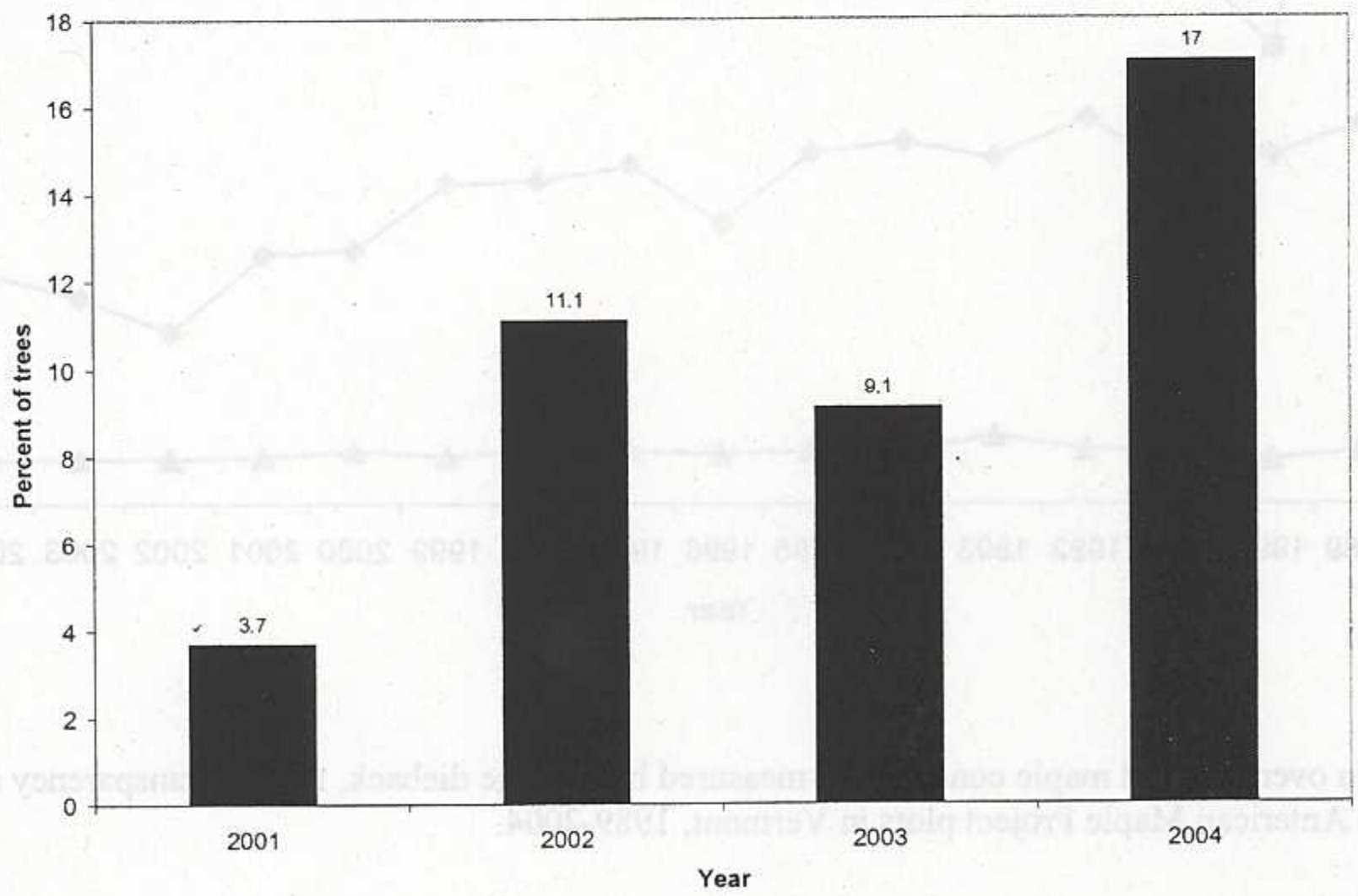


Figure 27. Trend in sugar maple defoliation (percent of trees with moderate to heavy defoliation) on 38 North American Maple Project plots in Vermont, 2001-2004.

Other Hardwood Species Health Statewide

Trends in tree health have been followed for 4 additional tree species that are common on North American Maple Project plots: red maple (Figure 28), yellow birch (Figure 29), white ash (Figure 30), and American beech (Figure 31). Overstory red maple tree health remained stable. Yellow birch foliage transparency increased again in 2004 to a high of over 20%, following a trend that began in 1997 and 1998. White ash showed a significant jump in foliage transparency this year, a result of forest tent caterpillar defoliation in southern sites. Beech health remained poor, with average dieback nearly 15% (compared to 5-7% in other species). However, dieback and vigor ratings improved from past years and may indicate the start to tree improvement. In comparing trees of different species for 2004, a significant number of ash trees had thin foliage (45% of overstory trees) and all indicators showed that beech trees are unhealthy (30-42% of overstory trees) (Figure 32). There was no new mortality of overstory trees for any of these species.

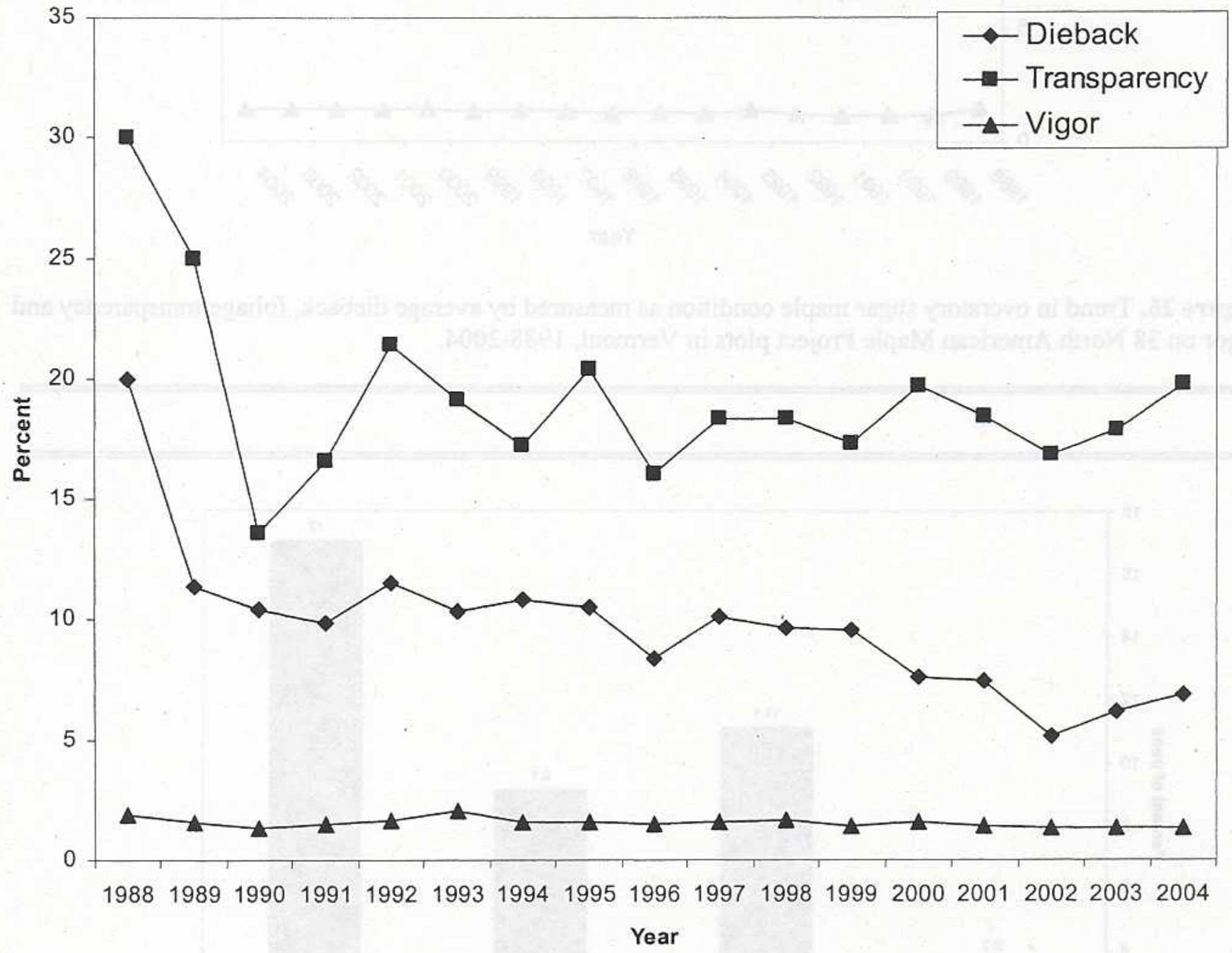


Figure 28. Trend in overstory red maple condition as measured by average dieback, foliage transparency and vigor, on 38 North American Maple Project plots in Vermont, 1989-2004.

