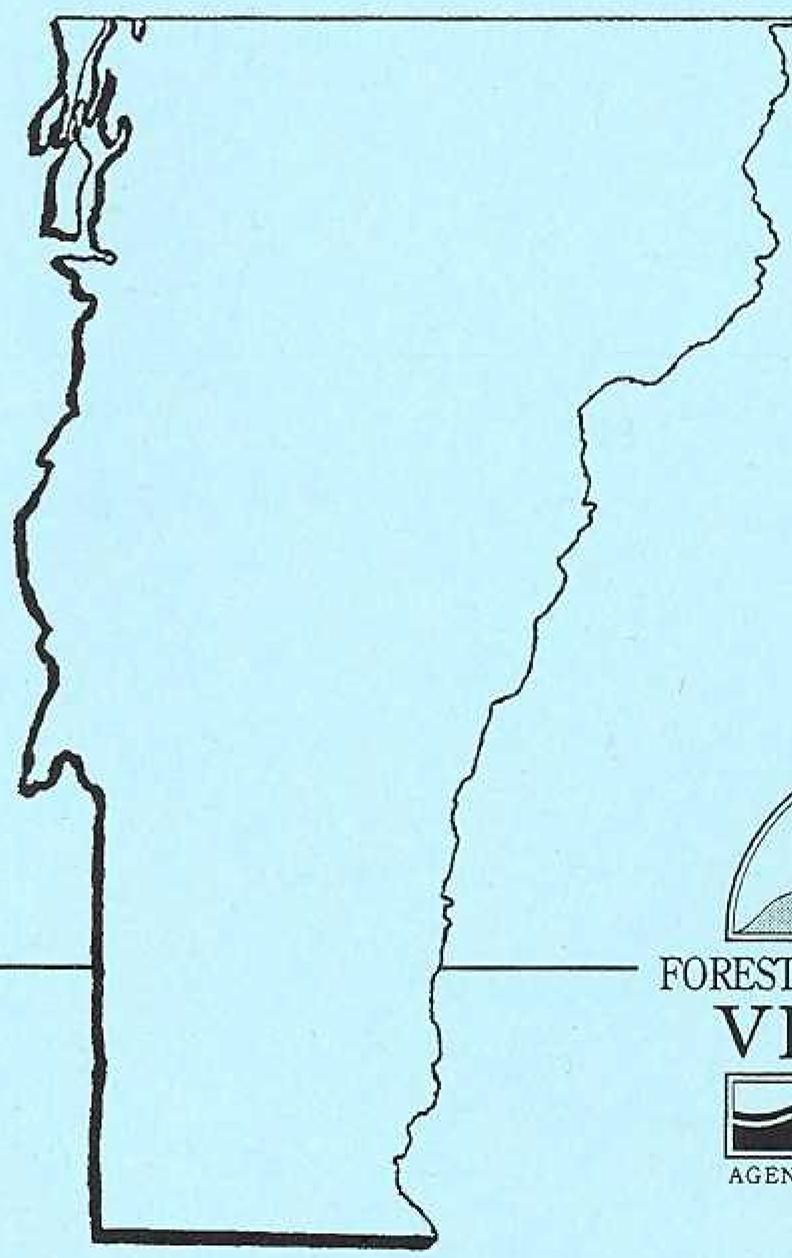
FOREST INSECT AND DISEASE CONDITIONS IN VERMONT
1996



VERMONT FOREST RESOURCE PROTECTION

FORESTS, PARKS & RECREATION
VERMONT
AGENCY OF NATURAL RESOURCES

AGENCY OF NATURAL RESOURCES
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FOREST INSECT AND DISEASE CONDITIONS IN VERMONT

CALENDAR YEAR 1996

PREPARED BY

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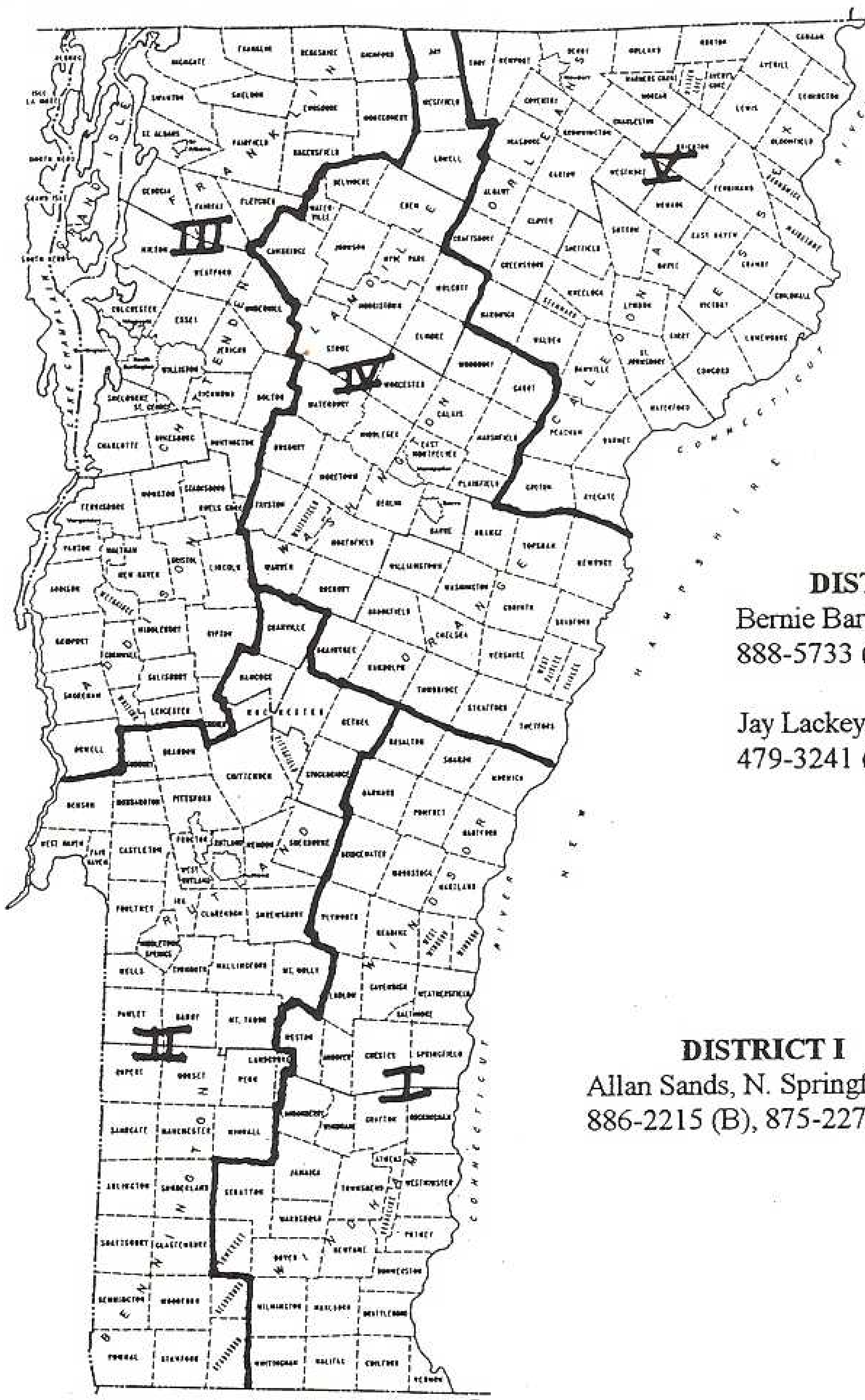

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1996 Forest & Insect Disease Highlights

Anthracnoses were extremely common due to the unusually wet weather. Maple anthracnose was mapped on 24,988 acres. Anthracnose was also common on birch, ash, butternut and oak.

Ash Dieback, mostly from ash yellows, remains common in southern Vermont and the Champlain Valley, but the rate of increase appeared to be slower than past years.

Balsam Gall Midge populations increased in northern Vermont, with damage detected in half of the plantations surveyed.

Balsam Shootboring Sawfly damage was observed in every Christmas tree plantation where it was previously detected, but damage was not as severe as 1994 or 1995. Cool, rainy weather during egg laying may be responsible for lower damage. Spray trials indicated that a split application can give good control.

Balsam Twig Aphid damage was particularly widespread, with moderate to heavy damage detected in all of the Christmas tree plantations surveyed.

Beech Bark Disease continued to cause beech decline and stem defect, although damage was difficult to detect from the air because ample moisture reduced chlorosis, and heavy dieback from oystershell scale masked symptoms. Tree condition declined in four of seven monitoring plots, although wax cover and Nectria were generally lower than 1995.

Birch Decline was mapped on 510 acres, mostly at upper elevations.

Birch Defoliation caused by birch leaf miners and birch anthracnose was widespread at upper elevations, with 47,500 acres of scattered defoliation mapped statewide.

Bruce Spanworm populations decreased, with only very light lower canopy feeding in most locations.

Butternut Canker remains common. Research continues at the University of Vermont on insect vectors and spatial distribution.

Chlorosis of White Pine was widespread in southern Vermont in late spring. The cause in unknown.

Curled Leaves were observed in many locations on a variety of hardwood species. Weather conditions are thought to be responsible.

Delphinella Tip Blight symptoms on fir increased, with nearly 70% of the Christmas trees surveyed having symptoms.

Diplodia Tip Blight caused widespread scattered shoot mortality of pine and fir. Dry conditions in 1995 and wet conditions in 1996 are thought to be the cause.

Drought was not a problem, but symptoms developed from dry conditions in 1995.

Fall Hemlock Looper did not cause any noticeable defoliation, although moths have been common statewide since 1991.

Forest Tent Caterpillar populations continued to be very low this year.

Gypsy Moth populations began building, especially in urban areas of Chittenden County, but no defoliation was detected. The buildup stalled, apparently due to the entomopathogenic fungus *Entomophaga maimaiga,* which was associated with dead larvae throughout the state. No visible defoliation is expected in 1997.

Hardwood Decline and Mortality decreased substantially, with 10,440 acres mapped compared to over 41,000 mapped in 1995. Dense foliage from plentiful moisture masked dieback that was visible previously.

Hemlock Woolly Adelgid was not observed in the two surveys conducted at the site in Stockbridge where the insect was accidentally introduced. No adelgids have been found there since 1991. Studies are underway at the University of Vermont to determine the survival of hemlock woolly adelgid at low winter temperatures.

A Late Second Flush of shoot growth was observed on several species in the Champlain Valley.

Maple Leaf Cutter caused very widely scattered defoliation in central Vermont. Elsewhere, there was generally less damage than previous years.

Miscellaneous Insects and Arthropods commonly submitted to the Forest Biology Laboratory included ants (especially carpenter ants), migratory agricultural pests, the multi-colored Asian lady beetle, spiders (especially fishing spiders and the common black-and-yellow argiope spider) and ticks.

Oystershell Scale populations on American beech increased dramatically, contributing to dieback in northern Vermont that was mapped on 17,643 acres. Populations in a survey plot, established in 1990, decreased after peaking in 1995.

Ozone Injury symptoms were observed on sensitive species at 75% of the locations surveyed. The severity of foliage symptoms was generally low to moderate.

Pear Thrips populations remained low, with very little damage observed, in spite of the slow spring development. Counts of thrips in the soil suggest that populations will be similar in 1997.

Pine Bark Adelgid was very heavy on individual trees in widely scattered stands. In a monitoring plot, adelgid levels dropped slightly from 1995, but heavily infested pines did not improve in crown density, as did lightly infested trees.

Poplar Leaf Blight caused widespread heavy damage to quaking aspen and balsam poplar, especially on roadside trees and in riparian areas.

Rhizosphaera Needle Disease of Fir caused needle browning and droop in a Christmas tree plantation in Danville, resulting in 700 trees being removed from sale.

Saddled Prominent populations remained low, but may be increasing in southern Vermont and the Northeast Kingdom.

Scleroderris Canker was not found in any new towns for the tenth consecutive year.

Spring Hemlock Looper caused no noticeable defoliation. Tree condition generally improved in stands defoliated in 1991.

Spruce Budworm trap counts rebounded this year, after a decrease in 1995, but remained at low levels.

Spruce Mortality was mapped on 3669 acres of mostly high elevation red spruce.

Tomentosus Root Rot, monitored in a white spruce plot in Dummerston, continues to cause mortality in a stand thinned in 1990.

Unthrifty Crowns Associated with Logging were mapped on 678 acres, half the acreage mapped in 1995.

Wet Site dieback and mortality mapped remained stable, with 9422 acres detected.

Winter Injury of Red Spruce was mapped on 9,500 acres, mostly in southern Vermont. The change in severity of dieback between 1993 and 1996, on plots established to monitor the impact of winter injury in 1993, was correlated to winter injury severity.

Vermont
1996 Forest Insect & Disease Management Recommendations

The following recommendations summarize information in this report of particular importance to forest managers. Additional information can be found under specific pests mentioned. Separate summaries for sugarbush and Christmas tree managers are 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 (page 1) or your county forester.

General - Ample rain led to dense foliage in 1996. Leaf size and color were generally good, and trees on most sites recovered from the stress of drought in 1995. The wet weather promoted widespread leaf diseases, and fungus diseases of insects.

Some trees did have symptoms brought on by 1995's dry weather. Dieback on ledgey sites, canker diseases, shoot blights, bark beetles, and problems with beech were related to drought.

Many tree species produced a lot of seed. Scout areas where cuts need to be timed following a good seed crop to see if seedlings are present.

Hardwoods: Dry conditions in 1995 made trees vulnerable to canker infections. Wet conditions in 1996 were ideal for spore production from existing cankers. Mainstem canker infection occurs through living branches, particularly through cracks in young branches which are bent down. The trees most at risk are young trees which still have flexible live branches in the lower 20' of mainstem. Over the next few years, inspect stands with advanced regeneration and young poles to determine if mainstem cankers have become widespread in these size classes. Weed out trees with cankers to improve stand quality.

Moist weather conditions were ideal for the buildup of anthracnose, and other fungus diseases, which led to widespread browning and early leaf drop. Because most of the symptoms occurred late in the season, the impact on tree condition should not be severe. Anthracnose on oak, which causes some shoot dieback, was much less common than anthracnoses on maple and birch, which infects only leaves. Although significant impact on overstory trees is not expected, the plentiful anthracnose inoculum on the forest floor may cause higher than normal mortality of maple seedlings expected to germinate in spring 1997 following the heavy seed year of 1996.

When working in the woods during the growing season 1997, look for curled leaves on maples or other hardwoods. This was an occasional symptom in 1996, and we are interested in more information about it to help in determining the cause.

Sugar Maple: Most defoliator populations, including forest tent caterpillar, maple leaf cutter, pear thrips, and Bruce spanworm, are expected to remain low. However, saddled prominent populations may be building. In regions which have historically been affected by this insect, listen for the sound of frass dropping and look for frass and leaf fragments on the forest floor when walking through sugar maple stands from mid-July to mid-August. The caterpillars may be difficult to find, since light populations tend to feed mostly in upper crowns. Saddled prominent defoliation can cause significant dieback, especially in stands which have been recently thinned. If you are aware of feeding activity, delay cutting.

Beech: Beech condition was quite variable this year. Drought in 1995 and oystershell scale led to noticeable dieback in some areas. The drought should also have made bark tissue more vulnerable to invasion by the Nectria fungus. However, ample moisture reduced the amount of visible chlorosis from beech bark disease, indicating that moisture availability compensated, in part, for the presence of disease. Heavy rainfall in October reduces beech scale populations. Rainfall in October 1995 was the wettest on record, and scale populations in monitoring plots had dropped by summer 1996. This variability in beech condition, with its contradictory implications, cautions against boilerplating management activities in beech.

Vermont Hardwood Tree Health Survey data show that more that half of the trees with moderate dieback levels (<50%) will recover. Where current dieback is caused by drought or oystershell scale, these stresses should subside, and tree condition should improve. Avoid disturbing these stands in the next few years. Although new beech bark disease infections may drop off in the short run because of reduced beech scale populations, where dieback is caused by beech bark disease, tree condition will often continue to decline.

Oak: The widespread occurrence of Entomophaga, the fungus disease of gypsy moth, may change how gypsy moth outbreaks occur in the northeast. Although 1996 may have been atypical because of the unusually wet spring conditions, this is now the second population buildup in a row that has been substantially altered by this fungus. Continue to stay abreast of gypsy moth population forecasts, as we try to learn how this new factor changes insect population dynamics. No defoliation is expected in 1997, and no management adjustments are necessary.

Hemlock: Populations of both hemlock looper species appear to be remaining at their normal, low levels. In stands that were heavily defoliated by the spring hemlock looper in 1991, two-thirds of the hemlocks are now healthy. In the future, salvage may not be necessary for this insect.

Studies on cold hardiness of hemlock woolly adelgid continue at the University of Vermont. Although many answers are still needed, it appears that insect survival decreases as the temperature they are exposed to decreases. In the meantime, the insect remains no closer than Northampton, Massachusetts. No management adjustments are recommended at this time.

Red Spruce: Although red spruce winter injury in 1993 had not appeared to cause much damage before 1996 in impact plots, the combined effects of 1995 drought and past winter injury seemed to cause dieback. Although most winter injury in 1996 occurred in high elevation stands that would not be managed for timber, be aware that trees stressed by drought and by winter injury should not be exposed to additional disturbances. This is especially important in the case of red spruce, on which Armillaria root rot is more aggressive than it is on other species.

Balsam Fir: Although a number of balsam fir problems were seen in Christmas tree plantations, no major problems were observed in wild stands this year. Many of the problems were increased because of the management practices in Christmas tree plantations, or were important because of the higher standards for tree quality. None of these insect or disease problems are expected to be important in timber stands.

White Pine: Snow breakage occurred in December in some southern Vermont stands. Where salvage is to be done, it should be done rapidly to prevent bluestain and the buildup of beetle populations.

Preliminary data indicate that pine bark adelgid may affect crown density. Poorer density should lead to slower growth. Add apparent resistance to this insect to the list of things to consider when marking trees to be thinned.