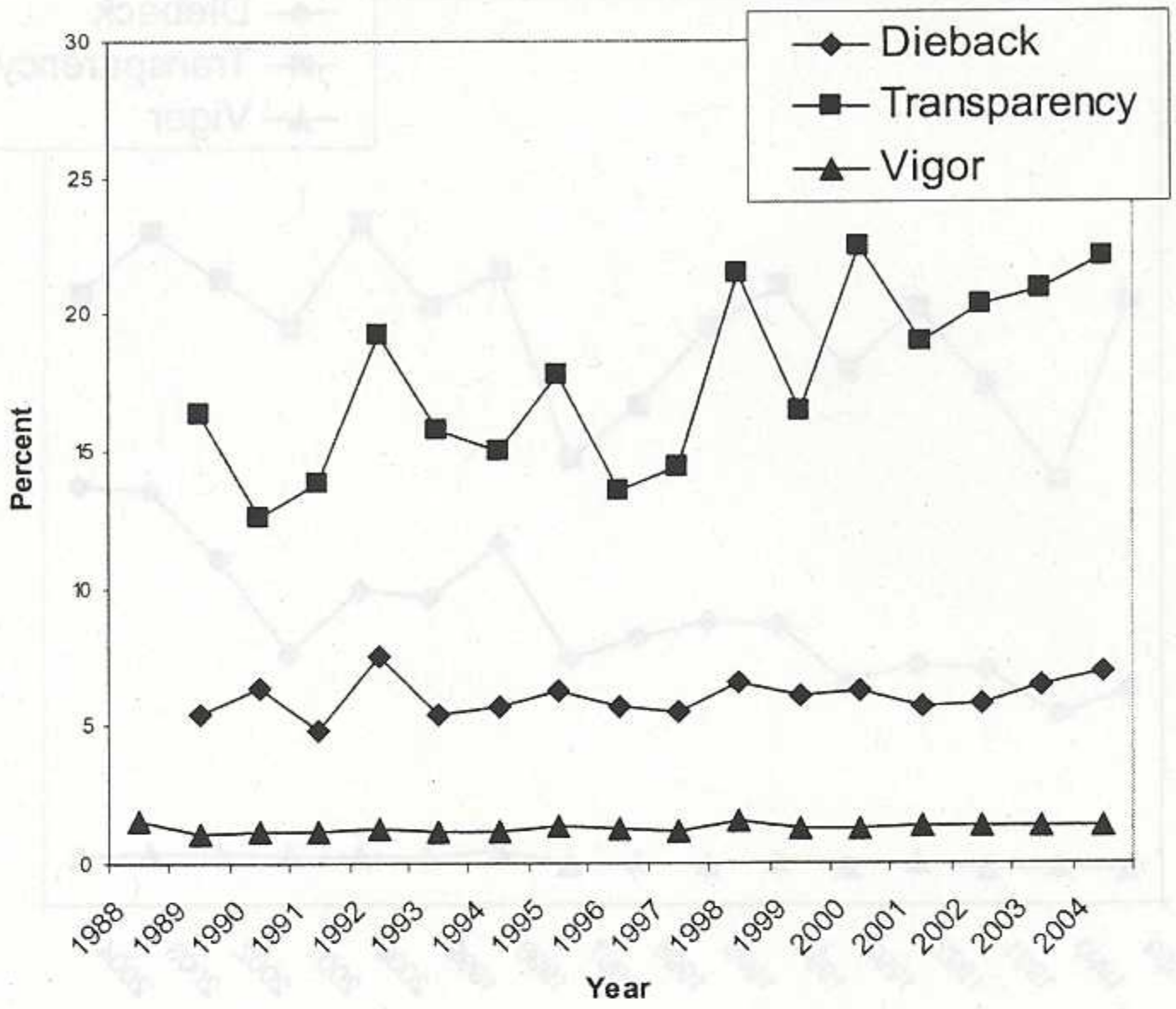


Figure 29. Trend in overstory yellow birch condition as measured by average dieback, foliage transparency and vigor, on 38 North American Maple Project plots in Vermont, 1989-2004.

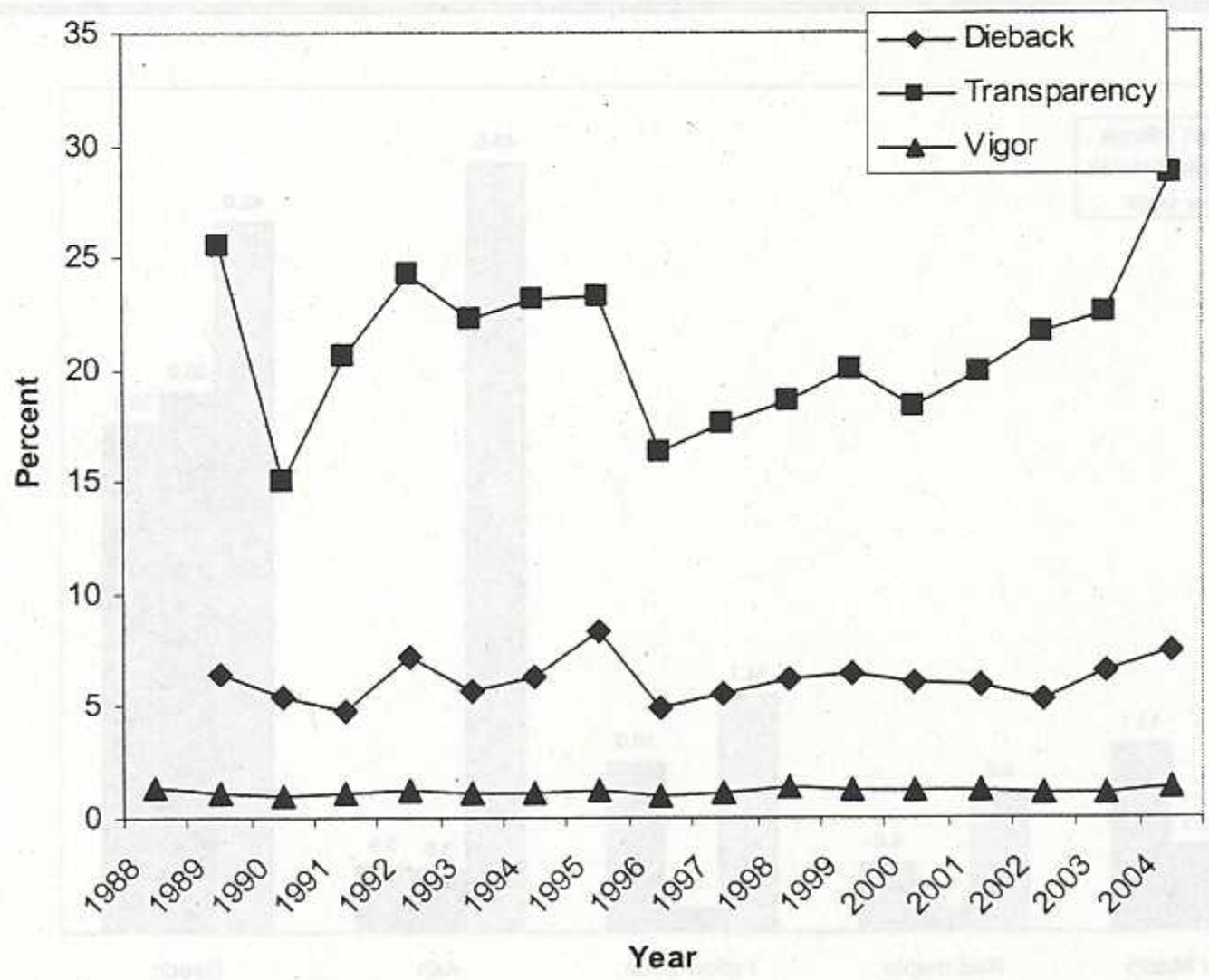


Figure 30. Trend in overstory white ash condition as measured by average dieback, foliage transparency and vigor, on 38 North American Maple Project plots in Vermont, 1989-2004.

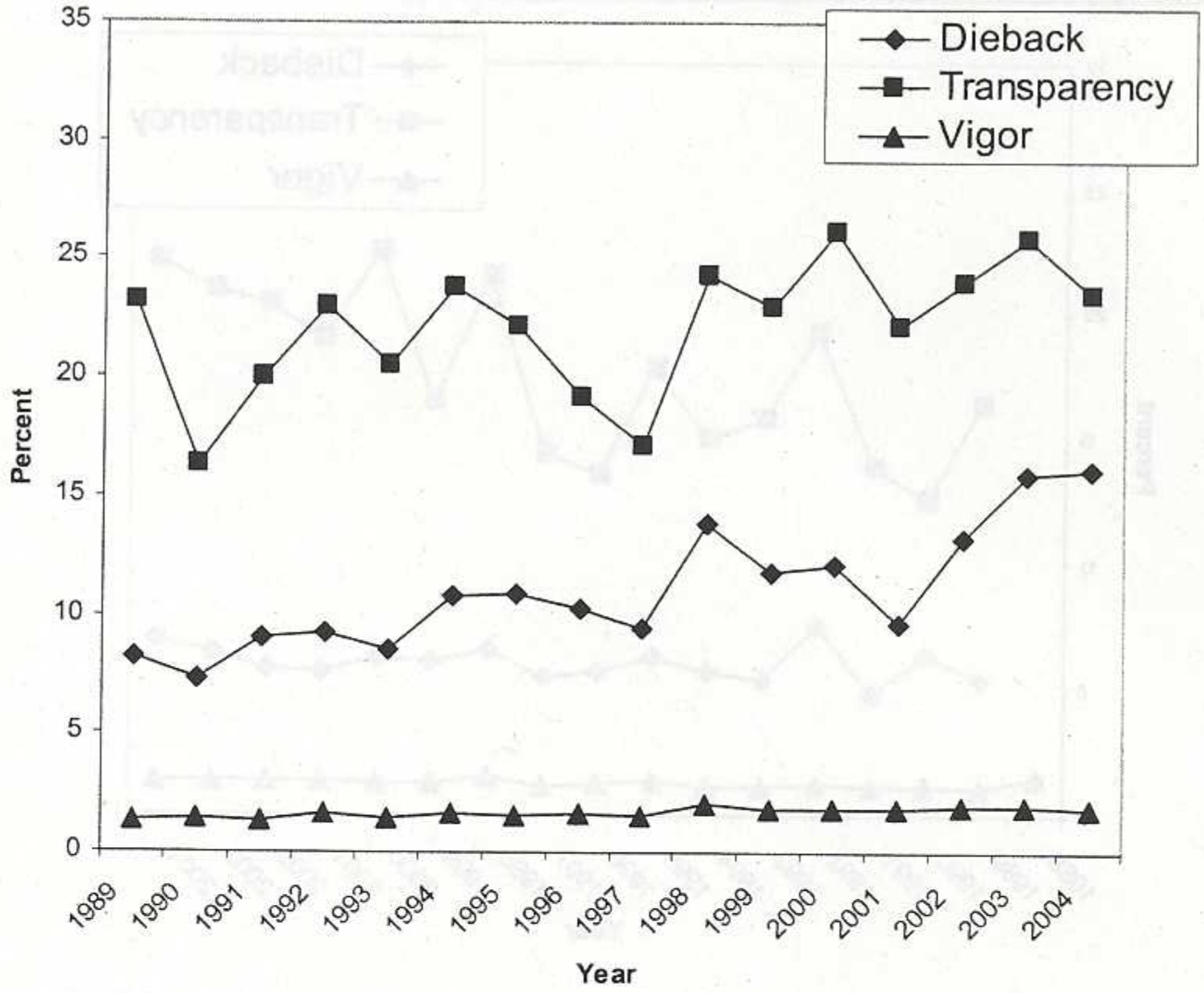


Figure 31. Trend in overstory beech condition as measured by average dieback, foliage transparency and vigor, on 38 North American Maple Project plots in Vermont, 1989-2004.