Red Pine: Several stressors of red pine were able to take advantage of trees stressed by the 1995 drought. Turpentine beetles infested lower boles. In serious drought conditions, or where the beetles have an opportunity to build up, beetle infestations can lead to mortality. However, trees may recover from turpentine beetle if you avoid disturbing stands where red pine has the diagnostic resinous pitch tubes near the ground. If cutting is done, small patches may need to be harvested. Remove as much stemwood as possible to prevent a build up of pine engraver beetles.

Diplodia shoot blight thrived on drought-stressed red pine. The wet spring in 1996 also provided good conditions for new infections. This led to substantial shoot blight of pine regeneration in some stands. Where shoot blight is heavy in overstory trees, expect dieback, and some mortality, of pine in the understory.

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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.

Two complete aerial surveys were flown this year. The first one was in late June-July to detect any early to mid-season defoliators. The last survey, in cooperation with the US Forest Service, was flown in late August to early September, and targeted defoliation by anthracnose and birch defoliators.

A ground survey is conducted annually on about 1,300 acres of Christmas tree plantations in North-Central Vermont as part of the Scleroderris quarantine. Observations were made on all pests during this survey. Acreages reported for Christmas tree problems refer to changes in these surveyed plantations and are not statewide totals. An additional 150 acres in southern Vermont were surveyed for the first time in 1995.

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Thanks to the many individuals who contributed to this report, including Trish Hanson, Sandy Wilmot, Jay Lackey, Tom Simmons, John Barrows, Hollis Prior, Pete Reed, Bernie Barton, John St. Arnauld, Allan Sands, and Nate Fice 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 Ron Wells, Brad Greenough, Mike Johnson, Lisa Thornton, Jim White, Jon Bouton, Dave Willard, Gary Sawyer, Jeff Briggs, Jay Maciejowski, and Dick Greenwood. Diagnostic assistance and other data was provided by Dale Bergdahl, Shari Halik, John Grehan, and Margaret Skinner and Gordon Nielsen (emeritus) from the University of Vermont; Jon Turmel and Scott Pfister from the Vermont Department of Agriculture; Bill Merrill and Nancy Wenner from Pennsylvania State University, and Dick Dearborn from the Maine Forest Service. Assistance in preparing maps and survey acreages was provided by Tom Luther from the US Forest Service, Forest Health Protection and Tom Merrifield and John Dudley from the Vermont Agency of Natural Resources. A special thanks to Melissa Currier for preparing the manuscript. 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.

WEATHER

"There is a sumptuous variety about the New England weather that compels the stranger's admiration - and regret. The weather is always doing something there; always attending strictly to business; always getting up new designs and trying them on people to see how they will go. But it gets through more business in Spring than in any other season. In the Spring I have counted one hundred and thirty-six different kinds of weather inside of twenty-four hours." - Mark Twain

Early winter was very snowy early, with ample cover in most locations by mid-December. A thaw in mid-January resulted in a mud season, some flooding due to snow melt, and bare ground in most places. After the thaw, cold and snow cover returned, and persisted until early April. Snow occurred on Sherburne Pass as late as May 30.

Spring was very wet, with cool temperatures. April was the wettest on record for Vermont (NE Regional Climate Center) and the second wettest on record for Burlington (NOAA). Development started late, extending the sugaring season. Sap sweetness was variable and volume was good; syrup was dark and flavorful.

In addition to starting late, development lasted a long time due to cool temperatures. Colder areas in central and northeastern Vermont received a late frost in June that caused mostly light damage to shade and ornamental sugar maples and fir Christmas trees. Elsewhere, there were scattered frosts in mid-May.

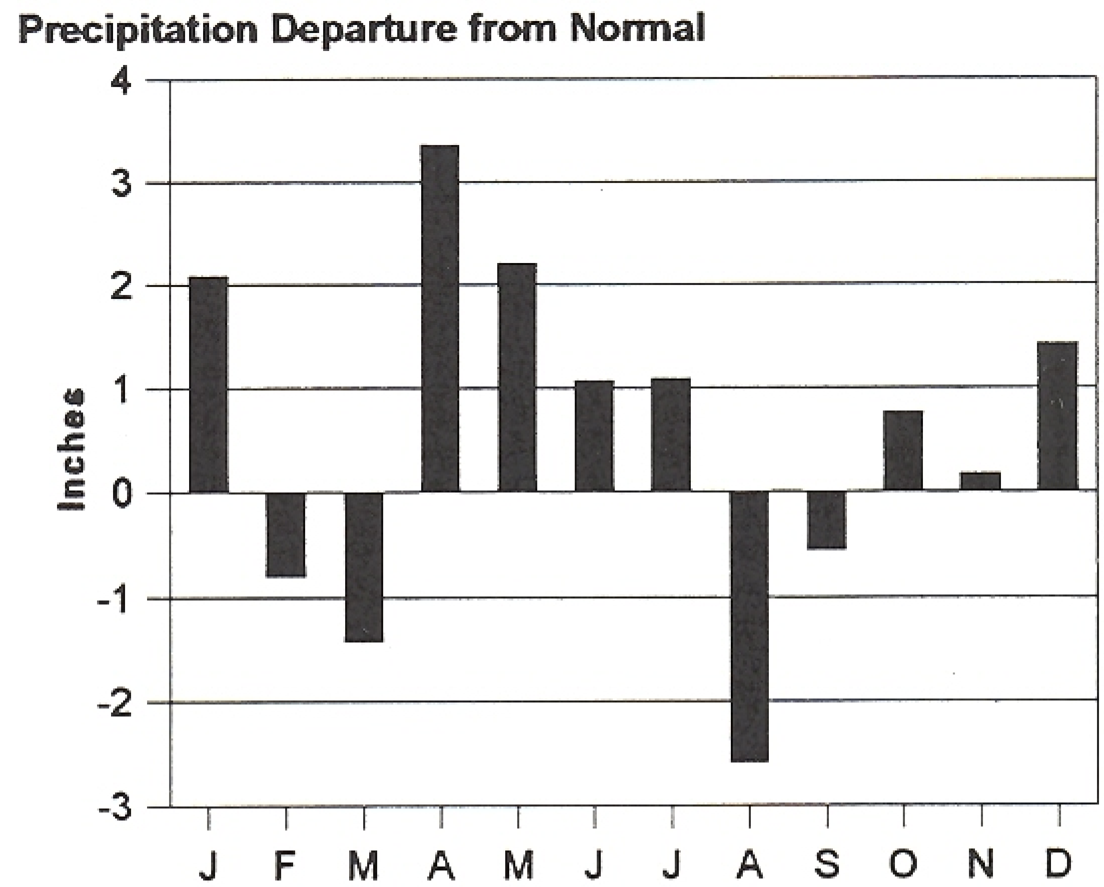
Cool, wet weather continued through July. There were no periods of extremely hot temperatures. Rainfall was so frequent that it was difficult for farmers to harvest their first hay crop. August was dry, but there was enough precipitation to prevent fires.

Fall foliage season began later than normal due to warmer, sunnier than normal, weather in August (1 degree above) and September (3 degrees above). In addition, there were no widespread stresses leading to early onset of color. The quality of color was considered below average in many locations, but was normal elsewhere. Fungus diseases caused premature browning and leaf drop of trees in some locations, particularly high elevation birch, riparian poplars, and roadside sugar maple and ash. Several nights of hard frost in early October browned up the leaves of many trees that had not yet begun to turn color.

Beechnuts and acorns were very abundant in the fall. Cones were numerous in places on spruce, white pine, and hemlock. Heavy seed production was also observed on red, sugar, silver, and Norway maple and black cherry. Leader development on spruces was unusually good.

Heavy, wet snow in early December in southern Vermont caused widespread scattered breakage, particularly of white pine.

Weather conditions are summarized in Figure 1. Phenology is summarized in Table 1 and Figures 2-3.



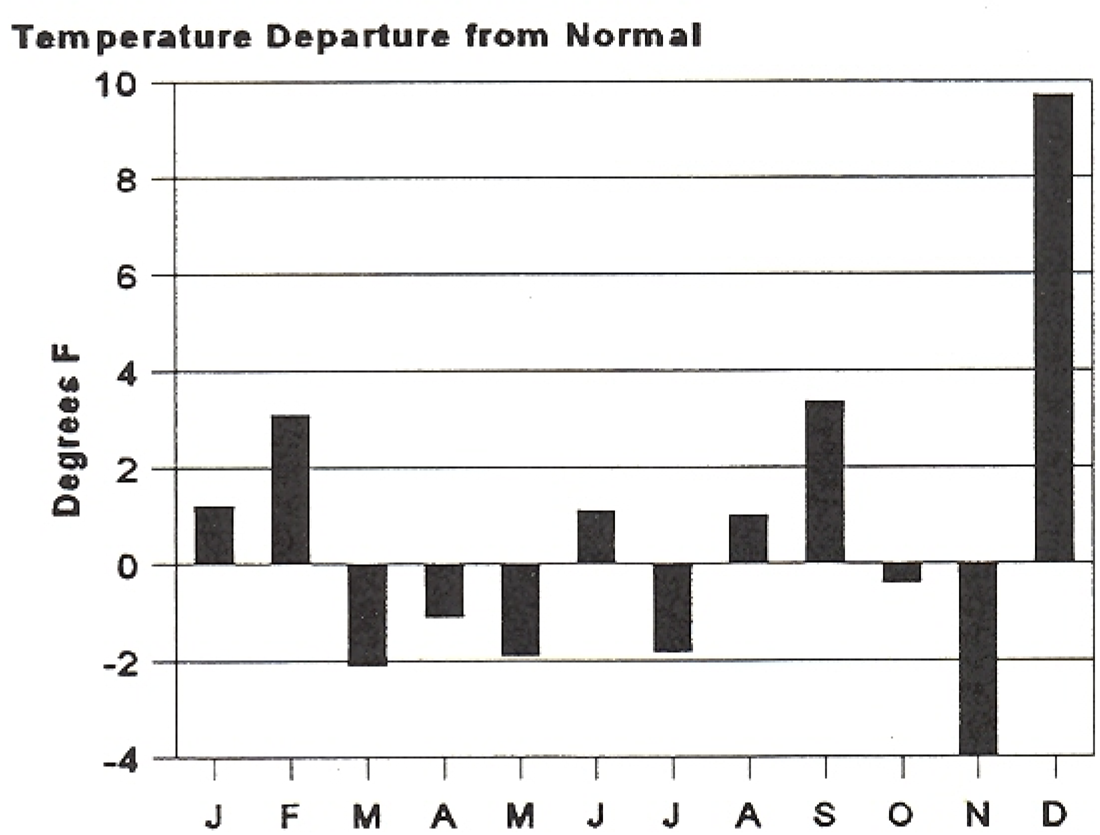


Figure 1. Departure from normal of 1996 precipitation and temperature at Burlington International Airport. Data from NOAA Local Climatological Data: Monthly Summary.

Table 1. 1996 Growing degree day accumulations and first observation dates of phenological development in 4 sites in Vermont. 50 degrees F used as the threshold of development.

Biological Indicator	Barre	Springfield	Stowe	Underhill
PLANT DEVELOPMENT				
Showing Green				
Balsam fir	52 (5/15)	68.5 (5/8)	69.5 (5/11)	53.6 (5/17)
Fraser fir			140 (5/20)	
Budbreak				
Balsam fir		90 (5/15)	69.5 (5/12)	142.7 (5/24)
Fraser fir			172 (5/22)	
Hemlock		161.5 (5/21)	190.5 (5/24)	159.4 (5/28)
Sugar maple		58 (4/27)	49.5 (5/7)	32.9 (5/6)
White ash		103 (5/18)	69.5 (5/13)	110.9 (5/20)
Red oak		79.5 (5/10)		
Flowers				
Elm		0.5 (4/19)		
Lilac		0.5 (4/19)	195.5 (5/28)	
Pin cherry			81.5 (5/17)	
Red maple		58 (4/27)	16 (4/21)	31.2 (4/29)
Shadbush		68.5 (5/8)	69.5 (5/13)	52.9 (5/15)
Sugar maple		58 (4/27)	62.5 (5/9)	49 (5/14)
Silver maple		0 (4/3)		
Poplar		0 (4/3)		
Full Green up		348 (6/6)		
INSECT DEVELOPMENT				
Eastern tent caterpillar nest	34.5 (5/2)		192.5 (5/27)	110.9 (5/20)
Maple leafcutter adult				49 (5/3)
Pear thrips adult	34.5 (5/2)	51.5 (4/23)		22.4 (4/25)
Plum curculio mating			312.5 (6/7)	
Balsam shootboring sawfly				
Adults present			20 (4/22)	
Adults ovipositing			140 (5/20)	
Peak larval drop from late-breaking balsam			282 (6/5)	
Last larval drop from late-breaking balsam			436.5 (6/13)	
OTHER OBSERVATIONS				
First peepers calling			7 (4/20)	

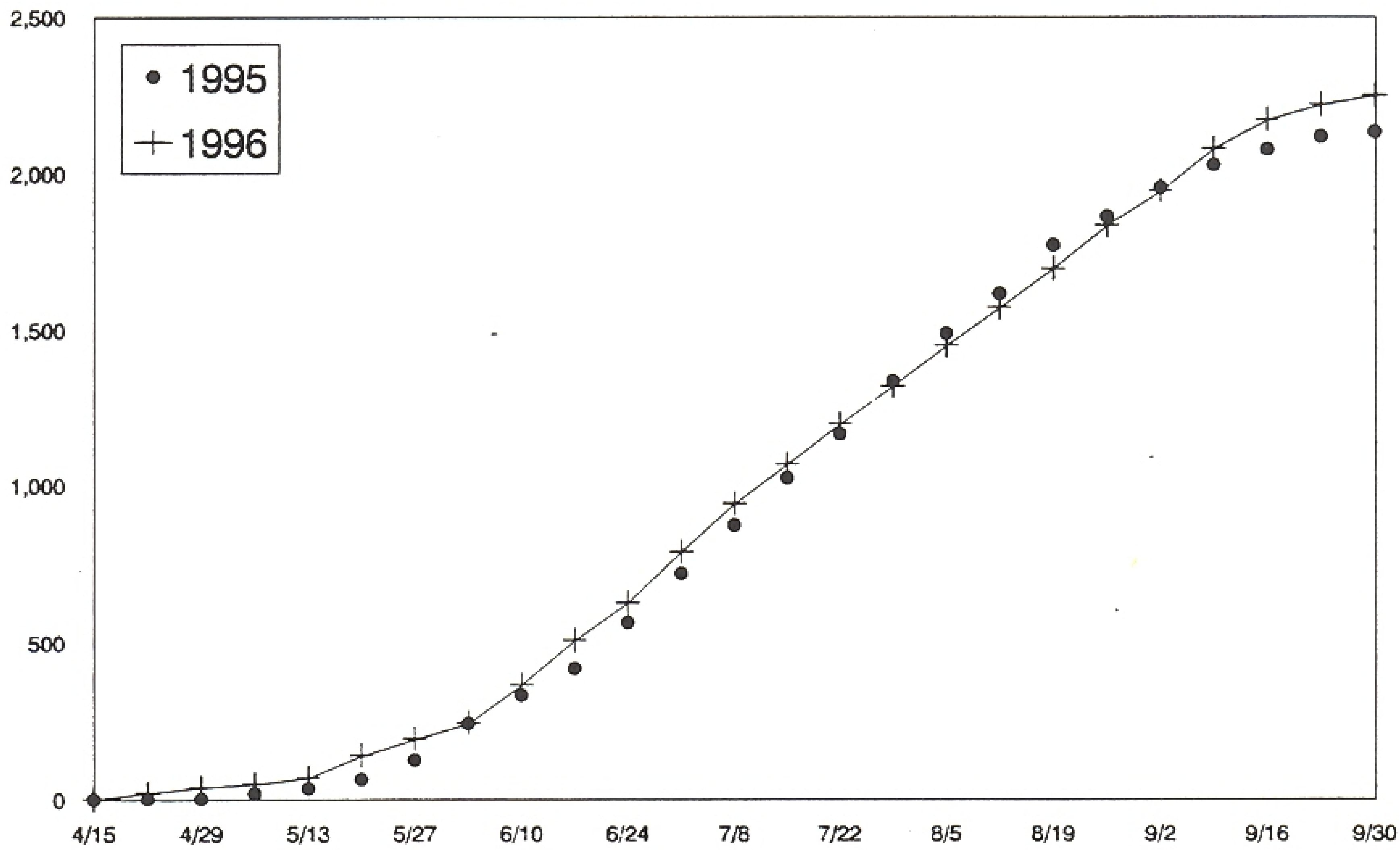
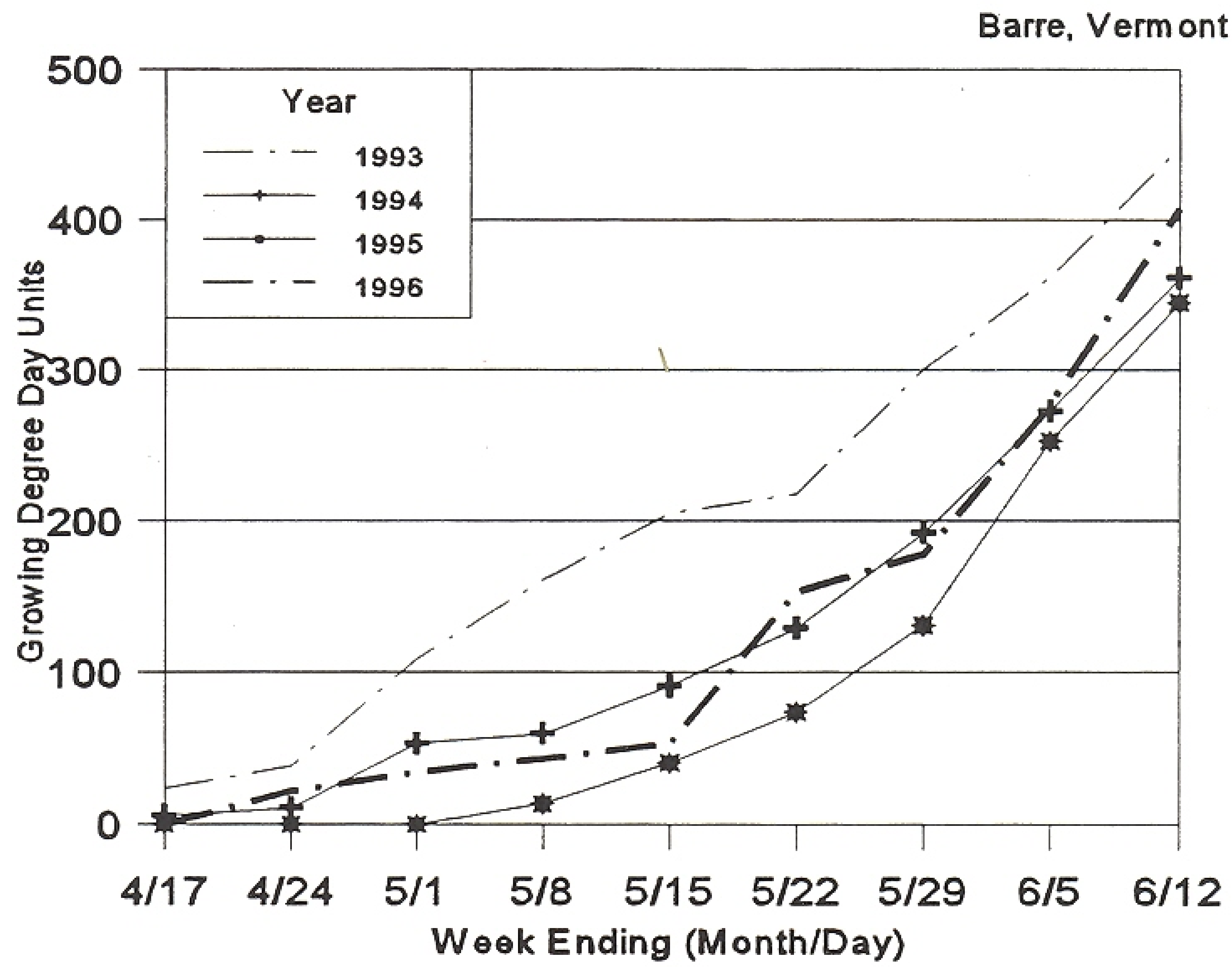
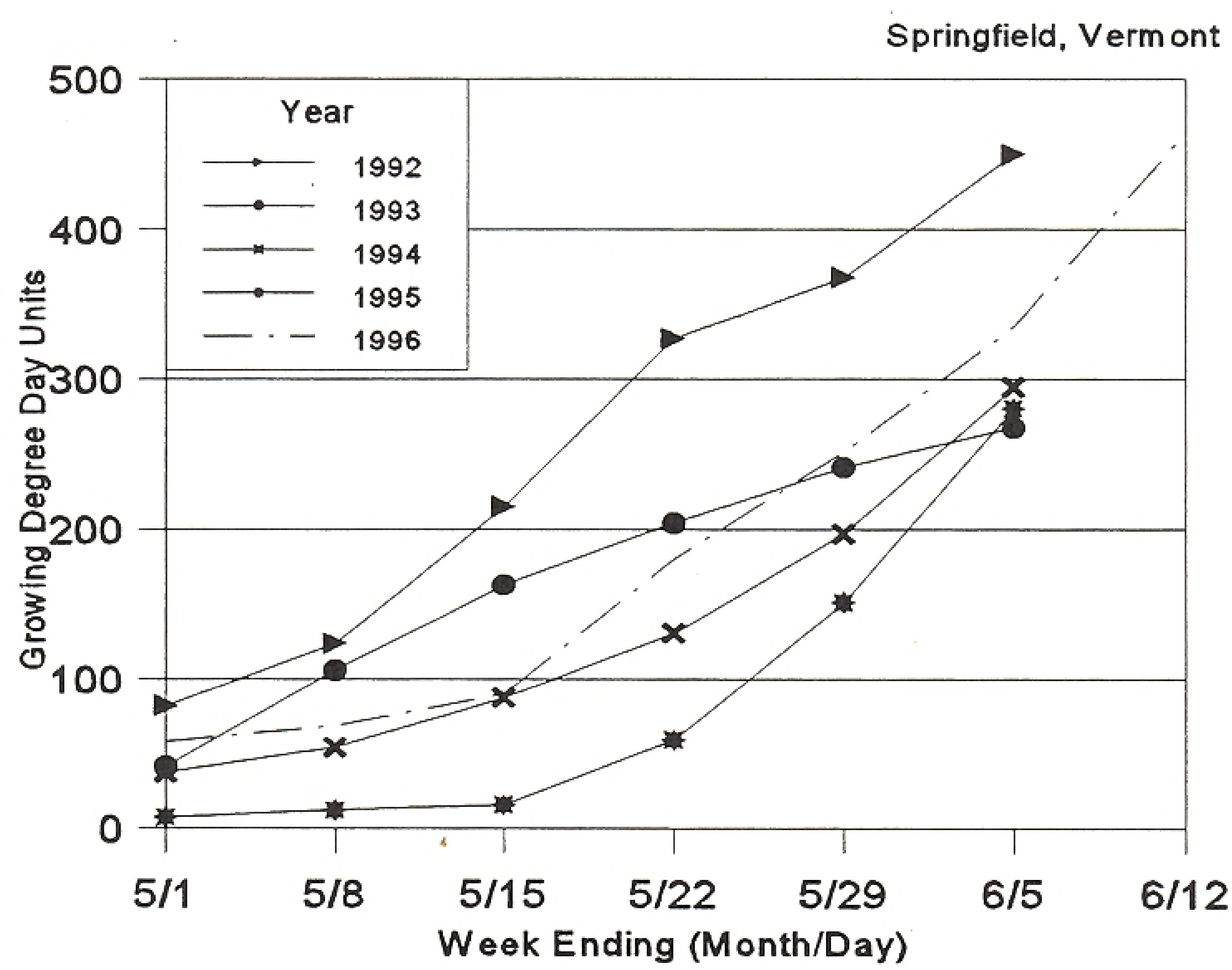
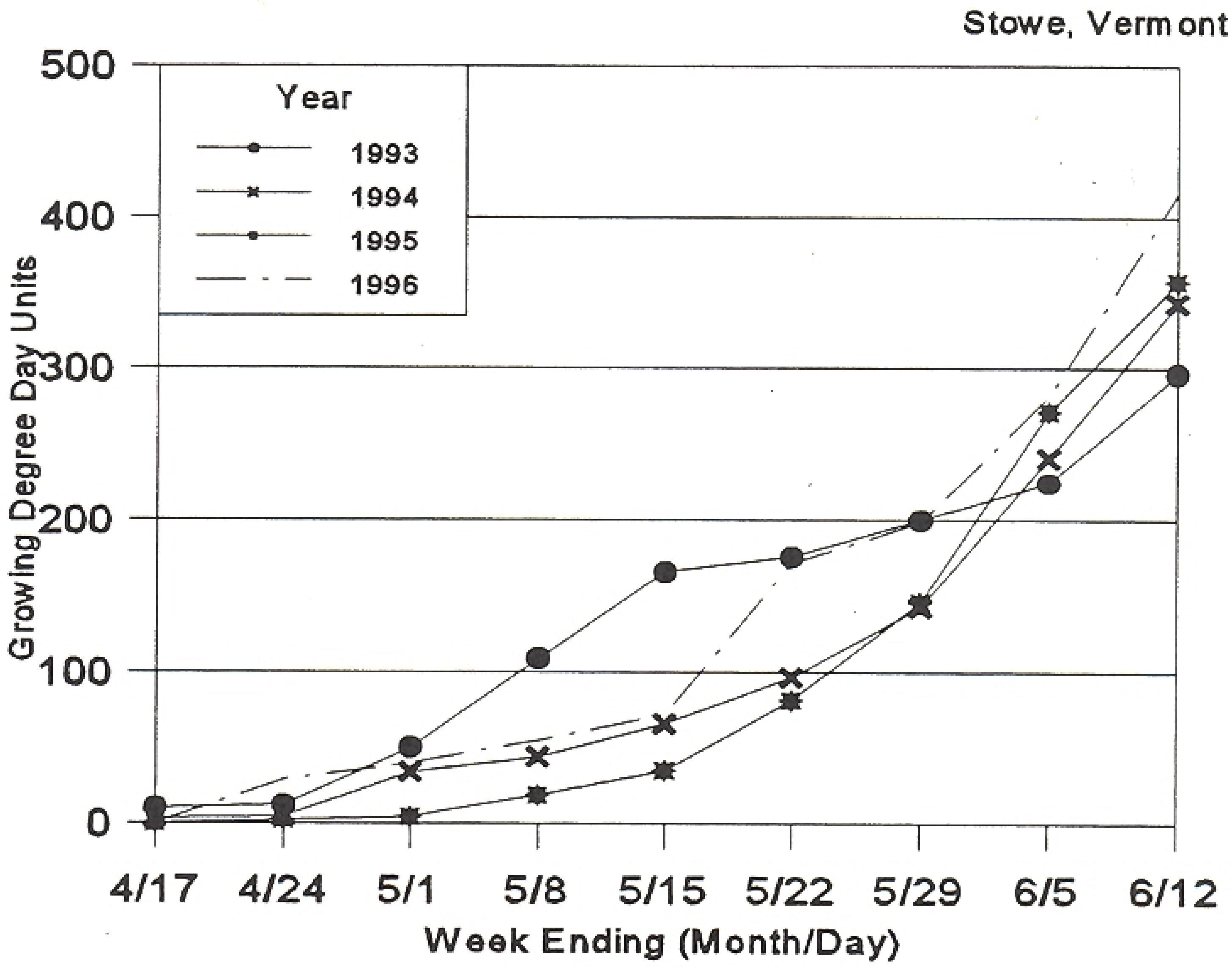


Figure 2. Weekly cumulative growing degree days throughout the 1995-1996 growing seasons at Stowe. 50°F used as the threshold of development.


Barre, Vermont
500
400
300
200
100
0
Growing Degree Day Units
Year
1993
1994
1995
1996
4/17
4/24
5/1
5/8
5/15
5/22
5/29
6/5
6/12
Week Ending (Month/Day)


Springfield, Vermont
500
400
300
200
100
0
Growing Degree Day Units
Year
1992
1993
1994
1995
1996
5/1
5/8
5/15
5/22
5/29
6/5
6/12
Week Ending (Month/Day)



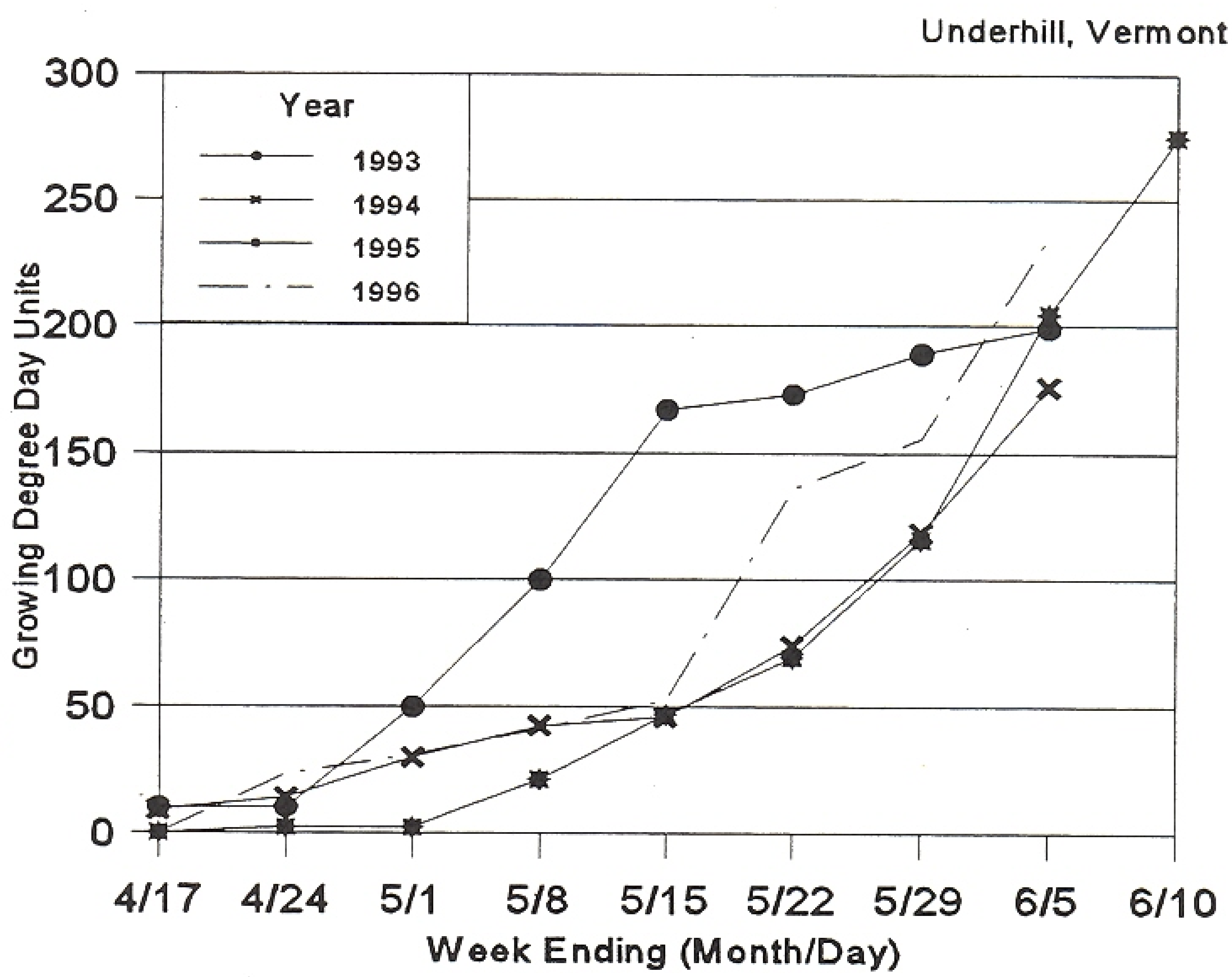


Figure 3. Weekly cumulative growing degree days at 4 locations by year through 1996. 50°F used as the threshold of development.

OZONE SUMMARY

The maximum ozone levels at both Vermont stations were higher this year than in 1995, but below the National Ambient Air Quality Standard of 0.124 ppm for 1 hour, a level set for the protection of human health. In general, wetter than normal weather helped produce lower than usual ozone levels, especially in the spring and early summer. However, these wet conditions also promoted vigorous plant growth, which means active uptake of ozone, and subsequent symptoms of injury on plant foliage.

There are many different ways to express ozone data so that they are more meaningful to plant health. Ozone levels that adversely affect sensitive plant species (i.e. black cherry and white ash) are from 0.060 to 0.080 ppm. The number of hours greater than 0.060 or 0.080 ppm, the SUM06, the SUM08 and the W126 are all indices used to relate ozone levels with potential plant injury. These indices reflect a cumulative exposure to ozone levels that are known to cause damage to sensitive plant species.

The maximum level of ozone at the northern Vermont station (Underhill) was higher this year than in 1995. Otherwise, ozone exposure was similar to or less than last year at this site.

Ozone exposure in parts of southern Vermont tends to be greater than in northern Vermont. The maximum level of ozone was higher than in 1995 at the southern Vermont station (Bennington). Likewise, all the plant related indices showed higher exposure levels this year as compared with last year.

Table 2 . Ozone levels recorded during the 1996 growing season at two stations. Data provided by the Vermont Air Pollution Control Division.

Monitor Site	Total Number of Hours with		Maximum Level		SUM06 (ppm-hr)	SUM08 (ppm-hr)	W126 (ppb-hr)
	≥0.060 ppm	≥0.080 ppm	ppm	Date			
Underhill	156	13	0.094	June 2	10.3	1.15	14.09
Bennington	292	38	0.110	June 7	20.2	3.40	19.62

Ozone injury symptoms were observed on sensitive plant species in August at 75% of the locations surveyed throughout the state (Figure 4). The severity of foliage symptoms was generally low to moderate (using a rating system of 0 (no injury) to 5 (>75% injury on affected leaves). The effect of ozone injury on forest health is not currently known. No ozone damage was detected on forest trees from aerial and ground surveys.