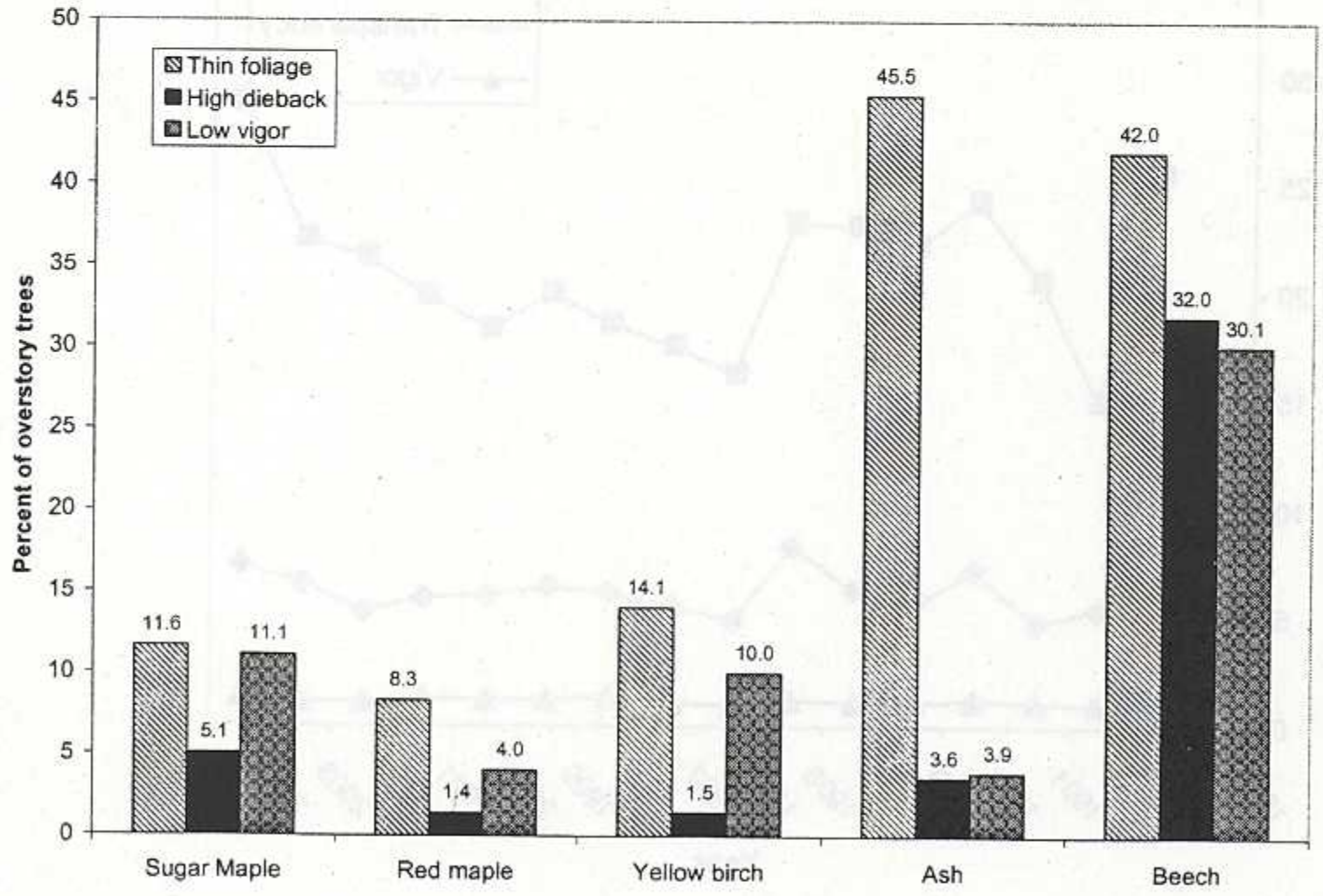


Figure 32. Comparison of health indicators between species on North American Maple Project plots in 2004. Results shown as percent of overstory trees with thin foliage (>25% foliage transparency), high dieback (>15% dieback) and low vigor (moderate to severe decline).

Vermont Monitoring Cooperative Tree Health

Trends in tree health in the Lye Brook Wilderness Area

Trees on Lye Brook Wilderness Area plots showed signs of foliage problems in 2004 at lower elevation sites (Figure 33). Foliage indicators showed over 20% of overstory trees had thin foliage (>25% foliage transparency) and thin crowns (<40% crown density). Although annual conditions have been fluctuating since 1994, the percent of trees with thin foliage has remained elevated since drought conditions began in 1999-2000 (Figure 34).

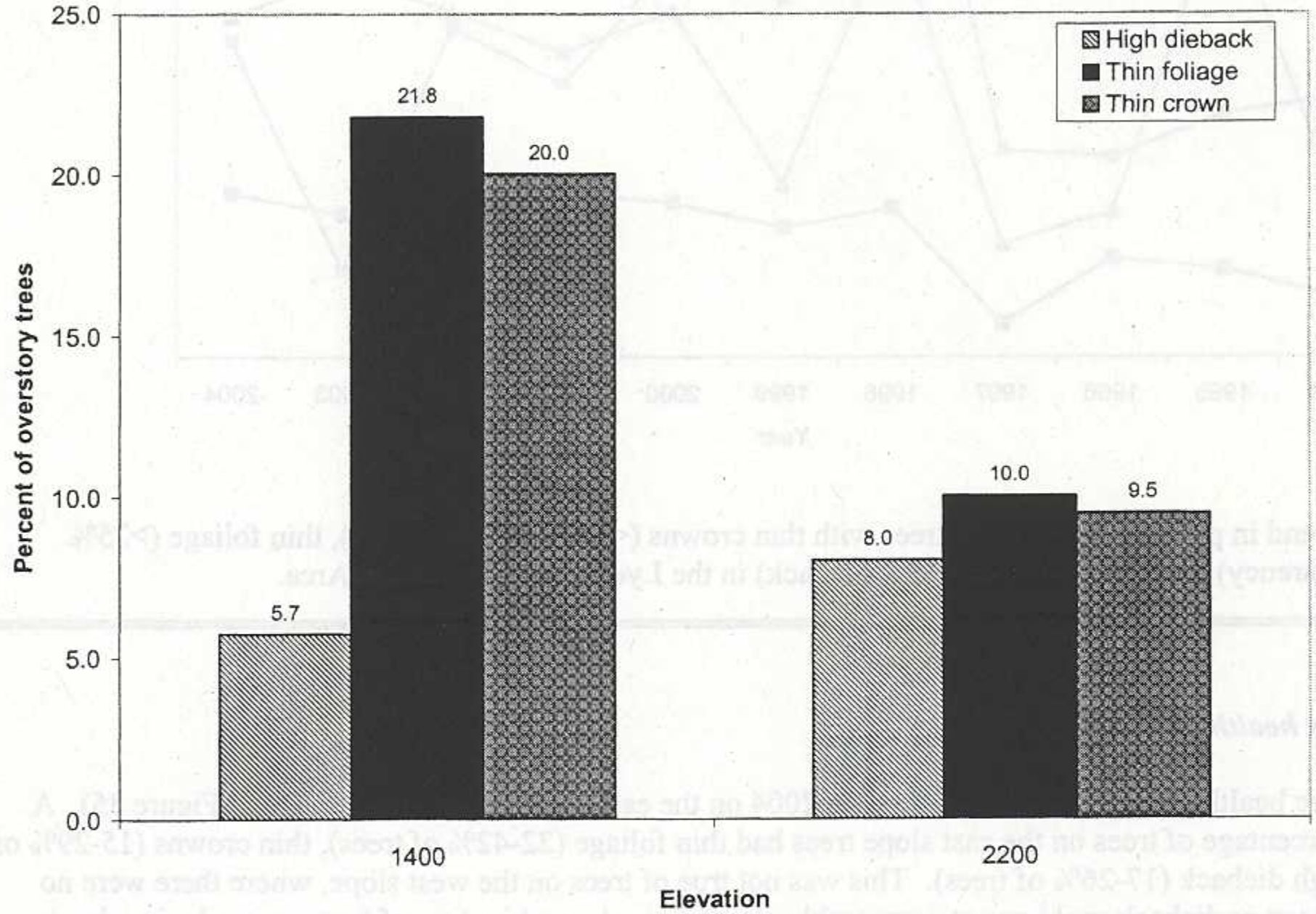


Figure 33. Percent of overstory trees with thin crowns (<40% crown density), thin foliage (>25% foliage transparency) and high dieback (>15% dieback) on Lye Brook Wilderness Area plots at 1400 and 2200 feet in 2004.