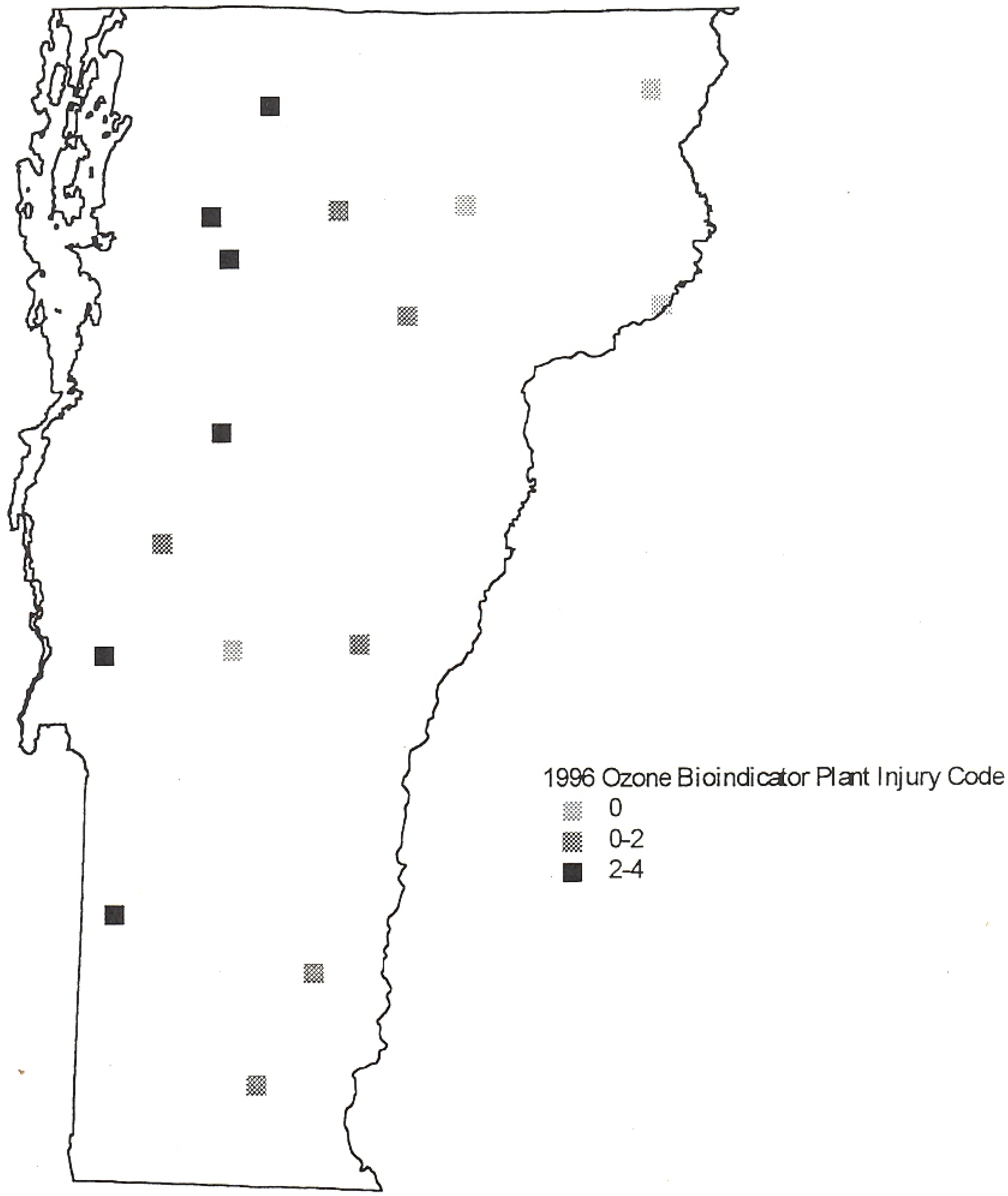


Figure 4. Approximate locations where ozone injury to sensitive plants was evaluated in 1996. Severity of foliage symptoms was coded: 0 = none, 0-2 = <25%, and 2-4 = 25-75% of surface area affected on symptomatic leaves.

Forest Insects

HARDWOOD DEFOLIATORS

Birch Defoliation, caused by **Birch Leaf Miners**, *Fenusa pusilla* and *Messa nana*, and **Birch Anthracnose**, caused by *Marsonnina betulae* and *Septoria sp.*, was widespread at upper elevations with 47,500 acres of scattered defoliation mapped statewide, compared to 70,850 acres damaged by leaf miners and birch skeletonizer in 1995 (Table 3, Figure 5). Stands mapped as insect or fungus damage generally had the other present as well. Mapped damage increased in northern Vermont, with the largest increase in Washington County. In southern Vermont, late season browning and early leaf drop was widespread, but much was not mapped due to similarity to fall color. Birch skeletonizer decreased to light.

Table 3. Mapped acres of birch defoliation attributed to birch leaf miner and birch anthracnose in 1996.

County	Birch Leaf Miner				Birch Anthracnose	Total Birch Leaf Miner and Birch Anthracnose
	Light	Moderate	Heavy	Total	Moderate	
Addison	8,101	215	35	8351		8351
Bennington	17,139	235	53	17,427		17,427
Caledonia		500	327	827	273	1,100
Chittenden		427	444	871		871
Essex		17		17	4,063	4,080
Franklin		341		341		341
Lamoille		725	82	807		807
Orange	141	2,279	563	2,983		2,983
Orleans		1,283	6	1,289	389	1,678
Rutland	2,453	131		2,584		2,584
Washington	2,095	2,170	597	4,862		4,862
Windham	1,028			1,028		1,028
Windsor	1,121	243		1,364		1,364
Total	**32,078**	**8,566**	**2,107**	**42,751**	**4,725**	**47,746**

Bruce Spanworm, *Operophtora bruceata*, populations decreased, with only very light lower canopy feeding in most locations. Ten acres in Franklin County were mapped from the air, and a 40 acre sugarbush in Sheldon was heavily infested for the second straight year. This sugarbush was aerially treated with Dipel 4L at 8 BIUs per acre on May 23, but control was less than expected (about 50% reduction) and moderate to heavy defoliation occurred.

Forest Tent Caterpillar, *Malacosoma disstria*, populations continued to be very low this year statewide. Few caterpillars were seen and no forest defoliation was observed. Only one moth was caught in any of the ten locations where pheromone traps were used (Table 4). A Luminoc light trap in Hyde Park, with a blue light plus pheromone for four hours per night, caught no moths this year, compared to 27 moths in 1995.

Table 4. Average number of forest tent caterpillar moths caught in pheromone traps, 1988-1996.[1]

Location	1988	1989	1990	1991	1992	1993	1994	1995	1996
Roxbury	0.0	0.6	0.2	0.0	0.0	0.0	0.0	0.0	0.0
Waterbury	1.2	3.6	0.0	0.4	0.0	0.0	0.0	0.0	0.0
Waterville	0.2	2.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fairfield	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bethel	-	0.4	0.2	0.4	0.0	0.0	0.2	0.0	0.0
Sherburne	-	2.6	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Barnard	0.6	-	2.6	2.2	-	0.0	0.0	0.0	0.0
Underhill (VMC 1400)	-	-	-	0.0	0.0	0.0	0.0	0.0	0.0
Underhill (VMC 2200)	-	-	-	-	0.0	0.0	0.0	0.0	0.0
Underhill (VMC 3800)	-	-	-	-	0.0	0.0	0.0	0.0	0.0
Average	**0.6**	**1.6**	**0.4**	**0.4**	**0.0**	**0.0**	**0.2**	**0.0**	**0.1**

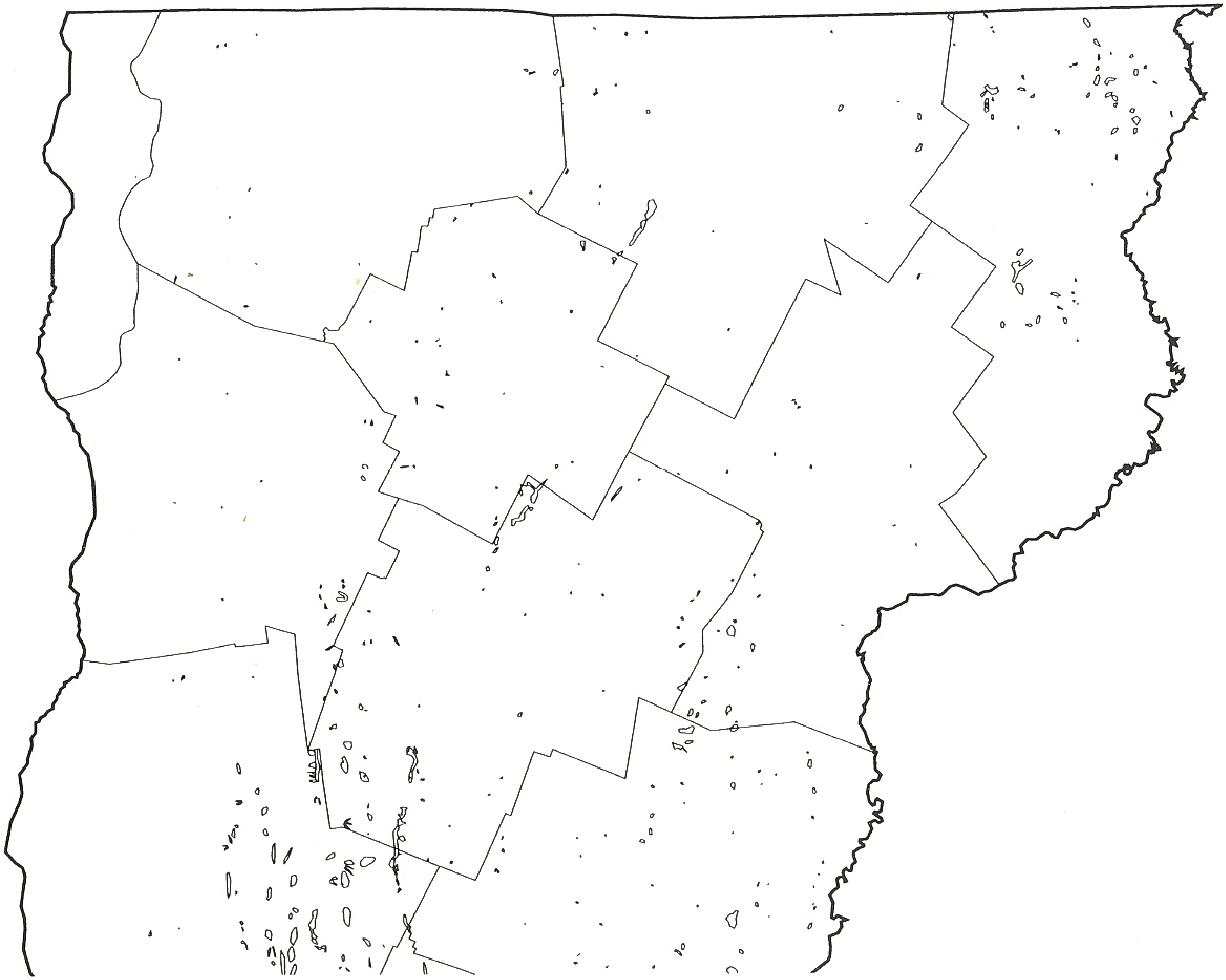
[1]Multi-pher traps baited with RPC-2 component lures, 5 traps per location.

Gypsy Moth, *Lymantria dispar*, populations began building, especially in urban areas of Chittenden County. Homeowner complaints increased, but no defoliation was detected. There were many caterpillars with symptoms of infection by virus and *Entomophaga maimaiga*.

A study to determine the distribution of *E. maimaiga* was conducted in cooperation with the University of Vermont Entomology Laboratory. Larval cadavers from numerous locations were confirmed as positive for the fungus. In the Burlington/Colchester area, gypsy moth cadavers were found in 58% of the sites surveyed. *E. maimaiga* resting spores were found on 88% of the cadavers tested.

There was a substantial increase in males flying again this year. Egg masses were difficult to find in most locations during late summer, indicating that the disease seen earlier reduced populations. No egg masses were found in focal area monitoring plots in southern Vermont, and counts remained low, similar to 1995, in northern Vermont (Table 5). No visible defoliation is expected in 1997.

BIRCH LEAF FUNGUS and BIRCH LEAF MINER/SKELETONIZER



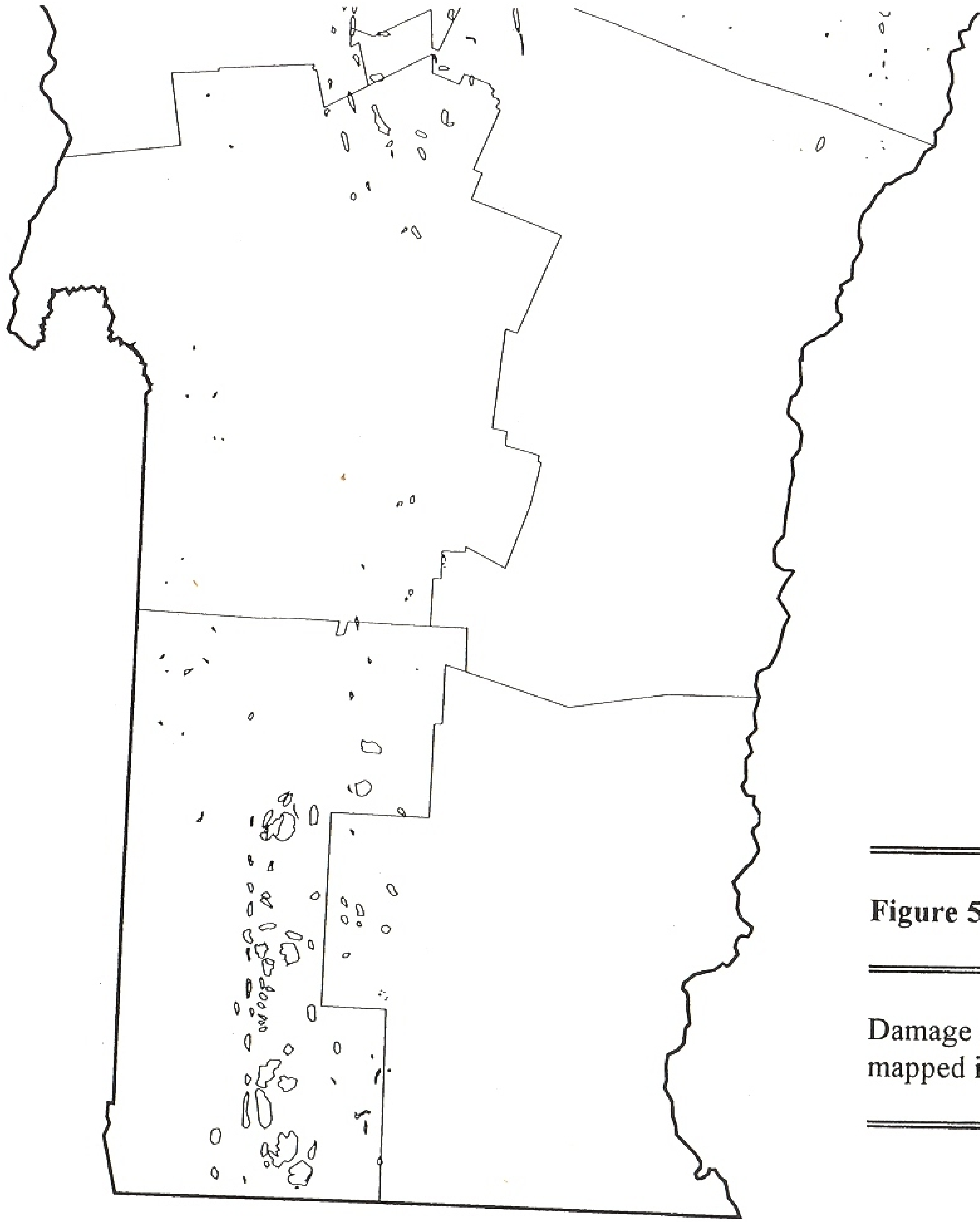


Figure 5. 1996 birch defoliation.

Damage area approximate location. Total damage mapped in 1996 = 47,746 acres.

Table 5. Gypsy moth egg mass counts from focal area monitoring plots 1987-1996[1]

Plot Location	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Minards Pond	0	7	99	10	0	0	0.5	0	2	0
Fort Dummer	0	1	1	0	0	0	0.5	0	0	0
Handley Mtn.	1	4	417	7	2	1	0	0	0	-
Perch Pond	115	226	168	1	1	0	0	0	0	0
Rocky Pond	6	53	>400	11	0	0.5	0	0	0	0
Petersburg	0	1	296	89	51	1	0	0	9	0
Tate Hill	0	6	498	5	25	0	0	0	2	0
Arrowhead[2]	21	48	96	3	2	0	0	2.5	0	0
Brigham Hill[3]	37	28	74	212	22	0	0.5	0.5	0	0.5
Middlesex	0	1	19	23	3	0	0	0.5	0	0.5
Sandbar	45	173	226	57	6	3	3	1.0	5	4.5
VMC 1400	-	-	-	-	-	-	1	0	2	-
Average	**20**	**46**	**200**	**38**	**10**	**0.5**	**0.5**	**0.4**	**1.7**	**0.5**

[1]Average of two 15m diameter burlap-banded plots.
[2]Aerial sprayed with Bt (Foray) in 1990.
[3]Aerial sprayed with Bt (SAN415) in 1988.

Maple Leaf Cutter, *Paraclemensia acerifoliella*, caused some moderate to heavy defoliation in scattered locations, some of which was mapped during aerial surveys (Washington County 45 acres, Orange County 176 acres, and Caledonia County 75 acres). Total area affected was similar to 1995. Heavily damaged stands were also observed in Starksboro, Underhill, and Tinmouth. Elsewhere, it was common on lower branches and regeneration, sometimes associated with anthracnose, with generally less damage than previous years.

Saddled Prominent, *Heterocampa guttivata*, populations remained low, but may be increasing in southern Vermont and the Northeast Kingdom, where individual larvae were occasionally observed. Light upper canopy feeding was observed in Wilmington, Groton, and Walden, but could not be detected during aerial surveys. One larva was observed as late as 9/30 in Parker's Gore.

OTHER HARDWOOD DEFOLIATORS

INSECT	HOSTS(S)	LOCALITY	REMARKS
Alder Leaf Beetle *Altica ambiens alni*	Alder	Caledonia & Orleans Counties	Scattered defoliation.
American Dagger Moth *Acronicta americana*	Black Cherry	East Haven	Not uncommon in light traps and at windows.
Beech Looper unknown species	Beech	Rochester	Individual larva.
Birch Leaf Folder *Ancylis discigerana*	Yellow Birch	Windsor, Bennington, & Rutland Counties	Occasionally observed causing light damage.
Birch Leaf Miner *Fenusa pusilla*			See narrative.
Birch Skeletonizer *Bucculatrix canadensisella*			See narrative.
Bruce Spanworm *Operophtera bruceata*			See narrative.
Butternut Woollyworm *Eriocampa juglandis*		Starksboro	Light.
Cherry Scallop Shell Moth *Hydria prunivorata*	Black Cherry	Rochester Springfield Stowe	Single nests.
Early Birch Leaf Edgeminer *Messa nana*			See narrative.
Eastern Tent Caterpillar *Malacosoma americanum*	Cherry Apple	Throughout	Common. Remains light.

OTHER HARDWOOD DEFOLIATORS

INSECT	HOSTS(S)	LOCALITY	REMARKS
Elm Leaf Beetle *Pyrrhalta luteola*	American Elm	Rutland Arlington Orleans & Lamoille Counties	Ornamentals. Along the Batten Kill. Some heavy defoliation of young elms.
Elm Leaf Miner *Fenusa ulmi*			Not observed.
European Snout Beetle *Phyllobius oblongus*	Basswood Sugar Maple	Waterbury Addison County	Ornamentals.
Fall Cankerworm *Alsophila pometaria*			Not observed.
Fall Webworm *Hyphantrea cunea*	Cherry Other Hardwoods	Widespread	Remains heavy in the southern Connecticut River Valley and parts of Rutland County, especially along roadsides and fencerows. Elsewhere, light.
Forest Tent Caterpillar *Malacosoma disstria*			See narrative.
Green Striped Mapleworm *Anisota rubicunda*	Sugar Maple	Glover Stowe	Light feeding in sugarbush. Ornamentals.
Gypsy Moth *Lymantria dispar*			See narrative.
Half Winged Geometer *Phigalia titea*			Not observed.

OTHER HARDWOOD DEFOLIATORS

INSECT	HOSTS(S)	LOCALITY	REMARKS
Imported Willow Leaf Beetle *Plagiodera versicolora*	Willow	Scattered	Associated with willow scab, mapped on 45 mostly riparian acres in Addison, Chittenden, and Franklin Counties.
	Weeping Willow	Hartland Springfield Worcester	Ornamentals.
Japanese Beetle *Popillia japonica*	Hardwoods	Throughout	Some moderate-heavy damage but generally lower than usual, possibly due to 1995 drought.
Large Aspen Tortrix *Choristoneura conflictana*	Aspen	Waterbury	Thousands lured to lights at Holiday Inn.
Lilac Leaf Miner *Caloptilia (=Gracillaria) syringella*	Lilac	Brattleboro Stowe	Ornamentals.
Linden Looper *Eranis tilaria*			Not observed.
Locust Leaf Miner *Odontata dorsalis*	Black Locust	Hartland Putney Chittenden County	Heavy damage in isolated locations. 50 acres mapped from the air. Elsewhere, light.
Maple Basswood Leaf Roller *Sparganothis pettitana*			Not observed.
Maple Leaf Cutter *Paraclemensia acerifoliella*			See narrative.
Maple Leafblotch Miner *Cameraria aceriella*	Sugar Maple	Caledonia Orleans Washington Lamoille Counties	Unusually abundant this year.
Maple Trumpet Skeletonizer *Epinotia aceriella*	Sugar Maple	Throughout	Common at light defoliation levels.

OTHER HARDWOOD DEFOLIATORS

INSECT	HOSTS(S)	LOCALITY	REMARKS
Maple Webworm *Tetralopha asperatella*	Sugar Maple	Springfield	Occasional webs.
Mountain Ash Sawfly *Pristiphora geniculata*		Bennington	Heavy on a few ornamentals.
Oak Leaf Tier *Croesia semipurpurana*			Not observed.
Oak Skeletonizer *Bucculatrix ainsliella*	Red Oak	Brattleboro Rutland	Scattered pupae observed.
		Middlesex North Bennington	Light-moderate damage.
Orange-humped Mapleworm *Symmerista leucitys*			Not observed.
Pear Slug Sawfly *Caliroa cerasi*	Cotoneaster	Barnard	Heavy late defoliation.
Red-humped Oakworm *Symmerista canicosta*			Not observed.
Rose Chafer *Macrodactylus subspinosus*	Many	Widely scattered	Common.
Ruby Quaker (Moth) *Orthosia rubescens*	Beeches Maples	Montpelier	
Saddled Prominent *Heterocampa guttivata*			See narrative.
Satin Moth *Leucoma salicis*	Cottonwood	Royalton	Dieback from previous defoliation still visible.
	Balsam Poplar	Walden	Heavy on ornamental. Populations down elsewhere.

OTHER HARDWOOD DEFOLIATORS

INSECT	HOSTS(S)	LOCALITY	REMARKS
Spiny Elm Caterpillar *Nymphalis antiopa*			Not observed.
Spring Cankerworm *Paleacrita vernata*			Not observed.
Uglynest Caterpillar *Archips cerasivoramus*	Cherry	Widely scattered in northern Vermont	Light - few sightings. Rochester population collapsed.
White Marked Tussock Moth *Orgyia leucostigma*	Sugar Maple	Waterford	

SOFTWOOD DEFOLIATORS

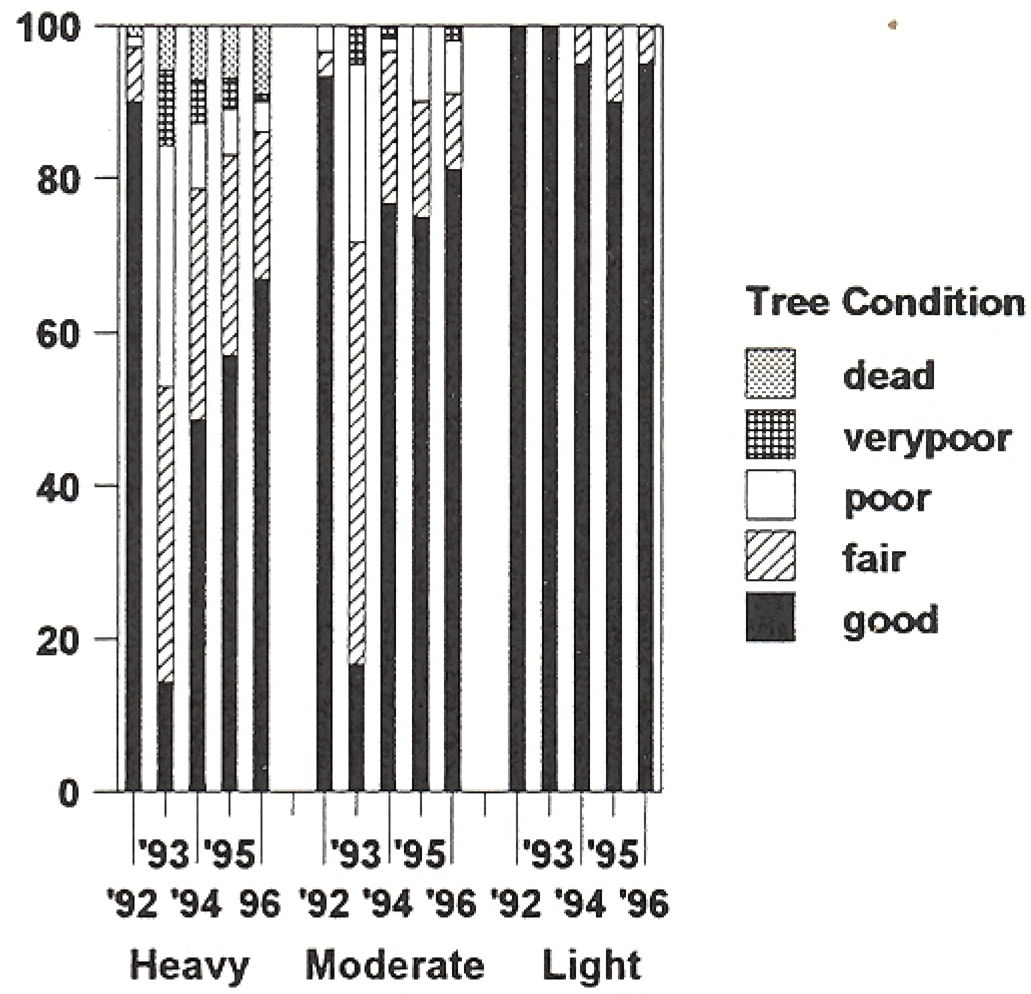
Fall Hemlock Looper, *Lambdina fiscellaria*, did not cause any noticeable defoliation this year, although moths have been common statewide since 1991. Individual larvae were observed in Vernon and Brattleboro. The number of sites with pheromone traps was reduced in 1996. In the remaining sites, the average moth catch decreased again this year (Table 6).

Table 6. Fall hemlock looper population counts in 1992-96.

Location		Winter 92-93	Larvae/3 m[2] Summer		Moths/Trap[3] Fall				
County	Town	Viable Eggs/3 m[1]	1992	1993	1992	1993	1994	1995	1996
Addison	Ferrisburg	5	0	17	38	86	-	310	40
Bennington	Dorset	0	0	-	15	126	71	32	37
Caledonia	Sutton	-	-	1	-	-	-	-	-
Caledonia	Barnet	2	3	7	-	118	11*	151	108
Caledonia	Waterford	0	2	0	241	133	187	64	-
Chittenden	Bolton	0	0	1	714	288	137	24	-
Chittenden	Underhill-VMC 1400	-	-	-	325	80	123	111	49
Chittenden	Underhill-VMC 2000	-	-	-	521	-	133	28	232
Chittenden	Underhill-S	-	-	-	41	27	25	8	-
Franklin	Swanton	4	0	2	-	55	92	30	-
Grand Isle	Alburg	0	0	0	-	-	-	47	40
Lamoille	Stowe-VMC3800	-	-	-	41	-	0	0	1
Lamoille	Morristown-W	3	1	3	342	129	280	254	94
Lamoille	Morristown-N	4	0	1	261	112	383	242	-
Orange	Strafford	0	0	0	454	117	202	177	-
Orange	Williamstown	0	0	0	316	160	141	310	104
Orleans	Derby	4	4	4	320	154	185	135	16
Rutland	Castleton	0	0	-	7	33	50	24	-
Rutland	Pittsford	0	0	-	10	67	103	21	45
Washington	Duxbury	-	-	-	666	250	173	212	-
Windham	Brattleboro	0	0	-	22	84	16*	30	62
Windsor	Sharon	0	0	-	94	71	268	291	107
Windsor	Stockbridge	0	0	-	201	175	41	37	-
Average		**1.1**	**0.6**	**1.6**	**264**	**118**	**144**	**115**	**72**

[1]Number of eggs per three 1 m long mid-crown branches (<4.5/3 m = light defoliation).
[2]Number of larvae per 3 m of foliage on understory trees (<30/3 m = light population).
[3]Number of moths per Multi-pher trap baited with a *fall hemlock looper* pheromone.
*Not included in average due to trap problems.

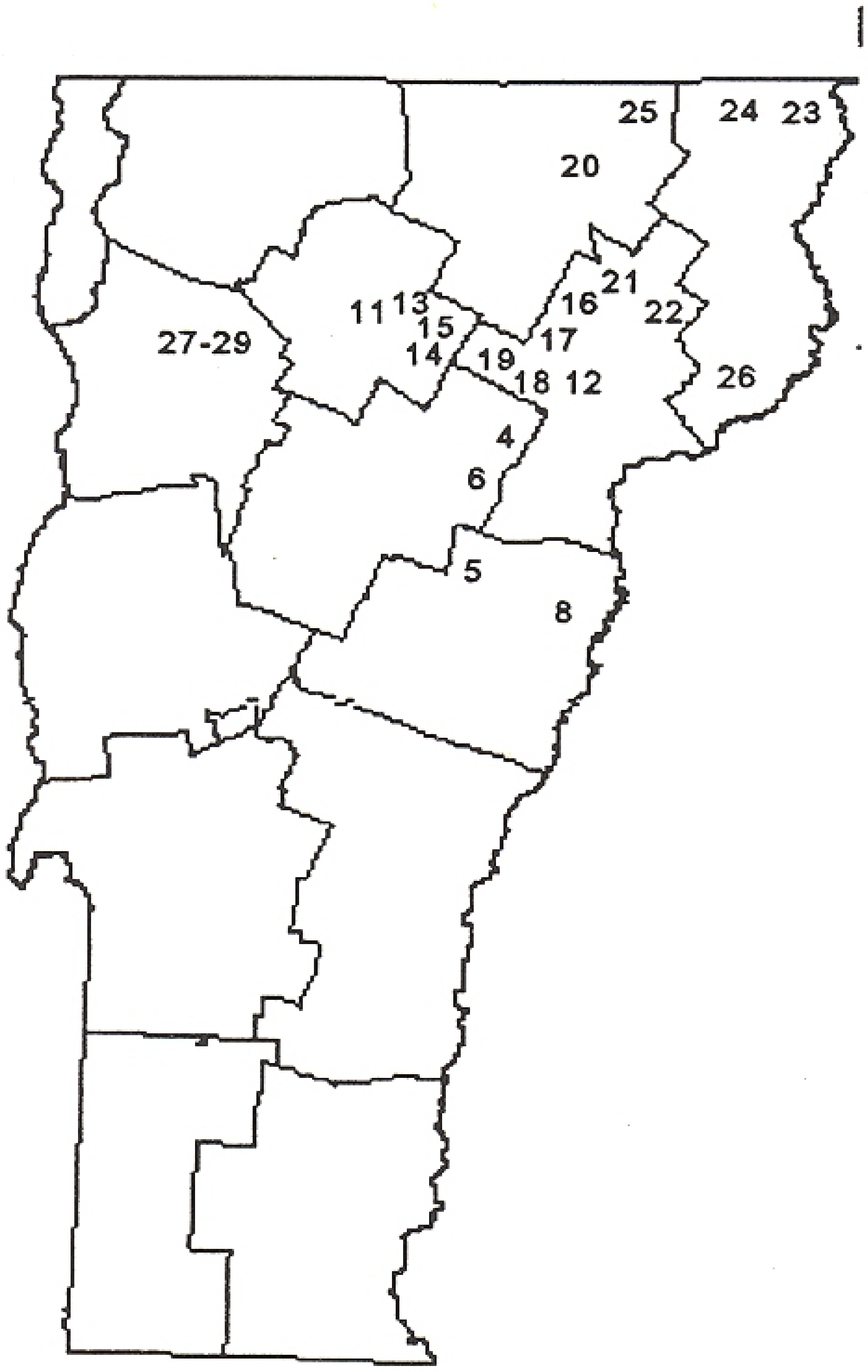
Spring Hemlock Looper, *Lambdina athasaria*, caused no noticeable defoliation, but 240 acres of dieback from 1991 defoliation in Windham County is still visible from the air. Tree condition generally improved in plots established to determine the impact of the 1991 defoliation. Additional mortality did occur in one plot which had been heavily defoliated (Figure 6). No moths were caught in pheromone traps (3 northern Vermont locations) baited with fall hemlock looper pheromone.



1991 Defoliation Severity:

Figure 6. Percent of trees in spring hemlock looper impact plots in each of five condition classes when evaluated in spring of 1992-1996, by defoliation severity in 1991. Data are from ten trees in each of seven stands which had heavy defoliation, six which had moderate defoliation, and two which had no defoliation.

Spruce Budworm, *Choristoneura fumiferana*, continued at low levels, with no visible defoliation detected. The number of moths captured in pheromone traps in northern Vermont has been fluctuating. After a sudden increase in 1991, and similar levels in 1992-1994, there was a slight decrease in 1995. Trap counts rebounded this year, but remained at low levels (Figures 7 and 8).



Location No.	Name	# of moths/trap
4.	Danville Hill	14.3
5.	Reservoir	8.3
6.	Marshfield Pd.	4.0
8.	Scotch Hollow	3.3
11.	Centerville	20.0
12.	Coles Pd.	5.3
13.	Diggins	14.3
14.	Wolcott F&G	2.7
15.	Bear Swamp	6.7
16.	Withers	3.0
17.	Mason	2.3
18.	Star School	6.3
19.	Beagle Club	13.0
20.	Brownington Pd.	10.7
21.	Calendar Brk.	12.7
22.	Chieppo	2.0
23.	Bunnel Brk.	0.7
24.	Norton Cem.	1.0
25.	Holland Pd.	1.7
26.	Victory Bog	0.7
27.	Underhill (VMC 1400)	30.3
28.	Underhill (VMC 2220)	9.7
29.	Underhill (VMC 3800)	49.0
	Average (excluding 28, 29)	**7.8**

Figure 7. Spruce budworm pheromone plot locations and average number of moths caught per trap in 1996.

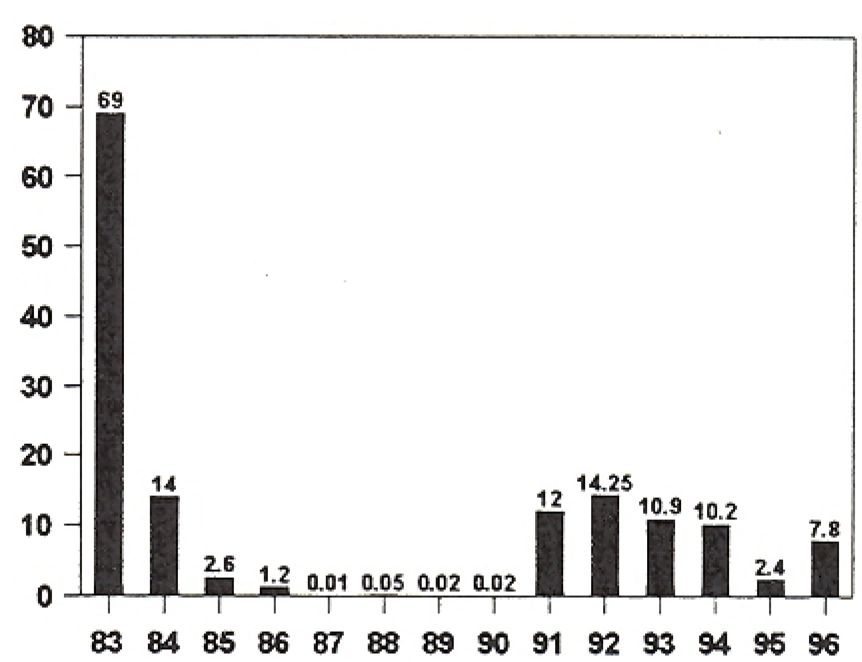


Figure 8. Average number of spruce budworm moths caught in pheromone traps, 1983-1996. Three to five pheromone traps per site for 15-23 sites.