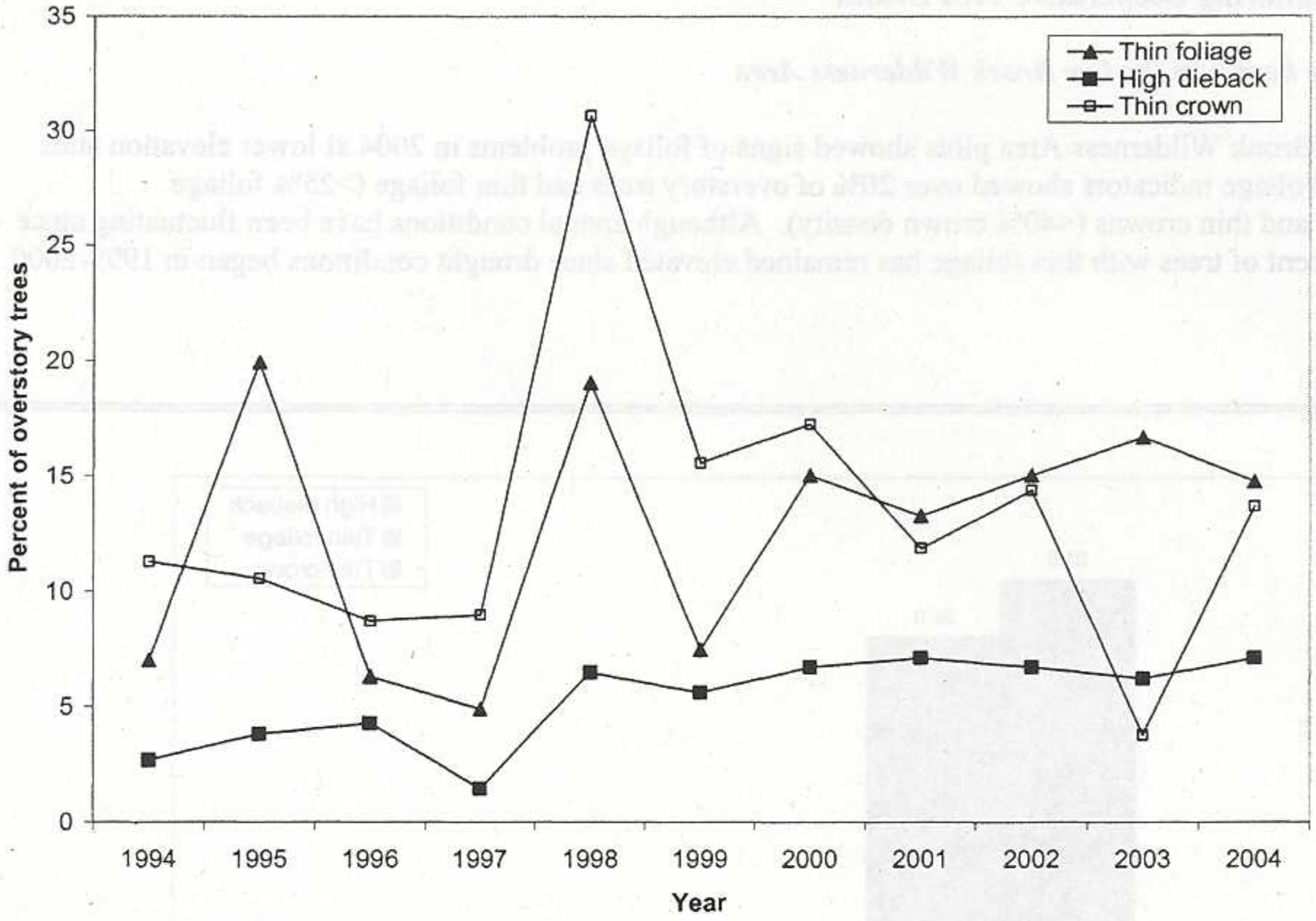


Figure 34. Trend in percent of overstory trees with thin crowns (<40% crown density), thin foliage (>25% foliage transparency) and high dieback (>15% dieback) in the Lye Brook Wilderness Area.

Trends in tree health on Mount Mansfield

Significant tree health problems were measured in 2004 on the east slope of Mount Mansfield (Figure 35). A substantial percentage of trees on the east slope trees had thin foliage (22-42% of trees), thin crowns (15-29% of trees), and high dieback (17-26% of trees). This was not true of trees on the west slope, where there were no trees with foliage or dieback problems at comparable elevations. A combination of factors may be involved: beech bark disease at lower elevations, continuing symptoms from droughts in previous years, and upper elevation spruce effects from 2003 winter injury.

Summit sites (3800 ft.) had an increased incidence of trees with thin foliage and high dieback (Figure 36). This increase follows a trend that began in 2001 during several drought years. Trees at this elevation are particularly vulnerable to fluctuations in water availability since soils are very shallow.

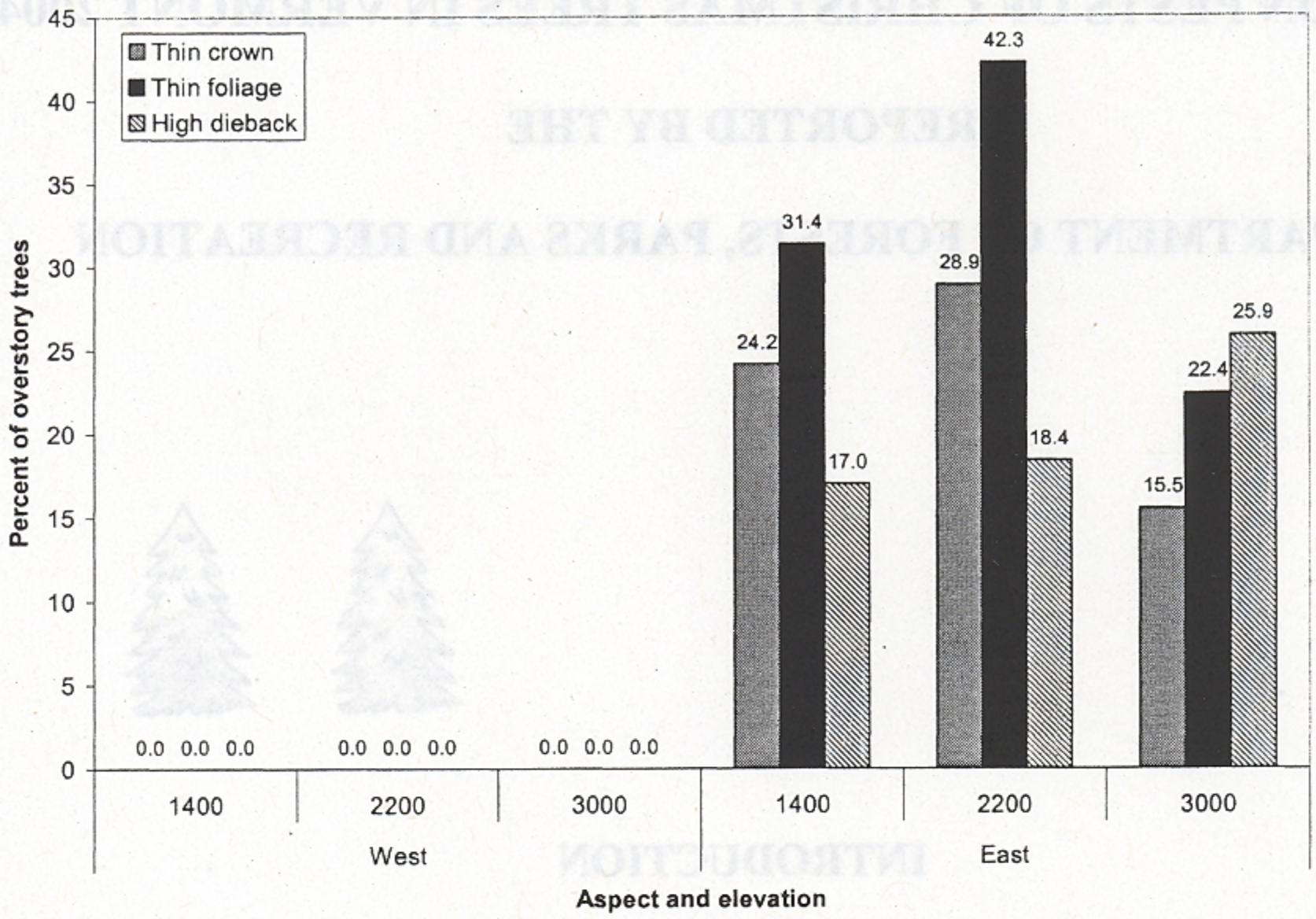


Figure 35. Percent of overstory trees on the west and east slope of Mount Mansfield with thin crowns (<40% crown density), thin foliage (>25% foliage transparency) and high dieback (>15% dieback) in 2004.