OTHER SOFTWOOD DEFOLIATORS

INSECT	HOST(S)	LOCALITY	REMARKS
Arborvitae Leaf Miner *Argyresthia thuiella*	Arborvitae	Rutland, Bennington, and Windham Counties	Less than 1995, but heavy on individual trees. Elsewhere, scattered light damage.
Balsam Fir Sawfly *Neodiprion abietis*			Not observed.
European Pine Sawfly *Neodiprion sertifer*	Mugo Pine	Morrisville	Ornamental.
European Spruce Needleminer *Taniva albolineana*	Blue Spruce	Rutland	Christmas trees.
Fall Hemlock Looper *Lambdina fiscellaria*			See narrative.
Fir Coneworm *Dioryctria abietivorella*	Fraser Fir Balsam Fir	Craftsbury Shrewsbury	Light feeding on Christmas trees.
Introduced Pine Sawfly *Diprion similis*	White Pine Scots Pine	Danville Bristol Lincoln	A few larvae seen. Light defoliation.
Larch Casebearer *Coleophora laricella*	Eastern Larch	Essex County Throughout	Heavy defoliation. Scattered light-moderate damage, down from 1995. 50 acres mapped in Caledonia and Orleans Counties.
Larch Sawfly *Pristophora erichsonii*			Not observed.
Nursery Pine Sawfly *Diprion frutetorum*			Not observed.
Pine False Webworm *Acantholyda erythrocephala*			Not observed.

OTHER SOFTWOOD DEFOLIATORS

INSECT	HOST(S)	LOCALITY	REMARKS
Pine Webworm *Tetralopha robustella*			Not observed.
Red-headed Pine Sawfly *Neodiprion lecontei*	Scots Pine	Bennington Pownal Shaftsbury	Normal levels on Christmas trees.
Spring Hemlock Looper *Lambdina athasaria*			See narrative.
Spruce Bud Moth *Zeiraphera canadensis*			Not observed.
Spruce Budworm *Choristoneura fumiferana*			See narrative.
Spruce Coneworm *Dioryctria reniculelloides*	Blue Spruce	Rockingham	Light, scattered feeding in Christmas trees.
Spruce Needleminer *Archips sp.*	Mixed Conifer Plantation	Barre	
Webspinning Sawflies *Pamphiliidae*	Conifer Plantation	Barre	
White Pine Sawfly *Neodiprion pinetum*			Not observed.
Yellow-headed Spruce Sawfly *Pikonema alaskensis*	Blue Spruce White Spruce	St. Johnsbury Danville Greensboro Berlin	Scattered heavy defoliation of ornamentals.

SAPSUCKING INSECTS, MIDGES, AND MITES

Balsam Gall Midge, *Paradiplosis tumifex*, populations increased again this year in northern Vermont, and damage was detected in half of the balsam fir Christmas tree plantations surveyed. A number of growers reported noticeable damage. Damage is expected to be heavy enough to affect tree marketability in 1997.

Balsam Twig Aphid, *Mindarus abietinus*, damage to balsam fir was particularly widespread this year, causing heavy needle curling on fir Christmas trees and ornamentals where control measures were lacking or inadequate. Heavy sooty mold developed on many damaged trees. Lady beetle larvae were common on infested trees in many plantations. Mostly moderate to heavy damage was detected in all of the balsam fir Christmas tree plantations surveyed.

Hemlock Woolly Adelgid, *Adelges tsugae*, was not observed. Two surveys were conducted at the site in Stockbridge where the insect was introduced, and no adelgids or hemlock seedlings were found. No adelgids have been found there since Fall 1991, although 11 surveys have been done since then. No signs of adelgid were observed on the hemlock seedlings which had been planted at the site in 1993 as trap trees.

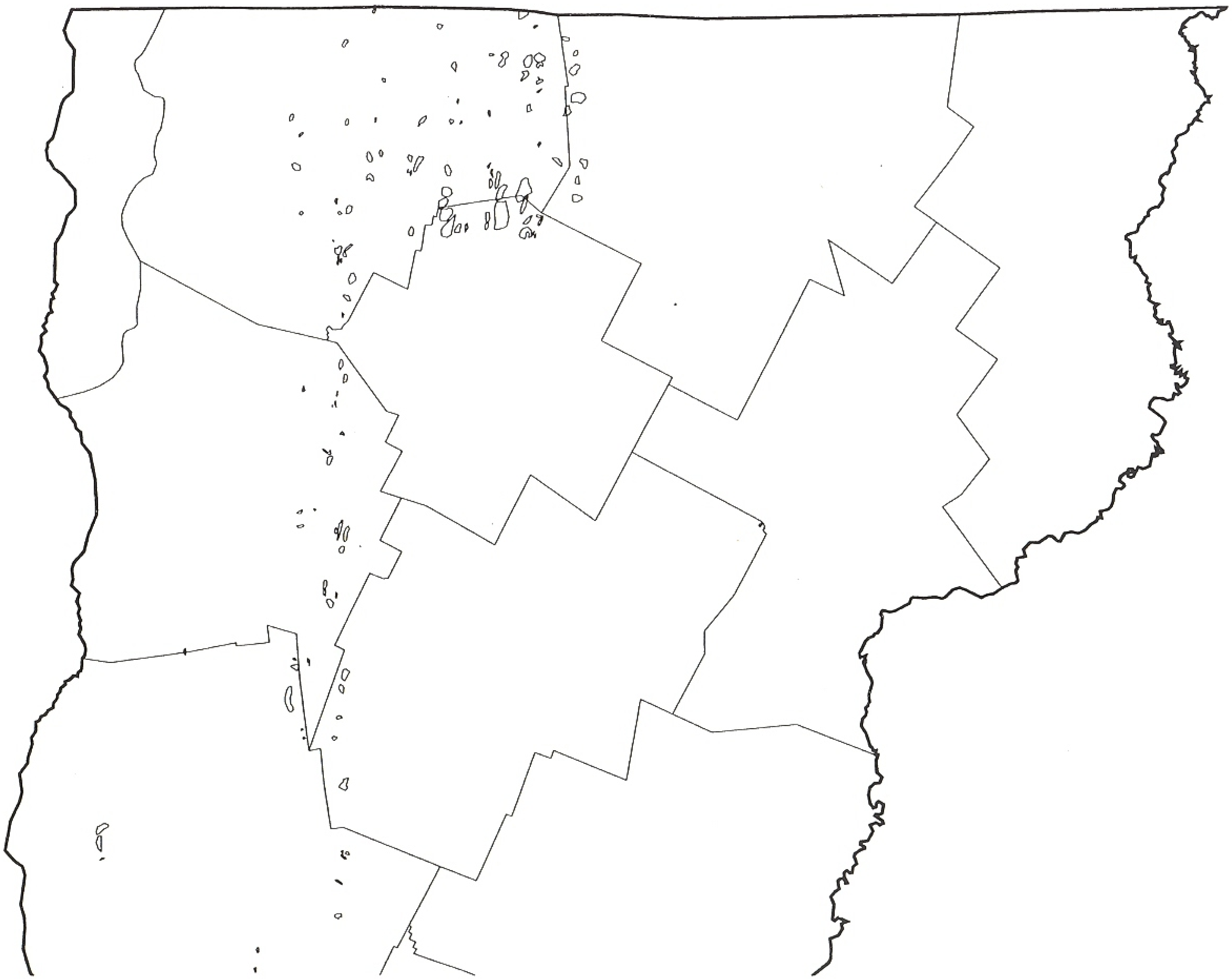
A study to determine the survival of hemlock woolly adelgid at low winter temperatures is being done at the University of Vermont Entomology Laboratory in cooperation with the US Forest Service State and Private Forestry and other New England states. Preliminary results indicate that the longer the insect is exposed to cold temperatures, the greater the mortality. Studies are also underway investigating entomopathogenic fungi that may be used as control agents.

Oystershell Scale, *Lepidosaphes ulmi*, populations on American beech increased dramatically, contributing to extensive dieback in northern Vermont heavy enough to be detected by aerial survey. Beech crown dieback was mapped on 17,642 acres, and the scale was commonly found in affected stands (Table 7, Figure 9). Ground checks of beech dieback aerially sketched as moderate revealed an average crown dieback of 42%. Last summer's drought may have played a role in increasing the dieback, either as an additional stressor and/or by causing physiological changes in the trees that made them more susceptible to the insect. Heavy populations of woolly beech aphid also contributed to foliar stunting and discoloration of beech.

Elsewhere, oystershell scale was occasionally heavy on regeneration. Heavy populations were also observed on ornamental beech, lilac, and green ash.

Populations of the scale insect in a survey plot in Huntington appear to be decreasing after an all-time high in 1995 (Table 8, Figure 10).

OYSTERSHELL SCALE



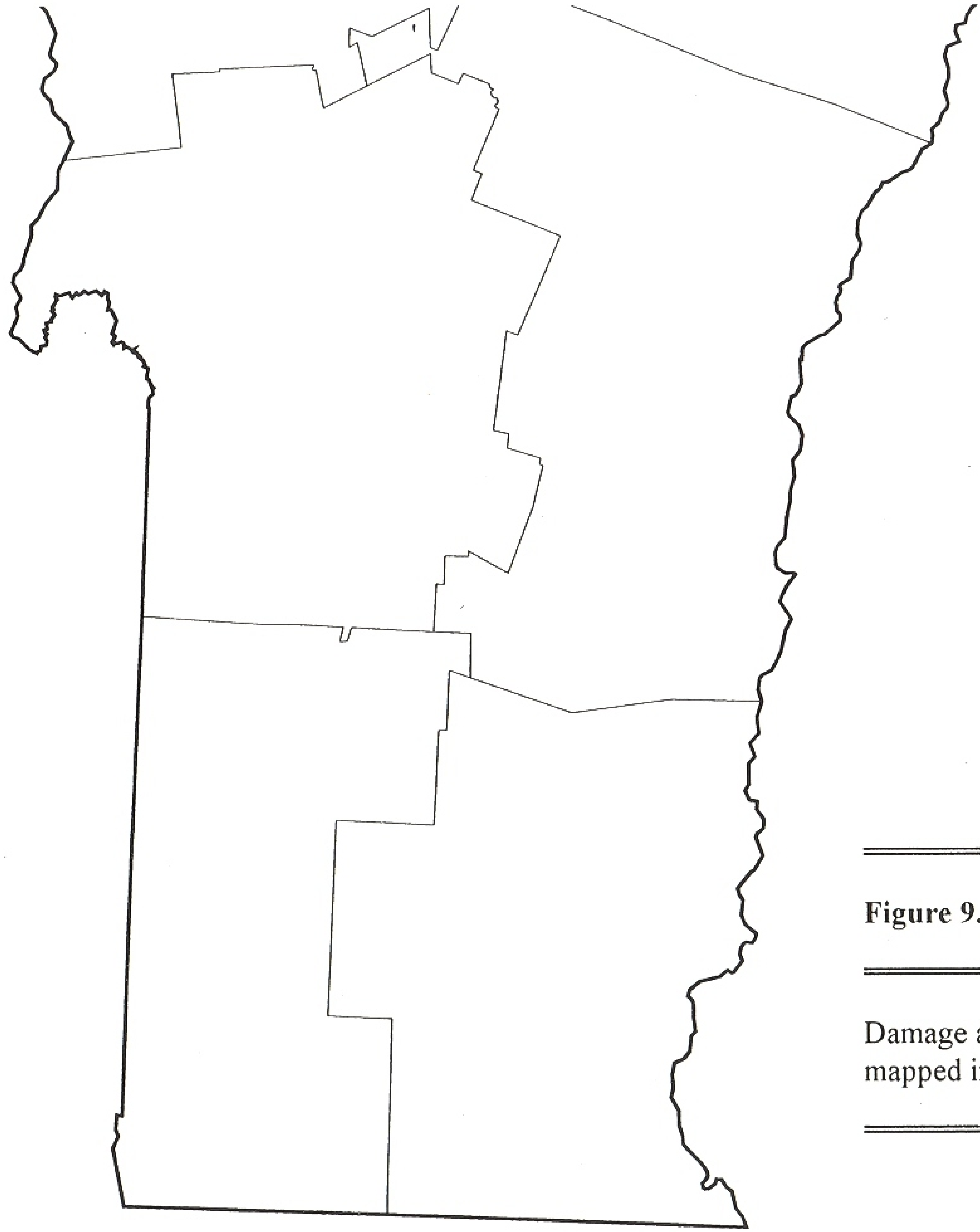


Figure 9. 1996 dieback from oystershell scale.

Damage area approximate location. Total damage mapped in 1996 = 17,642 acres.

Table 7. Mapped acres of damage from oystershell scale in 1996.

County	Light	Moderate	Heavy	Total
Addison		1,676		1,676
Chittenden		1,734		1,734
Franklin	329	6,378	965	7,672
Lamoille		4,065		4,065
Orleans		1,557	143	1,700
Washington		764		764
Windsor		31		31
Total	**329**	**16,205**	**1,108**	**17,642**

Table 8. Number of oystershell scales on current year beech twigs in Camel's Hump State Forest, 1990-1995[1].

	Average Number of Mature Viable Scales per:													
	Twig							Millimeter						
	1990	1991	1992	1993	1994	1995	1996	1990	1991	1992	1993	1994	1995	1996
Suppressed	2.1	0.9	2.6	1.2	2.1	9.0	0.6	0.05	0.04	0.19	0.03	0.07	0.15	0.06
Intermediate	8.5	5.9	6.8	1.4	8.4	16.8	1.2	0.13	0.14	0.09	0.05	0.16	0.31	0.12
Codominant	7.4	0.7	4.8	4.8	3.4	11.3	0.2	0.11	0.32	0.33	0.11	0.08	0.71	0.17

[1]Average for 10 branches from one tree per crown class, collected in Autumn.

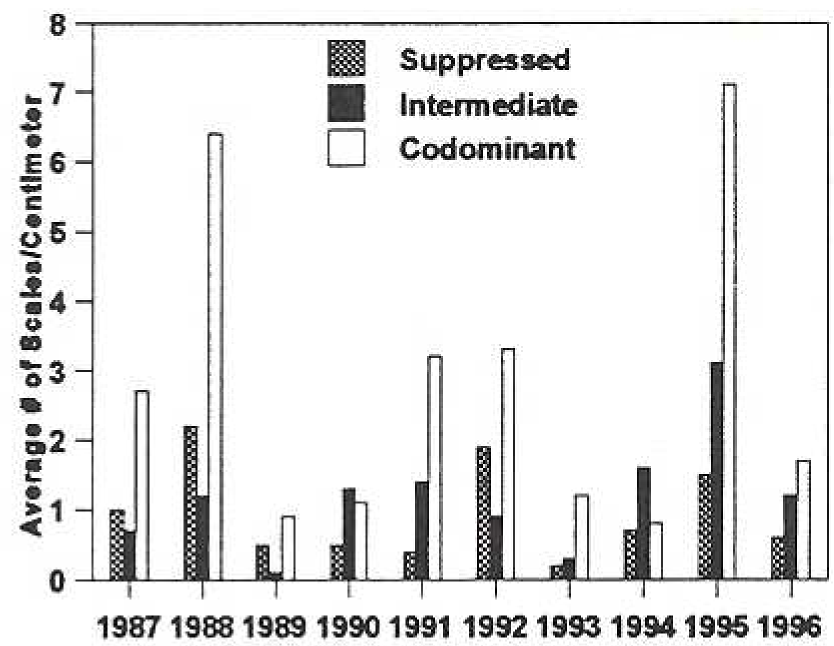


Figure 10. Number of viable oystershell scales per centimeter of current year twig in three tree canopy positions, Camel's Hump State Forest, 1987-1996. Average of 10 current year twigs/per tree crown class, collected in Autumn.

Pear Thrips, *Taeniothrips inconsequens*, populations remained low this year. Very little damage was observed, in spite of the slow spring development. Although averages remained low (Figure 11), counts of adults were occasionally heavy in developing buds, and moderate damage was observed on a few shade trees in southern Vermont, and widely scattered regeneration. No significant defoliation has been observed since 1993, when nearly 84,000 acres were mapped. Counts of thrips in the soil going into the winter suggest that populations will be similar in 1997 (Figure 12). Counts decreased in 61% of sites, and increased in 18%.

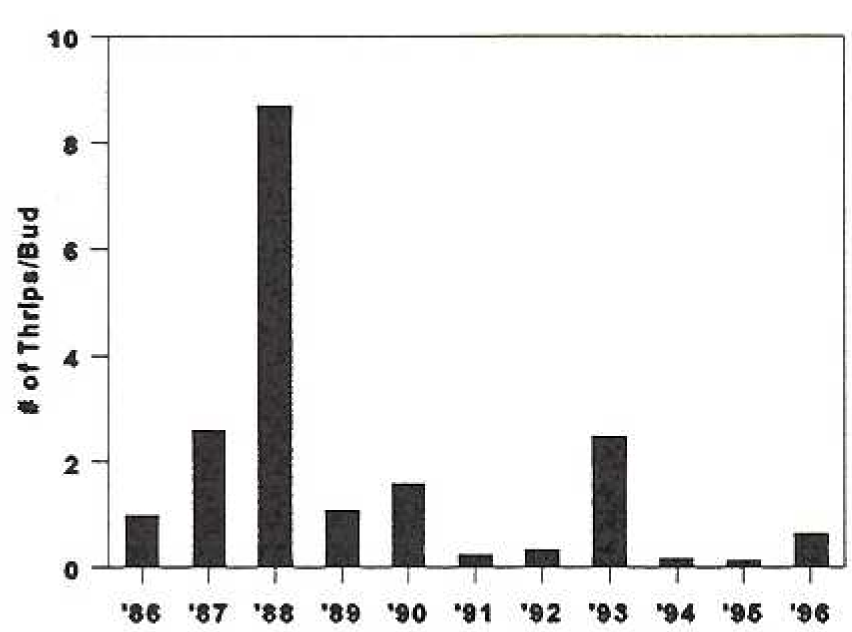


Figure 11. Average thrips counts in buds of sugar maple in southern Vermont 1986-1996. Average of 2 sugarbushes in 1986 and 6 sugarbushes in 1987-1995, 5 in 1996 (100 buds/sugarbush).