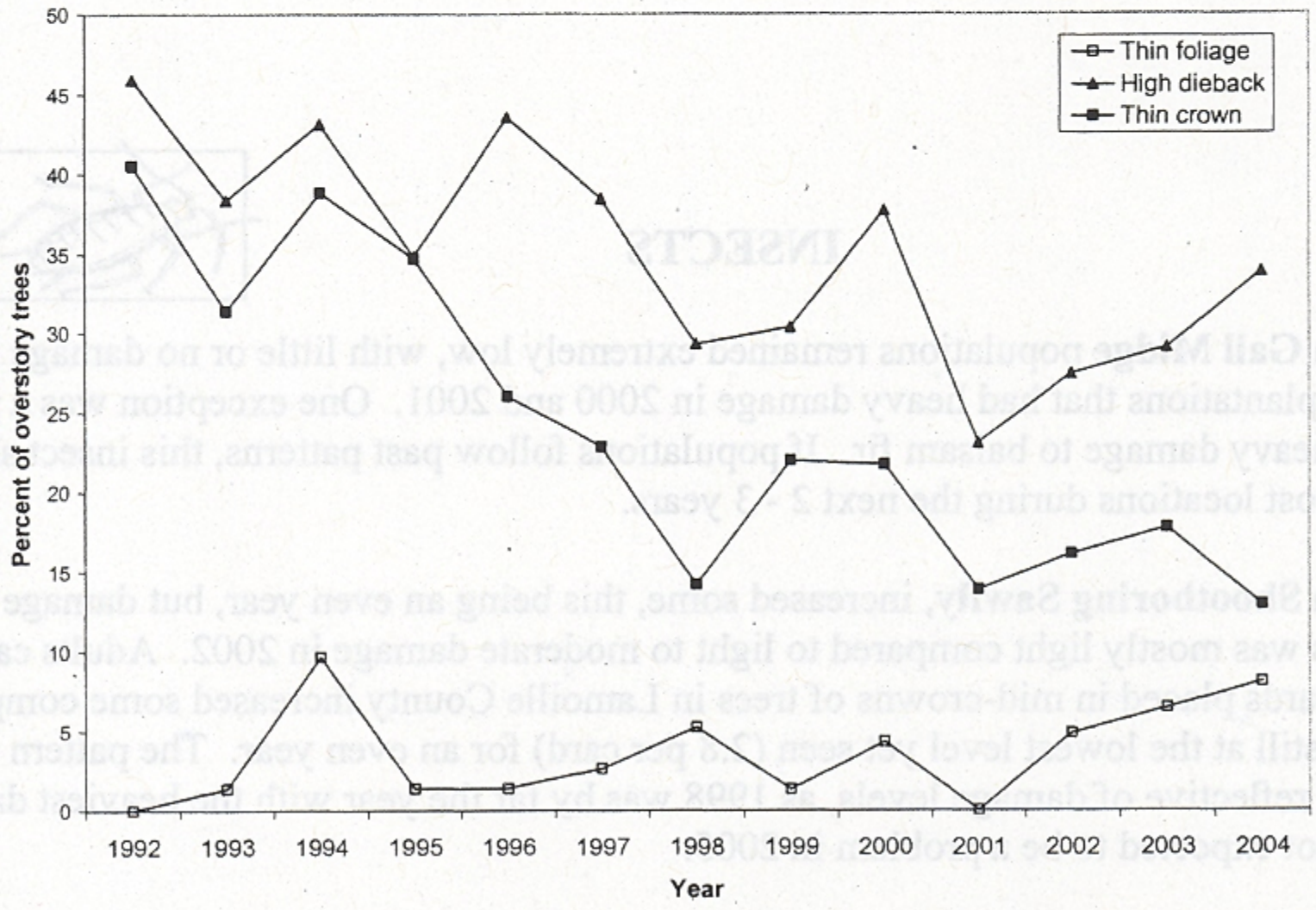


Figure 36. Trend in percent of overstory trees with thin crowns (<40% crown density), thin foliage (>25% foliage transparency) and high dieback (>15% dieback) at the summit of Mount Mansfield.

COMMON PESTS OF CHRISTMAS TREES IN VERMONT 2004

REPORTED BY THE

DEPARTMENT OF FORESTS, PARKS AND RECREATION

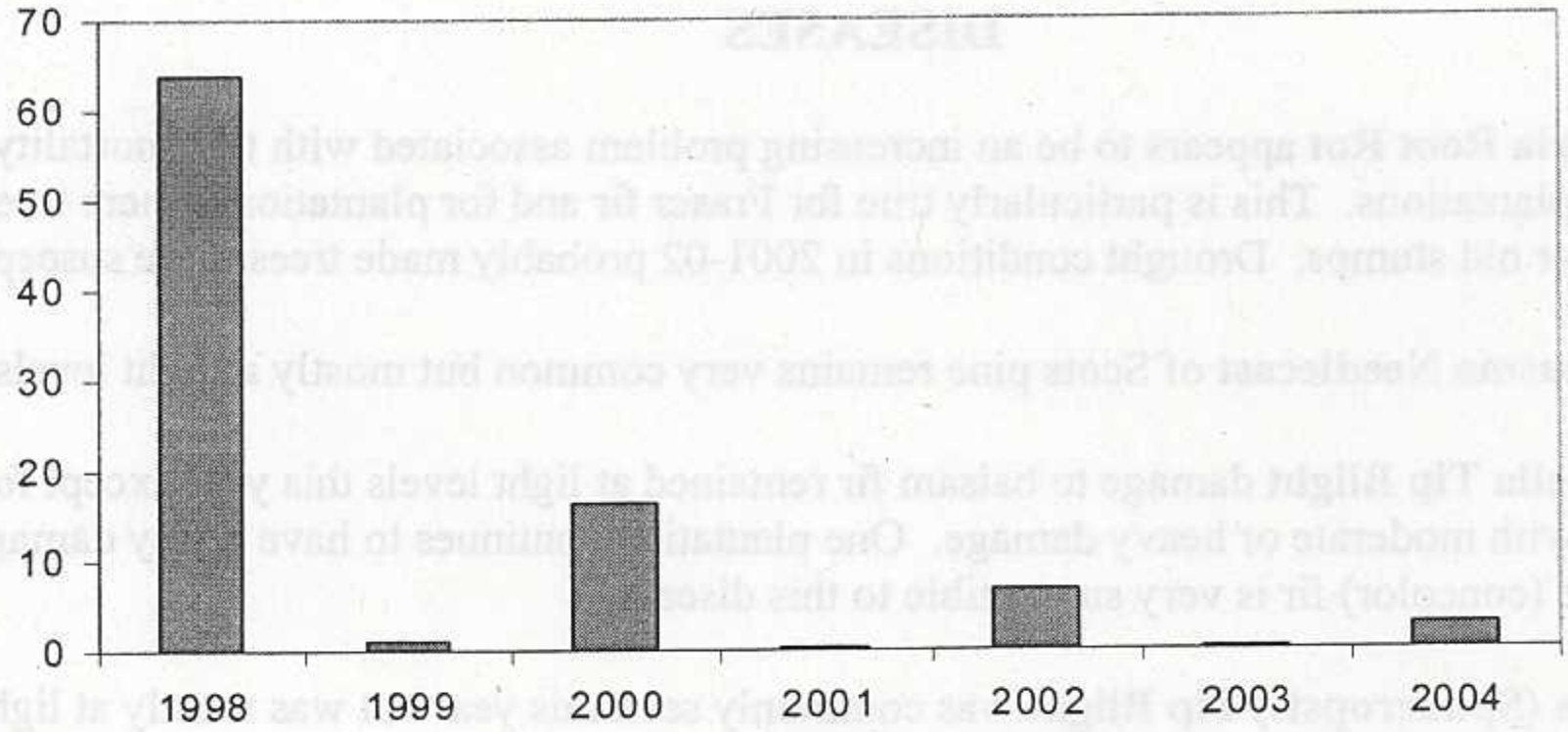
INTRODUCTION

Information in this report is based largely on observations by Forest Resource Protection personnel, including some spot-checks of key plantations. This was an excellent growing season for Christmas trees, similar to 2003, and again many growers reported that their trees had the fewest insect and disease problems ever seen.

INSECTS

Balsam Gall Midge populations remained extremely low, with little or no damage in Christmas tree plantations that had heavy damage in 2000 and 2001. One exception was a plantation in Cabot with heavy damage to balsam fir. If populations follow past patterns, this insect should not be a problem in most locations during the next 2 - 3 years.

Balsam Shootboring Sawfly, increased some, this being an even year, but damage to fir Christmas trees was mostly light compared to light to moderate damage in 2002. Adults caught on 3x5 yellow sticky cards placed in mid-crowns of trees in Lamoille County increased some compared to 2003 but were still at the lowest level yet seen (2.8 per card) for an even year. The pattern of adults caught is fairly reflective of damage levels, as 1998 was by far the year with the heaviest damage. This insect is not expected to be a problem in 2005.



Number of Balsam Shootboring Sawfly Adults Caught on 3x5" Yellow Sticky Cards from 1998 to 2004.

Balsam Twig Aphid damage was light to non-existent in most locations for the second consecutive year, after being at light levels in 2002. Many growers that frequently apply pesticides to control twig aphid did not spray at all this year.

Balsam Woolly Adelgid populations collapsed due to cold temperatures in January. This insect was not observed on Christmas trees in 2004.

Cooley Spruce Gall Adelgid galls on blue or white spruce were difficult to find this year, although light populations were observed on the alternate host, Douglas-fir.

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

Pine Spittlebugs were seen on white pine at light levels in widely scattered locations.

Root Aphids were associated with discoloration and dieback of young fir trees in plantations in Springfield and Essex.

Sawyer Beetle adults were sometimes seen but damage was infrequent.

Spruce Bud Moth damage was occasionally observed on blue spruce at trace levels.

Spruce Spider Mite populations remained mostly low. Widely scattered plantations had occasional fir trees with light to moderate damage. Mite populations had increased noticeably in many areas by the end of the growing season, so damage may be more noticeable in 2005.

White Pine Weevil damage to pine and spruce trees remained common throughout the survey area but damage remained mostly at light levels.