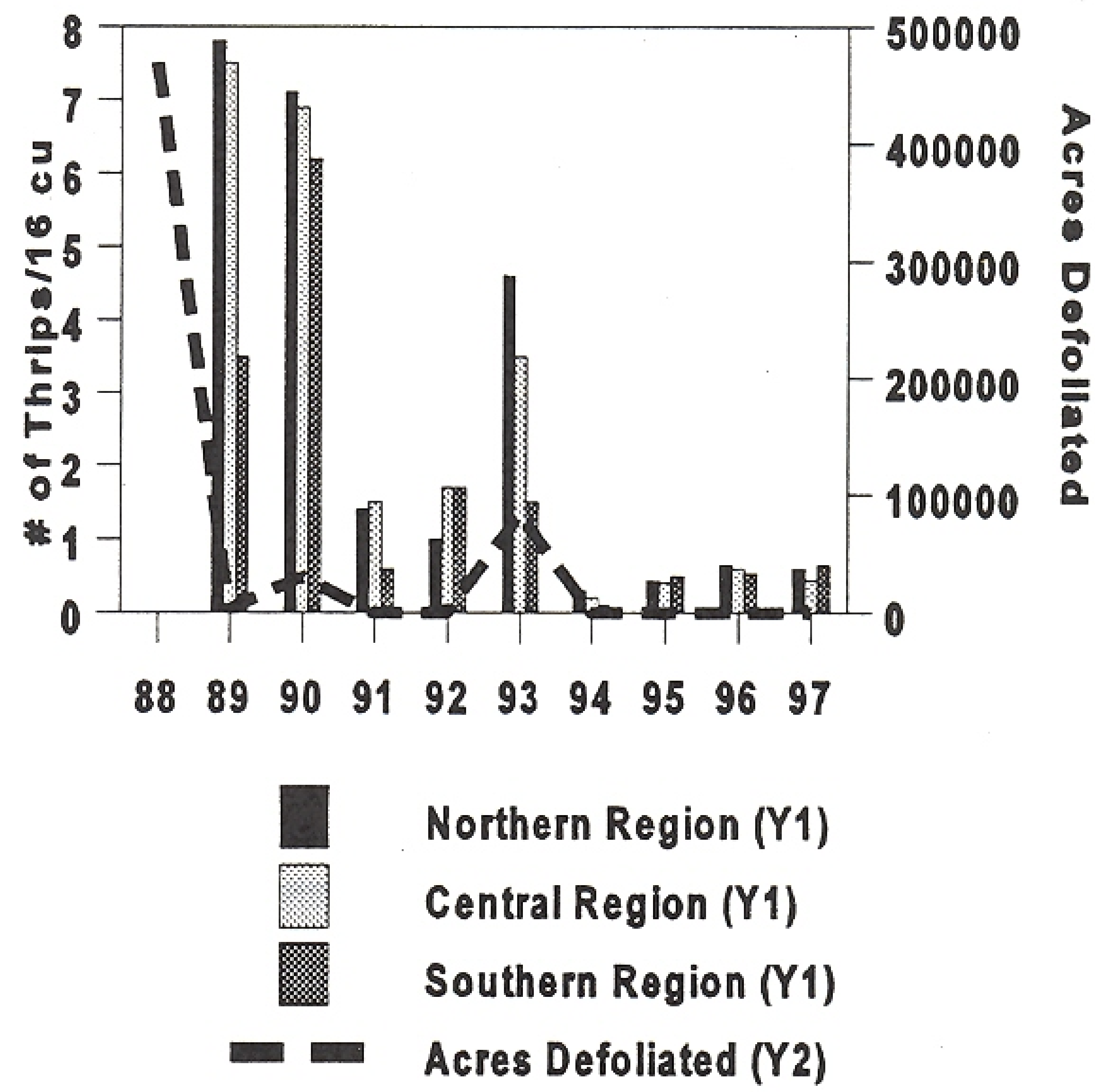


Figure 12. Average counts of overwintering pear thrips in soil samples (# of insects/16 in^3) by region of the state, compared to acres of thrips damage mapped statewide the following summer. Overwintering thrips numbers determined by extraction in 1989-93, and by forced emergence in 1994-97.

Pine Bark Adelgid, *Pineus strobi*, was very heavy on individual trees in widely scattered stands in southern Vermont. Light populations were also observed in Christmas trees. In a monitoring plot in Rupert, adelgid levels dropped slightly (Figure 13). Crown density improved on trees with low levels of adelgid, but remained the same on trees with high levels (Figure 14, difference sig at p=.01).

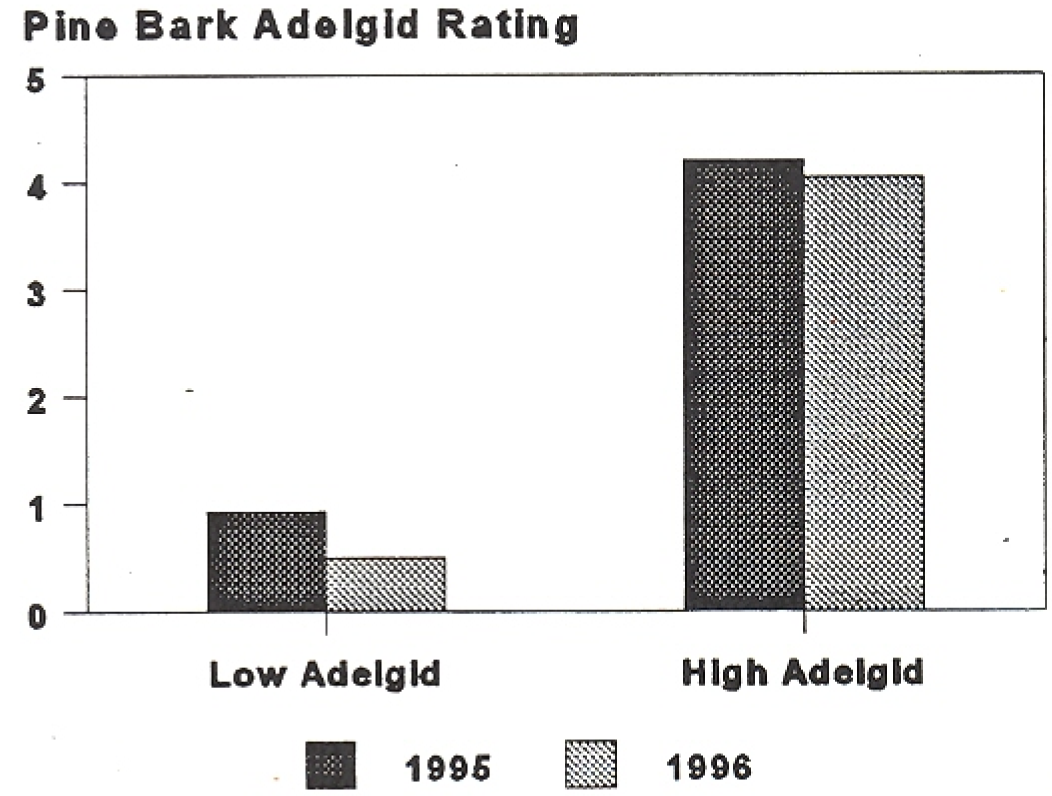


Figure 13. Park bark adelgid rating on 12 white pine trees in Rupert with generally low levels of adelgid in 1995, and 23 with generally high levels, 1995-1996. Adelgid is rated on the worst face as 0: None; 1: Some white visible; 2: Obvious white limited to one internode; 3: Obvious white more extensive; 4: More white than grey; 5: Flocculent, white over most of smooth stem.

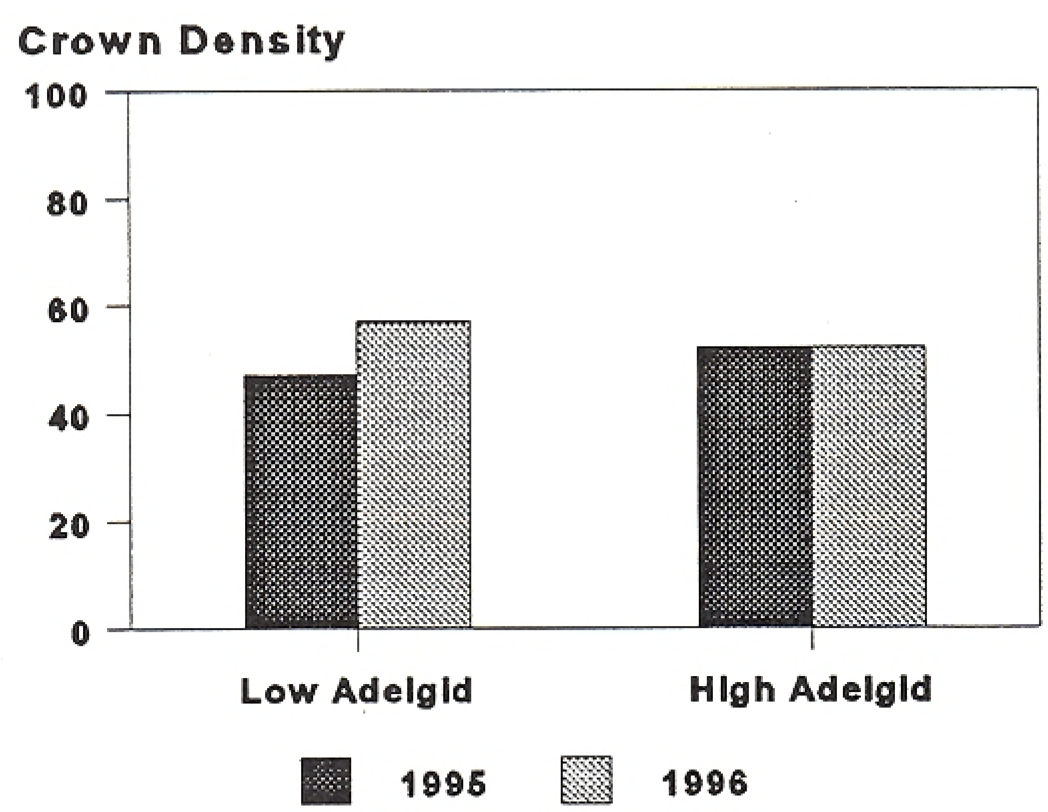


Figure 14. Crown density on 12 white pine trees in Rupert with generally low levels of adelgid in 1995 and 23 with generally high levels, 1995-1996. Crown density is rated using national forest health monitoring standards.

OTHER SAPSUCKING INSECTS, MIDGES, AND MITES

INSECT	HOSTS(S)	LOCALITY	REMARKS
Aphids *Cinara sp.*	Balsam Fir White Pine	Widely scattered	Light populations on Christmas trees and ornamentals.
Aphids *Periphyllus sp.*	Sugar Maple	Northeast Kingdom	Light infestations on many trees.
Ash Flowergall Mite *Aceria fraxiniflora*	Brown Ash	Weybridge	Isolated damage.
Balsam Gall Midge *Paradiplosis tumifex*			See narrative.
Balsam Twig Aphid *Mindarus abietinus*			See narrative.
Balsam Woolly Adelgid *Adelges piceae*	Balsam Fir	Chittenden Essex County	Light populations.
Basswood Thrips *Thrips calcaratus*	American Basswood	Ferrisburg	Moderate to heavy damage seen.
Beech Blight Aphid *Fagiphagus imbricator*	Beech	Marlboro	Ornamentals.
Beech Scale *Cryptococcus fagisuga*			See Beech Bark Disease.
Birch Aphid *Euceraphis betulae*	Paper Birch	Widespread	Very heavy in early fall on leaves of trees infected with anthracnose.
Black Pine Leaf Scale *Nuculaspis californica*	Scots Pine	Townshend	Christmas trees.
Cooley Spruce Gall Adelgid *Adelges cooleyi*	Blue Spruce White Spruce Douglas Fir	Widely scattered	Only light damage to Christmas trees and ornamentals detected.

OTHER SAPSUCKING INSECTS, MIDGES, AND MITES

INSECT	HOSTS(S)	LOCALITY	REMARKS
Cottony Maple Scale *Pulvinaria innumerabilis*			Not observed.
Eastern Spruce Gall Aphid *Adelges abietis*	Spruce	Throughout	Generally light, but common. Decreased on Christmas trees. Heavy on white spruce ornamentals in Pownal.
Euonymus Scale *Unaspis euonymi*	Euonymous	Brattleboro	Ornamentals.
Fletcher Scale *Lecanium fletcheri*			Not observed.
Gall Midge *Neuroterus sp.*	White Pine	Kill Kare State Park	
Hemlock Woolly Adelgid *Adelges tsugae*			See narrative.
Honeylocust Plant Bug *Diaphnocoris chlorionis*	Locusts	Burlington	Fewer than last year.
Lacebugs *Corythucha sp.*	American Elm Balm of Gilead	Chittenden Washington Lamoille Counties	Heavy damage to some roadside trees.
Lecanium Scale	Blueberry	Springfield	Very heavy.
Lecanium sp.	Oak	Swanton	Ornamental.
	Beech	Pownal Sunderland	Heavy on regeneration.
Maple Spindle Gall Mites *Vasates aceris-crumena*	Sugar Maple Red Maple	Widespread	Remains common.

OTHER SAPSUCKING INSECTS, MIDGES, AND MITES

INSECT	HOSTS(S)	LOCALITY	REMARKS
Oak Apple Gall *Amphibolips sp.*	Oak	Colchester Windham County	
Oak Gall *Neuroteus umbilicatus* *Neuroteus spp.* *Amphibolips cookii*	Oak	Middlesex	Generally of little consequence.
Cynips sp.	Pin Oak	Waitsfield	
Oystershell Scale *Lepidosaphes ulmi*			See narrative.
Ocellate Gall Midge *Cecidomyia ocellans*	Sugar Maple Red Maple	Widespread	Common this year.
Pear Leaf Blister *Eriophyes pyri*	Pear	Westminster Barre	Ornamentals.
Pear Thrips *Taeniothrips inconsequens*	Sugar Maple		See narrative.
Periodical Cicada *Magicicada septendecum*			Not observed.
Pine Bark Adelgid *Pineus strobi*			See narrative.
Pine Fascicle Mite *Trisetacus alborum*	White Pine	Northern Vermont	Unusually common on Christmas trees again this year.
Pine Leaf Adelgid *Pineus pinifoliae*	White Pine Red Spruce	Northern Vermont Lincoln Gap	Decreasing - few detections this year in Christmas trees. Numerous galls.
Pine Needle Midge *Contarinea baeri*	Scots Pine	Northern Vermont	Decreasing in Christmas trees.
Pine Needle Scale *Chionapsis pinifoliae*	Mugo Pine	Cambridge	Heavy.

OTHER SAPSUCKING INSECTS, MIDGES, AND MITES

INSECT	HOSTS(S)	LOCALITY	REMARKS
Pine Spittlebug *Aphrophora parallela*	White Pine Eastern Larch Mugo Pine	Widely scattered	Some heavy populations in Chittenden County but light elsewhere.
Pine Thrips *Gnophothrips sp.*	Scots Pine	Wolcott Craftsbury	Moderate damage to Christmas trees in two plantations.
Pine Tortoise Scale *Toumeyella parvicornis*	Scots Pine	Barre Dummerston	On Christmas trees for the third consecutive year. Very light populations.
Poplar Petiole Gall Aphid *Pemphigus populitransversus*	Quaking Aspen	Pownal	Some defoliation.
Ragged Spruce Gall Aphid *Pineus similis*	Red Spruce	Northern Vermont	Remains common.
Ridged Bunch Gall *Callirhytis gemmaria*	Oak	Swanton	
Root Aphid *Prociphilus americanus*			Not observed.
Spruce Gall Aphid *Adelges lariciatus*			Not observed.
Spruce Spider Mite *Oligonychus ununguis*	Conifers	Throughout	Unusually light. Heavy spring rains may have washed mites off.
Willow Blister Gall *Cecidomyidae*	Weeping Willow	Worcester	
Woolly Alder Aphid *Prociphilus tessellatus*	Silver Maple Alder	Scattered	Light populations.
Woolly Beech Aphid *Phyllaphis fagi*	American Beech	Throughout	Contributed to heavy foliage stunting and discoloration. Common on understory beech.
Woolly Elm Aphid *Eriosoma americana*	American Elm	Charleston	On roadside trees.

Balsam Shootboring Sawfly, *Pleroneura brunneicornis*, continues to be a common problem in fir Christmas tree populations in northern Vermont but was observed only on occasional shoots in southern Vermont. Damage from this sawfly was observed in every location where it was previously detected, but trees were not damaged as extensively as in 1994 or 1995. Overall, fraser fir tended to receive the heaviest damage. This year 42% of the fraser fir plantations infested had moderate damage compared to 31% in 1995. Conversely, 25% of the balsam fir plantations had moderate damage compared to 29% in 1995. Damage should decrease in 1997.

Adults began emerging April 22 in Stowe and May 1 in Wolcott and Elmore, but moderate numbers were not observed on trees in Elmore until May 7, one week later than in 1995. Females emerged first, with first male emergence 6 days later. Emergence in Elmore was completed by May 9, but this was followed by an extended period of cold, windy, rainy, snowy weather. Peak egg laying did not take place until about May 20, and adults were visible until May 24 after most balsams had broken bud and 50 percent of the frasers were at green bud stage. This is in sharp contrast to 1995 when adults were gone by the time balsams broke bud in mid-May. The adverse weather when adults should have been laying eggs may be responsible for the damage being less than predicted for this year.