DISEASES

Armillaria Root Rot appears to be an increasing problem associated with tree mortality in more and more plantations. This is particularly true for Fraser fir and for plantations where trees are inter-planted near old stumps. Drought conditions in 2001-02 probably made trees more susceptible.

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

Delphinella Tip Blight damage to balsam fir remained at light levels this year except for an occasional tree with moderate or heavy damage. One plantation continues to have heavy damage on white fir. White (concolor) fir is very susceptible to this disease.

Diplodia (Sphaeropsis) Tip Blight was commonly seen this year but was mostly at light levels. Hosts included balsam fir, Fraser fir and white pine.

Fir-Fern Rust, which was common in 2003, was even more widespread this year, but damage remained mostly light.

Interior Needle Drop was unusually light on balsam and fraser fir trees in the fall.

Lirula Needlecast was observed at a trace level on balsam fir in a Waterford plantation.

Lophodermium Needlecast remained common at mostly light levels.

Phytopthora Root Rot was commonly associated with the death of Fraser fir and occasionally balsam fir growing on poorly or somewhat poorly drained sites in widespread locations. Dale Bergdahl, Forest Pathologist from the University of Vermont, conducted a survey for the disease this summer. *Phytopthora* was isolated in two of the four plantations surveyed that had dying fraser fir.

Rhizosphaera Needle Blight of Fir, caused by *Rhizosphaera pini*, remained at mostly light levels in scattered locations and was reported as far south as Springfield. Balsam fir remains the principal host but a trace amount of damage was observed on Fralsam fir.

Rhizosphaera Needlecast of spruce remains common, with mostly light damage reported.

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

Swiss Needlecast of Douglas-fir remained common at moderate to heavy levels in some plantations in widely scattered locations.

White Pine Blister Rust damage remains common throughout the state.

Winter Injury killed buds on Douglas-fir Christmas trees in Bennington.

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

Yellow Witches Broom Rust of balsam fir remains common at light to moderate levels.

Frost Damage was occasionally seen this year. One plantation in Craftsbury had light to moderate damage and one in Bakersfield had light damage. Species affected included fir, blue spruce and white spruce.

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, and Yellow-headed Spruce Sawfly.

Diseases: Spruce Needle Rust, Sirococcus Shoot Blight, White Pine Needle Blight and Rhabdocline Needlecast.

Prepared by Department of Forests, Parks and Recreation, Division of Forests Staff:

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Barbara S. Burns, Forest Insect and Disease Specialist, Springfield	885-8821
Sandy H. Wilmot, Forest Health Specialist, Morrisville	888-5733
Trish Hanson, Entomologist, Waterbury Laboratory	241-3606

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Lars Lund, Rutland	786-3856
Pete Reed, Essex Junction	879-5683
Tom Simmons, Essex Junction	879-5685
Tess Greaves, Morrisville	888-5733
Jay Lackey, Barre	476-0178
Kathy Decker, St. Johnsbury	751-0117

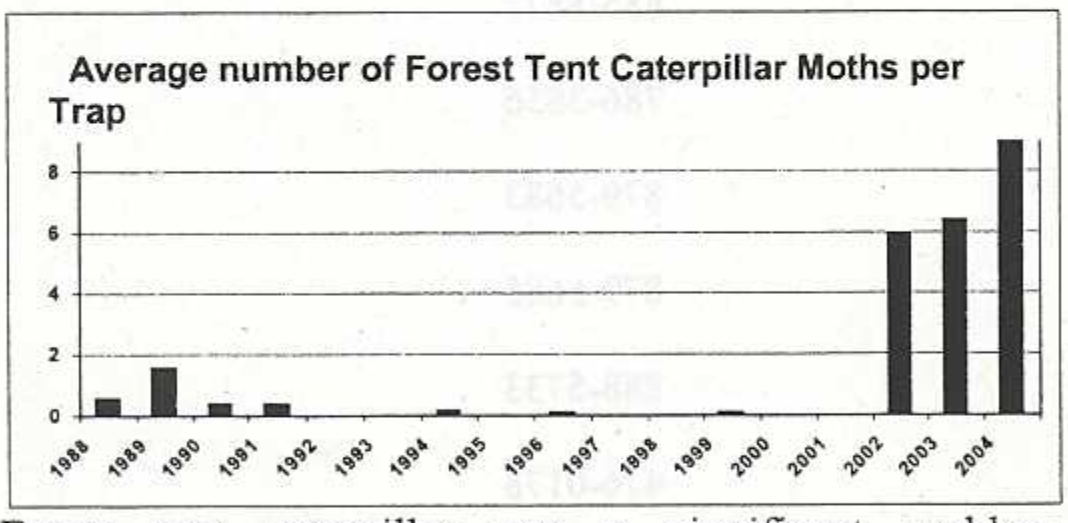
HEALTH OF SUGAR MAPLE IN VERMONT - 2004

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

This information on health of sugar maple is based on aerial surveys and field observations by the VT Dept. of Forests, Parks, and Recreation, the University of Vermont and the U.S. Forest Service. Every year, the Department of Forests, Parks, and Recreation looks at tree health from the ground and from the air. In 2004, 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.

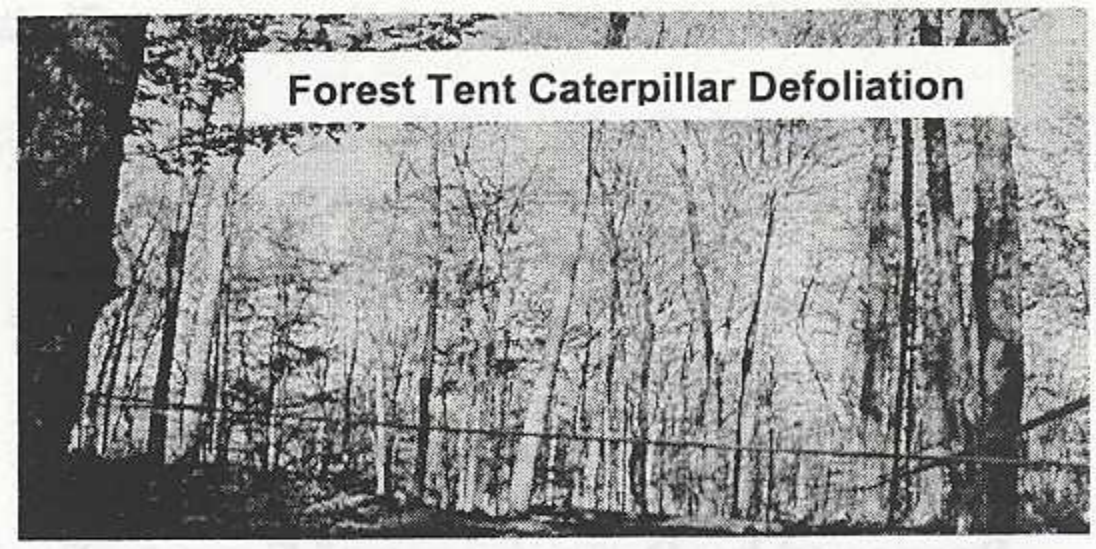
Defoliation Attributed to Forest Tent Caterpillar Mapped in 2004

Forest Tent Caterpillar caused widespread defoliation of sugarbushes in 2004. Over 90,000 acres of defoliation by this insect were mapped (at left). The number of forest tent caterpillar moths caught in traps increased this summer, indicating that we should expect more defoliation in 2005 (see chart). Egg mass surveys done to date also indicate that some new areas will be defoliated next summer. Historically, outbreaks last 1-3 years in one region, but 3-8 years statewide, as new regions are defoliated.

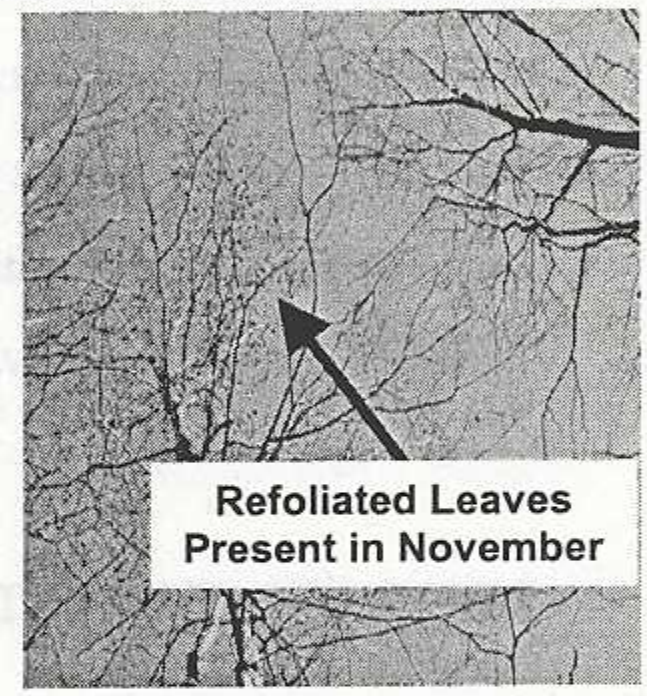


Forest tent caterpillar was a significant problem to sugarbushes between 1977 and1982. While southern and central counties had the most defoliation early in that outbreak, heavy damage occurred in northern counties later on. In all, over 360,000 acres were defoliated. By 1984, sugar maple decline and mortality were noticeable on about 10% of this area.

Defoliation affects tree health by reducing starch reserves available for winter survival, sap production, spring leaf flush, and wood growth. Trees growing on nutrient rich soils are better able to tolerate defoliation.



Many trees did not refoliate normally. Although defoliated trees broke bud by July, this refoliation was also destroyed by caterpillars. Some even broke bud a third time, and still had green leaves in November (arrow). Maple health was evaluated, by rating root starch reserves, in several defoliated sugarbushes. Roots had adequate starch levels as long as they had not put out a new flush of leaves in the fall AND were growing on deep, nutrient-rich soils.



We recommend the following management practices to sugarmakers concerned about tree health during the forest tent caterpillar outbreak:

For sugarbushes that were defoliated in 2004, trees that didn't refoliate, or refoliated in the fall, shouldn't be tapped in 2005, unless testing has determined that starch reserves are adequate.

Elsewhere in the infested region, the risk of forest tent caterpillar defoliation in 2005 can be predicted by doing an egg mass survey this winter. If defoliation is predicted, foliage can be protected next spring by aerial spraying of the biological insecticide, Bt. Some cost share for spraying may be available. Delay any timber harvesting for at least 3 years after the outbreak to minimize additional stress on trees, and to see which trees survive. Current Use plans can be amended by contacting the county forester.

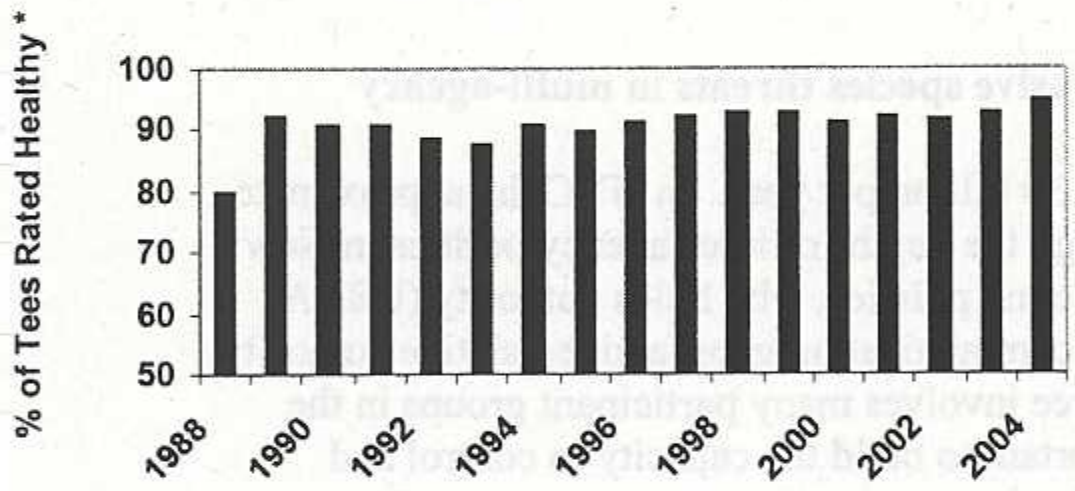
Forest Tent Caterpillar Egg Mass

All sugarmakers should look for forest tent caterpillar egg masses this winter in the tops of maples. They're visible with binoculars. Check for caterpillars or defoliation in June. Be flexible when scheduling timber harvests, so you can postpone them if populations build. While thinning usually benefits tree health, cutting trees during an outbreak can increase the damage from defoliation.

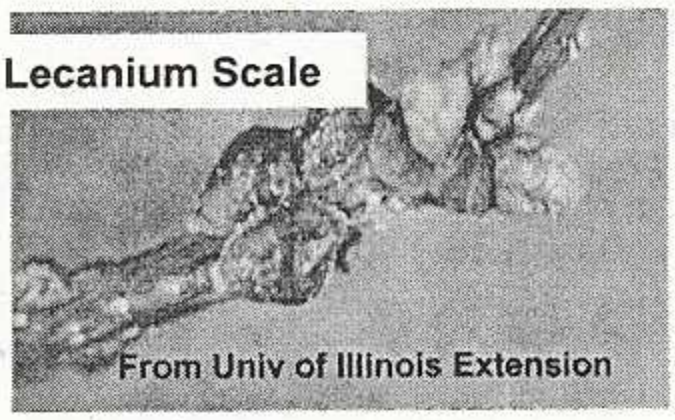
Weather conditions in 2004 were generally good for sugar maple. Although the previous winter included some cold temperatures, continuous snow cover prevented root damage. Late spring frosts were uncommon. Moisture was adequate throughout the growing season.

To assess the **General Condition** of maple stands, 2000 sugar maples were evaluated as part of the North American Maple Project. Over 90% of sugar maple trees on survey plots remained healthy in 2004, and mortality was low. On average, crown vigor improved, indicating some recovery from previous drought years. Defoliation from forest tent caterpillar, Bruce spanworm and maple leaf cutter caused significant defoliation on nearly half of these plots.

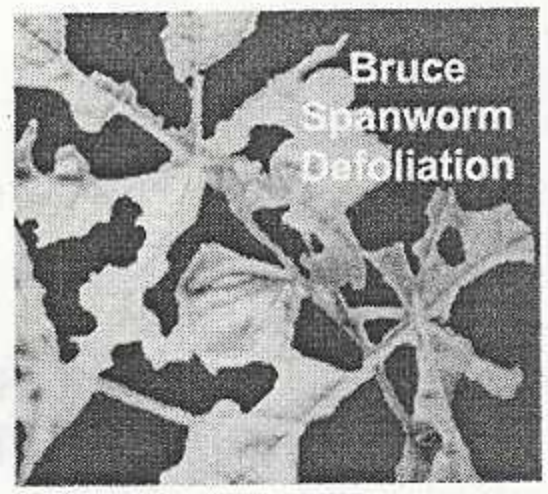
Sugar Maple Condition in Vermont
North American Maple Project Plots



Many sugarbushes had heavy levels of a tiny insect called **Lecanium Scale** infesting twigs on lower branches. This insect feeds on sap, and reproduces under a hard brown shell, which resembles a shiny bud. The impact on tree health is unknown. However, the sugary honeydew excreted by feeding scale insects was the cause of the dull, black covering that was often noticeable on tubing and understory leaves. "Sooty mold" uses honeydew as a food source.



Bruce Spanworm damage dropped off in northern Vermont, but increased in the southern counties. Heavy defoliation of sugar maple occurred in the mountains around Killington, Plymouth, and Mt. Holly, but no defoliated sugarbushes were reported. Moths were common in the fall, so this insect may be present again in 2005. Bruce spanworms are green inchworms whose feeding results in lacy looking leaves. Feeding starts as soon as the leaves come out, and refoliation occurs by mid-July. The impact on tree health is not severe because defoliated trees have an opportunity to replenish their food reserves by the end of the growing season. We do not recommend aerial suppression of this insect.



Maple Webworm was very noticeable late in the year, especially in sugarbushes where there had been a lot of forest tent caterpillars. This insect feeds inside rolled up leaves, and thrived on leaves that were already rolled by forest tent caterpillars in the process of making cocoons.

Maple Webworm, from inside rolled leaf

For More Information: Insect and disease reports, and requests for identification, publications, and information on control, should be directed to the County Forester or Forest Resource Protection personnel at our district or county offices.

Addison	388-4969	879-6565
Bennington	375-1217	786-3851
Caledonia	751-0111	751-0110
Chittenden	879-5694	879-6565
Essex	751-0111	751-0110
Franklin	524-6501	879-6565
Grand Isle	524-6501	879-6565
Lamoille	888-5733	476-0170
Orange	476-0173	476-0170
Orleans	334-7325	751-0110
Rutland	786-3853	786-3851
Washington	476-0172	476-0170
Windham	257-7967	885-8855
Windsor	296-7630	885-8855

22nd
VERMONT FOREST PEST WORKSHOP
Aiken Center, JANUARY 3, 2005

CO-SPONSORED BY
VERMONT DEPARTMENT OF FORESTS, PARKS AND RECREATION
RUBENSTEIN SCHOOL OF ENVIRONMENT AND NATURAL RESOURCES

MEETING SUMMARY.

A special thanks to Brent Teillon for his contribution to the VFP workshop through the years. Best of luck in retirement.

The 2004 Vermont Forest Pest Award was presented to Bill Clark, for his continued lifelong contribution to the Vermont Maple Sugar industry. **Robert Paquin, from Senator Leahy's office**, was on hand to present the award.

UVM Forest Entomology Lab, guest speakers

Michael Bohne, USFS New York –Battling the Asian Longhorned Beetle
A report on the current state of the New York City ALB eradication program. Approximately 100 individuals are currently working on this project. There are many political and functional difficulties involved in the process of tree monitoring and removal in the urban environment. Interpreting the success of this project was also made difficult because accomplishment is measured by a lack of observed infestations. Cateret, NJ reported a new infestation in 2004. 410 infested trees have been observed in this case and 4000 trees will be removed this winter. The community of Cateret appears to be very supportive of the eradication efforts. Look for the ALB quarterly reports for updated information.

Jerry Carlson, New York Department of Conservation- Invasive species threats in multi-agency environments, politics and interagency conflicts
The estimated cost to the US economy of invasive species is $130 billion per year. In NYC the approximate cost per tree planted is $1000. What does it take to wade through the depths of inter-agency politics in New York? It is important to consider historical partnerships, conflicting policies, who holds authority (USDA APHIS, Forest Service, NYC mayor, NYC parks managers…) communication gaps, and legislative authority versus political will power. The NYC invasive species task force involves many participant groups in the process. Partnerships among all levels of government are important to build the capacity to control and eradicate invasive species.

OBSERVATIONS

New Yorkers seem to have a lot of things other than beetles or trees on their mind.
Inspectors have been chided for looking for insects on imported goods.
NYC is becoming a greater and greater port - 65% increase in overall container traffic since 1998.
$100 billion worth of wares moved through port (up 12 percent in 1 year).
Agencies often appear to be more concerned with data gathering than with more active prevention, regulation, and enforcement.
Agencies such as the Michigan Department of Agriculture have been dramatically rearranged by sudden invasive species management issues.

USDA Forest Service Durham Field Office

Cynthia Ash - USFS Durham field office 2004 accomplishments and highlights
Remote sensing - Digital aerial sketchmapping system. Aerial photos of New Jersey are being used to observe early foliage senescence and to help delimit the extent of ALB infestation. USFS is providing training and coordination for state Sudden Oak Death (SOD) surveys and survey training for diagnosticians in northeast US. *Phytophthora* species are quite common in the forest, and identification requires skill. Participation in ALB NY outreach programs including monthly conference calls. USFS Durham assisted with a survey for the New England invasive plant atlas. Check it out at: http://invasives.eeb.uconn.edu/ipane/. Efforts in 2005 will include: DFO forest health program, outreach to underserved federal and tribal lands, facilitation of exotic pest response planning, ground truthing aerial survey data, improve the monitoring of grants and agreements, and improving safety awareness.

UVM Forest Pathology Lab: HWA and butternut canker work

Dan Ruddell - Butternut canker mortality assessment
Dan has been working on a county by county assessment of butternut canker mortality. It is estimated that butternut is experiencing 45-50 percent mortality throughout the state. During his 2004 field season, Dan failed to observe a single canker free butternut in VT. Mortality, however, appears to be lower in riparian areas. Dan is exploring the potential effects of calcium depletion on butternut mortality and health.

Dan Ruddell and Ben Machin - Hemlock Woolly Adelgid (HWA) risk assessment
A HWA risk assessment model first designed for Windham County is currently being extended to include the six southern most counties of Vermont. This GIS model uses susceptibility and vulnerability matrices in order to quantify site specific risk of HWA introduction and eastern hemlock mortality. Such factors as proximity to seasonal residencies, proximity to nurseries, USDA cold hardiness zone, and soil moisture conditions are factored into the model. Currently the model is being applied in a risk assessment of Marsh Billings Rockefeller National Historic Park in Woodstock.

Shane Lishawa -HWA risk assessment in deer wintering areas (DWA) of southern Vermont
In the summer of 2004, DWAs in the southern four counties of Vermont were sampled in order to develop a model examining the eastern hemlock component of Vermont's DWAs. In addition, the HWA risk assessment model developed by Machin and Ruddell will be used in order to assess the risk of the HWA introduction to the DWAs of Vermont. A separate study is currently being conducted comparing winter temperature and snow depths within stands with eastern hemlock cover versus stands with hardwood cover in order to quantify some of the conditions created by eastern hemlock cover in winter.

USFS South Burlington

Paul Schaberg –Red Spruce Winter Injury-2003 Winter injury associated with acid rain/calcium depletion
In 2003, approximately 65% of red spruce experienced winter injury. This figure is 5 times the baseline injury rate. Paul's lab has worked to determine what caused the elevated injury levels. An ordinary least squares regression and a geographically weighted regression were run in order to determine if a spatial pattern of the 2003 injury exists. It was revealed that higher elevation, western longitude, and west-facing plots experienced significantly greater injury. It has been shown that calcium depletion leads to reduced plant cold tolerance. It is concluded that red spruce winter injury in 2003 was greater in Ca depleted sites. What will be the ecological legacy of the 2003 winter injury? Long-term monitoring will be needed in order to assess this question.

Vermont Department of Forests, Parks and Recreation/Vermont Monitoring Coop

Barbara Burns - Review of pests in 2004 with a special focus on forest tent caterpillar
-Beech bark disease, the area infected continues to increase
-Balsam woolly adelgid, cold winters appear to have killed back
-Birch dieback, continued observance
-Larch decline increasing
-Buckthorn cankers, fungi isolated and appear to be causing mortality
-Fraser fir mortality, possibly *Phytophthora*
-Diplodia shoot blight, a midwestern strain has been identified that is more virulent than the more common variety
-Maple anthracnose, observed but not abundant
-Fireblight on apple, common on wild apples
-Arborvitae leaf miner, identified by Ron Kelly
-Satin moth exotic on poplar
-Bruce spanworm, causing light crowns of beech and maple
-Fall cankerworm, observed in the Champlain Valley
-Green Fruitworm, observed
-Maple webworm, present throughout state
-Eastern Tent caterpillar common this year
-Forest tent caterpillar heavy defoliation on maples this year. Defoliation started early and damage occurred through mid-July. The feeding period expanded through mid August this year. Oak and maple did not refoliate well. Will this defoliation have a large impact on trees? Most trees can survive a defoliation event for one year, but the second year will yield more death. Calcium richness tends to predict mortality. Data from past events indicate that recurrent defoliation at the same locality is uncommon. We will see how this plays out.

Remember to submit your work to Barb for publication in *2004 Forest Insect and Disease Conditions for Vermont*- Reported by the Vermont Dept. of Forests Parks, and Recreation.

Sean Lawson - Vermont Monitoring Cooperative. 2004 Update on Staff and Projects
Vermont Monitoring Cooperative (VMC) is a partnership of State of VT, UVM, and USFS focusing on ecosystem health monitoring, research coordination and funding, and information sharing. In 2004 VMC acquired two new staff additions, Melody Brown Burkins, and Sean Lawson. VMC forest pest monitoring continued this year. New Projects in 2004 include; vapor phase mercury measurements at Proctor Maple Research Center forest canopy tower. VMCs newest meteorological station on Lake Champlain is featured at www.erh.noaa.gov/btv. VMC continues to fund ongoing projects in 2004-05 including; the Forest Ecosystem Management Demonstration Project, mercury monitoring projects, amphibian monitoring project, avian monitoring through VINS, and a long-term soils study. A new VMC website will be unveiled in early 2005.

Tess Greaves - 2004 HWA Eradication Project
In May of 2004, an accidental introduction of HWA was reported in VT. In less than one month, VT Forest and Parks Department completed eradication efforts having eliminated 413 of 427 eastern hemlocks originated with the infested stock.

Ron Kelly - Michigan Emerald Ash Borer Situation.
According to Mike Phillip of the Michigan DEA, there appears to be no hope of emerald ash borer (EAB) eradication in Michigan. Michigan has spent $12 million on ash removal and EAB monitoring this year. EAB is an aggressive killer of healthy ash species and has killed an estimated 8-12 million trees. Conspicuous signs and symptoms of infestation include; D-shaped exit holes, woodpecker holes, epicormic sprouts, notch feeding on leaves, bark splitting, and S-shaped larval galleries. Outlier populations of EAB appear to be originating in firewood movement from the infestation epicenter in the greater Detroit area. In 2004, 9000 "trap trees" throughout the state were created to attract and catch the insects. Management activities include; an ash quarantine, .5 mile radius ash removal from known infested trees, and chipping of culled trees. For more information visit these websites: **www.michigan.gov/mda, www.emeraldashborer.info, www.na.fs.fed.us/spfo/eab/index.html.**

Vermont Department of Agriculture

Scott Pfister - Pine shoot beetle, HWA, and SOD
Pine shoot beetle has been detected along VT border resulting in the expansion of quarantine in New York. The quarantine area extends throughout the lake states to Maine and down to West Virginia and restricts the movement of pine and pine logs. Nursery stock and Christmas trees need to be inspected and certified before export from VT.

HWA Quarantine. The current quarantine allows hemlock nursery stock from infested counties if inspected and certified free of HWA. The accidental introduction that occurred this spring came from stock that was certified free of HWA. There are currently no restrictions on hemlock nursery stock imported from non-infested counties. An inspection certificate must accompany nursery stock. In a proposed revision to the quarantine, among other things hemlock stock imported from infested counties would be totally prohibited.

SOD causal agent *Phytophthora ramorum* also causes many diseases and leaf blights. There are many hosts in North America and in Europe. Eastern host species include; oak, mountain laurel, and rhododendron. Surveys are being conducted in the east in order to determine, what the distribution of *P. ramorum* is in the US and if it is found in the east. The VT survey came up with all negative results. Nationally there were 176 positive finds in 22 states.

It is evident that nursery stock has been shipped all over the US, but there is no evidence to suggest that the pathogen has established itself anywhere in the US except for the West Coast.

Bonnie MacCulloch - VT Department of Agriculture Invasive species update
Some invasive species of concern for VT: Brown spruce longhorn beetle *Tetropium fuscum*; Siberian moth, an aggressive insect that attacks over 20 species of fir, pine, spruce, larch, and hemlock, not currently found in North America; Swede midge, a pest of brassicas; Giant hogweed; British yellowhead. High risk invasive species detection activities include identification of significant entry pathways, prioritizing introduction zones, enhancing the use of available resources and encouraging cooperation between federal and state agencies, making site visits, and initiating points of contact.

Alan Graham - 2004 Mosquito surveillance and suppression in Vermont
In the summer of 2004, 9 of 14 Vermont counties were involved in a mosquito survey. Mosquitoes were collected at 402 locations Approximately 41,000 mosquitoes were collected and many were tested for West Nile virus (WNV). There were 7 positive results, six of which occurred in Chittenden County. In a dead bird count and testing program, 9 of 598 dead birds tested positive for WNV.

Exhibit Awards

Poster/Display
1st place: David Brynn with VT Family Forests display
2nd place: Shari Halik and Dale Bergdahl with *Tomicus piniperda* poster
3rd place: Sandy Wilmot with a sugar maple pest poster

Most Unusual Pest
1st place: Don Tobi with black fuzzy balls on alder
2nd place: Rich Greenwood with corkscrew in maple
3rd place: Don Tobi and Bruce Parker with birds head buckthorn

Special thanks to the Vermont, Department of Forests, Parks and Recreation for providing lunch and refreshments, and to the UVM School of Environment and Natural Resources for providing meeting space in Aiken Center. Also, many thanks to Casey Hayes for preparing coffee and setting up lunch and Shane Lishawa for providing us with this summary.

See you all next year on Monday, January 9, 2006!!