Spray trials to control shootboring sawfly damage were conducted in Elmore again this year. Two applications of Lorsban 4L, at 1 quart per acre, were applied by the grower with a tractor-mounted mist blower. NU-film 17 was added as a spreader sticker. The first treatment was on May 10, after all female sawflies had emerged and 2 days after the first male emergence. This should have been ideal timing based on our experience from 1995 but because of the cold weather, adults surprised us by delaying activity until a week later when a few days of warm weather finally arrived. The second application was on May 21 about mid-way through the egg-laying periods (based on adults caught on sticky cards in host trees). Treated trees had 50 percent fewer buds killed by sawfly than untreated trees. So a split application should give good control if the first treatment is delayed until adults are just beginning to lay eggs, with a second treatment 3-5 days later. The difficulty comes in monitoring closely enough to determine this timing. Small yellow sticky cards placed at mid-crown in host trees appear to be useful in making this determination.

Laboratory biocontrol trials using a University of Vermont isolate of *Beauvaria bassiana* were conducted to see if this fungus has the potential to kill sawfly larvae as they migrate into the soil. Larvae were collected from fir shoots, dipped in a spore suspension of *B. bassiana* and then placed on moist filter paper in small petri dishes. The dilution used by UVM entomologists in pear thrips field trials (10^7 spores/ml) appears to be effective against shootboring sawfly based on these laboratory conditions. Natural mortality of untreated larvae was also quite high.

A few larvae were placed in a clear plastic 5½" long vial, filled with soil, and inserted into the ground to see how fast and how far they tunnel downward. All larvae were near the 5-inches-deep mark within 48 hours.

BUD, SHOOT, AND STEM INSECTS

INSECT	HOST(S)	LOCALITY	REMARKS
Allegheny Mound Ants *Formica exsectoides*	White Pine	Glover Caledonia County Bennington County	Killing young trees. Nests common.
Ambrosia Beetle *Scolytidae*	White Birch	Stockbridge	Declining trees.
Ambrosia Beetle *Gnathotrichus materiavius*	Balsam Fir	Shrewsbury	Found on lower portion of dying Christmas tree.
Asian Longhorned Beetle *Anoplophera glabripennis*			Not observed. Numerous suspected sighting prompted by media reports were unfounded. All were identified as native longhorn beetles.
Balsam Shootboring Sawfly *Pleroneura brunneicornis*			See narrative.
Brown Prionid *Orthosoma brunneum*	Hardwood	Middlesex	Found in decaying logs.
Eastern Pine Shoot Borer *Eucosma gloriola*	White Pine Scots Pine	Northern Vermont	Decreasing - occasional shoot mortality on Christmas trees.
European Pine Shoot Moth *Rhyacionia buoliana*	White Pine Scots Pine	Northern Vermont	Decreasing - occasional shoot mortality on Christmas trees.
Locust Borer *Megacyllene robiniae*	Black Locust	Shrewsbury	Endemic on ornamentals.
Maple Petiole Borer *Caulocampus acericaulis*			Not observed.
Northeastern Sawyer *Monochamus notatus*	Conifers	Middlesex	Reports widely scattered.

BUD, SHOOT, AND STEM INSECTS

INSECT	HOST(S)	LOCALITY	REMARKS
Northern Pine Weevil *Pissodes approximatus*	Spruce White Pine	Addison	Moderate damage.
Pales Weevil *Hylobius pales*	Fraser Fir	Northern Vermont	Damage decreasing on Christmas trees.
Pigeon Tremex *Tremex columba*		Barre	Trees cut for firewood.
Pine False Webworm *Acantholyda erythrocephala*			Not observed.
Pine Gall Weevil *Podapion gallicola*	Red Pine	Plymouth Danville	On every tree in one stand, causing thin crowns. Killing branches of pole timber.
Pine Root Collar Weevil *Hylobius radicis*	White Pine	Bennington	Attacking 3-4' Christmas trees.
Pitch Nodule Maker *Petrova albicapitana*			Not observed this year for the first time in several years.
Pitted Ambrosia Beetle *Corthylus punctatissimus*			Not observed.
Pseudanthonomus validus			Not observed.
Round-headed Apple Tree Borer *Saperda candida*	Apple Mountain Ash	Sheffield Danville St. Johnsbury Springfield	On ornamentals. More apparent this year because of 1995 drought.
Sawyer *Monochamus sp.*	Balsam Fir	Widely scattered	Light damage to Christmas trees.

BUD, SHOOT, AND STEM INSECTS

INSECT	HOST(S)	LOCALITY	REMARKS
Sugar Maple Borer *Glycobius speciosus*	Sugar Maple	Throughout	Remains a common cause of defect on slow-growing maples.
Trigonarthris minnesotana	Black Cherry	Plainfield	
Twig Pruner *Elaphidionoides villosus*	Red Oak	Rutland Grand Isle Franklin Chittenden Washington Addison Windsor Counties	Increasing scattered damage.
White Pine Weevil *Pissodes strobi*	White Pine Douglas Fir Scots Pine Red Spruce Norway Spruce White Spruce Blue Spruce	Throughout	Steady populations.
White-Spotted Sawyer *Monochamus scutellatus*	White Pine	Widely scattered	Adults less noticeable than in some years, however a number of adults were brought in to confirm that they were not Asian longhorned beetles.
Zimmerman Pine Moth *Dioryctria zimmermanni*	White Pine	Dorset Bennington	Young plantation. Associated with pine root collar weevil in Christmas trees.

ROOT INSECTS

INSECT	HOST(S)	LOCALITY	REMARKS
Asiatic Garden Beetle *Autoserica castanea*	Many	Widely scattered	General complaints common.
Conifer Swift Moth *Korsheltellus gracilis*		Hyde Park	Several adults collected in a Luminoc light trap in July.
June Beetle *Phyllophaga spp.*			Turf damage only reported.

BARK INSECTS

INSECT	HOST(S)	LOCALITY	REMARKS
Bronze Birch Borer *Agrilus anxius*	White Birch	Sherburne Bennington Pownal Shaftsbury	Ornamentals. Increased number of calls.
Eastern Larch Beetle *Dendroctonus simplex*	Eastern Larch	Widespread	Common on scattered larch with dieback.
Elm Bark Beetles *Hylurgopinus rufipes* *Scolytus multistriatus*			See Dutch Elm Disease.
Hemlock Borer *Melanophila fulvoguttata*			Not observed.
Monathrum mali	Firewood	Corinth	Sent to lab.
Pine Engraver *Ips pini*			Not observed.
Red Turpentine Beetle *Dendroctonus valens*	White Pine	Weathersfield	Affecting pole-sized trees.
		Springfield	Large roadside trees affected by drought.
		Benson	Ornamental.
	Red Pine	Tunbridge	Attacking 1 acre of pole timber and sawtimber after recent thinnings.
Spruce Beetle *Dendroctonus rufipennis*	Norway Spruce	Sharon	Populations increasing in stand with scattered root rot; however, many attacks unsuccessful.

MISCELLANEOUS INSECTS AND ARTHROPODS

Ants (*Camponotus* spp. and others): Numbers of requests for information and identification of carpenter ants remained high. The August flights of field and forest nesting ants, especially those species that have tiny winged males attached to the larger flying females, resulted in inquiries from several interested observers.

Beetles that cause tiny holes in maple tubing are being investigated at the University of Vermont.

Great golden digger wasp (*Sphex ichneumoneus*): Adults from several locations were submitted to the Forest Biology Lab for identification. These large ground-dwelling wasps place 2-7 anesthetized prey (often grasshoppers) in separate cells and lay one egg on each. Some nest in the floors of abandoned buildings.

Migratory agricultural pests: Populations of the potato leafhopper (*Empoasca fabae*), corn earworm (*Heliothis zea*), and fall armyworm (*Spodoptera frugiperda*) were up this year, and these pests arrived earlier in the region than they have in years past. Hurricane Bertha is thought to have played a role in their premature arrival.

Mosquitoes: Spring flooding and inclement weather in July (Hurricane Bertha and her cousins) helped provide good conditions for explosions of mosquito populations, especially in Addison and Rutland Counties.

Multicolored Asian ladybeetle (*Harmonia axyridis*): The insect that was considered a novelty by hundreds of people last fall, is rapidly achieving the nickname of the "Coleopteran clusterfly" because of the large numbers entering homes. While last year's inquiries from the public focused on identification of the insect, many of this year's questions had to do with ways to control it.

Spiders: For several days in June, we received a spider a day at the Forest Biology Lab. These were fishing spiders (*Dolomedes tenebrosus*), and each one we received was bigger than the previous specimen. In late summer and early fall, there were a number of inquiries about the colorful and common black-and-yellow argiope spider (*Argiope aurantia*). There were two sightings of black widow spiders (*Lactodectus mactans*) which came into local grocery stores on grapes.

Ticks: Requests for tick identifications and information continue to increase as public awareness and fear of Lyme disease increase. The risk of acquiring tick-borne infections within Vermont remains low. This year deer ticks (*Ixodes dammini/scapularis*), woodchuck ticks (*Ixodes cookei*), and dog ticks (*Dermacentor variabilis*) were submitted to the Forest Biology Laboratory for identification. Identifications were confirmed or made by Dick Dearborn (Maine Forest Service, Insect and Disease Lab) and Gordon Nielsen (Professor Emeritus, UVM).

Non-Target Moths caught in traps with lures for forest tent caterpillar (Table 9), in Luminoc light traps with and without forest tent caterpillar pheromone (Table 10), in traps baited with spruce budworm pheromone (Table 11), and in traps with lures for fall hemlock looper (Table 12) were tallied in 1996. Moths caught in a light trap in Rupert were also tallied (Table 13). Assistance in identifying moths was kindly provided by John Grehan.

Table 9. Non-target moths caught in multipher traps baited with forest tent caterpillar pheromone, 1996. Species name, author, and publication date are followed by common name and number of moths collected.

Geometridae	
Campaea perlata (Gn., 1857). (fringed looper, pale beauty)	1
Caripeta divisata Wlk. 1863. (gray spruce looper)	2
Homochlodes disconventa (Wlk., 1860)	78
Lambdina fiscellaria (Gn., 1857) (fall hemlock looper)	3
Lymantriidae	
Lymantria (=Porthetria) dispar L., 1758 (gypsy moth)	89
Noctuidae	
Zanclognatha laevigata (Grt. , 1872) (variable zanclognatha)	1
Pterophoridae	
Oidaematophorus lacterodactylus (Cham., 1873).	1
Tortricidae	
Choristoneura rosaceana (Harr., 1841) (obliquebanded leafroller)	1

Table 10. Moths caught in Luminoc light traps in Hyde Park, Lamoille County, July 1- July 22, 1996. Traps were run with light alone, or with forest tent caterpillar phermone and light, as indicated in table below. Data include Hodges checklist number (Hodges, R.W. et al. 1983. *Check List of the Lepidoptera of America North of Mexico*. E.W. Classey Limited and the Wedge Entomological Research Foundation, London. 284 p.), species, author and publication date, and number trapped. Collections were made by Ron Kelley.

7/1/96 Luminoc and forest tent caterpillar pheromone

Limacodidae			
	4659	**Packardia geminata** (Pack., 1864).	1
Geometridae			
	6620	**Melanolophia canadaria** (Gn., 1857).	4
	6677	**Cabera erythemaria** Gn., 1857.	2
	6740	**Xanthotype urticaria** Swett, 1918.	1
	6796	**Campaea perlata** (Gn., 1857).	2
	6813	**Homochlodes disconventa** (Wlk., 1860).	5
	6835	**Cepphis armataria** (H.-S., 1855).	1
	6884	**Besma endropiaria** (G. & R., 1867).	3
	7371	**Xanthorhoe iduata** (Gn., 1857)	3
	7645	**Heterophleps refusaria** (Wlk., 1861).	1
Notodontidae			
	7915	**Nadata gibbosa** (J.E. Smith, 1797).	2
		Heterocampa sp.	1
Noctuidae			
	8499	**Metalectra discalis** (Grt., 1876).	1
	10288	**Polia detracta** (Wlk., 1857).	2
	10587	**Orthodes cynica** Gn., 1852.	2

7/8/96 Luminoc

Geometridae			
	6740	**Xanthotype urticaria** Swett, 1918.	3
	7445	**Horisma intestinata** (Gn., 1857).	1
Notodontidae			
	7915	**Nadata gibbosa** (J.E. Smith, 1797).	7
	7957	**Dasylophia anguina** (J. E. Smith, 1797)	2
		Heterocampa sp.	4
Arctiidae			
	8111	**Haploa lecontei** (Guér-Meneville, 1832).	2
Noctuidae			
	9047	**Lithacodia muscosula** (Gn., 1852).	1
	9545	**Euplexia benesimilis** McD., 1922.	1
	10288	**Polia detracta** (Wlk., 1857).	9
	10405	**Lacinopolia lorea** (Gn., 1852)	1
	10919	**Diarsia jucunda** (Wlk., 1857).	6

7/8/96 Luminoc plus forest tent caterpillar pheromone

Drepanidae			
	6255	**Oreta rosea** (Wlk., 1855).	4
Geometridae			
	6737	**Euchlaena tigrinaria** (Gn., 1857).	1
	6740	**Xanthotype urticaria** Swett, 1918.	1
	6796	**Campaea perlata** (Gn., 1857).	2
	6837	**Probole alienaria** H.-S., 1855.	1
	6884	**Besma endropiaria** (G. & R., 1867).	1
	7371	**Xanthorhoe iduata** (Gn., 1857)	3
Sphingidae			
	7827	**Laothoe juglandis** (J. E. Smith, 1797).	1
Notodontidae			
	7915	**Nadata gibbosa** (J.E. Smith, 1797).	12
	7958	**Dasylophia thyatiroides** (Wlk., 1862)	2
		Symmerista sp.	4
		Heterocampa sp.	2
	8012	**Oligocentria semirufescens** (Wlk., 1865).	1
Arctiidae			
	8111	**Haploa lecontei** (Guér-Meneville, 1832).	1
Noctuidae			
	8322	**Idia americalis** (Gn., 1854).	2
	8499	**Metalectra discalis** (Grt., 1876).	3
	8727	**Parallelia bistriaris** Hbn., 1818.	2
	9047	**Lithacodia muscosula** (Gn., 1852).	4
	9065	**Leuconycta diphteroides** (Gn., 1852).	1
	9249	**Acronicta** prob. **increta** Morr., 1974.	1
	9545	**Euplexia benesimilis** McD., 1922.	6
	9556	**Chytonix palliatricula** Gn., 1852.	1
	10288	**Polia detracta** (Wlk., 1857).	7
	10919	**Diarsia jucunda** (Wlk., 1857).	4
	10928	**Graphiphora haruspica** (Grt., 1875)	1

7/13/96 Luminoc only

Geometridae			
	6656	**Hypagyrtis piniata** (Pack., 1870).	2
	6677	**Cabera erythemaria** Gn., 1857.	3
	7159	**Scopula limboundata** (Haw., 1809).	3
	7189	**Dysstroma hersiliata** (Gn., 1857)	1
	7422	**Hydrelia inornata** (Hulst, 1896).	1
	7645	**Heterophleps refusaria** (Wlk., 1861).	2

Sphingidae

7827	**Laothoe juglandis** (J. E. Smith, 1797).	2

Notodontidae

7915	**Nadata gibbosa** (J.E. Smith, 1797).	15
7919	**Peridea basitriens** (Wlk., 1855).	3
	Heterocampa sp.	5
8005	**Schizura ipomoeae** Doubleday, 1841.	7

Arctiidae

8090	**Hypoprepia fucosa** Hbn., 1827-1831.	1

Lymantriidae

8314	**Orgyia definita** Pack., 1864.	2

Noctuidae

8345	**Zanclognatha laevigata** (Grt., 1872).	8
8351	**Zanclognatha cruralis** (Gn., 1854).	2
8499	**Metalectra discalis** (Grt., 1876).	5
8727	**Parallelia bistriaris** Hbn., 1818.	1
9047	**Lithacodia muscosula** (Gn., 1852).	6
9249	**Acronicta increta** Morr., 1974	1
9545	**Euplexia benesimilis** McD., 1922.	1
10275	**Polia nimbosa** Gn., 1852.	3
10288	**Orthodes detracta** (Wlk., 1857).	4
10405	**Lacinopolia lorea** (Gn., 1852)	1
10944	**Xestia smithii** (Snell., 1896).	4
11008	**Eueretagrotis perattenta** (Grt., 1876).	2

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Drepanidae

6255	**Oreta rosea** (Wlk., 1855).	4

Thyatiridae

6237	**Pseudothyatira cymatophoroides**	1

Geometridae

	Semiothisa sp.	1
6656	**Hypagyrtis piniata** (Pack., 1870).	5
6737	**Euchlaena tigrinaria** (Gn., 1857).	1
6740	**Xanthotype urticaria** Swett, 1918.	3
6863	**Caripeta divisata** Wlk., 1863.	1
6965	**Eugonobapta nivosaria** (Gn., 1857).	3
7292	**Hydria prunivorata** (Fgn., 1955).	1
7445	**Horisma intestinata** (Gn., 1857).	1

Saturniidae

7757	**Antheraea polyphemus** (Cram., 1776).	1

Notodontidae

7915	**Nadata gibbosa** (J.E. Smith, 1797).	24
	Symmerista sp.	2
	Heterocampa sp.	14

Sphingidae

7824	**Paonias excaecatus** (J. E. Smith, 1797).	3
7825	**Paonias myops** (J. E. Smith, 1797).	2

Arctiidae

8090	**Hypoprepia fucosa** Hbn., 1827-1831.	2
8111	**Haploa lecontei** (Guér-Meneville, 1832).	1

Lymantriidae

8314	**Orgyia definita** Pack., 1864.	3

Noctuidae

8322	**Idia americalis** (Gn., 1854).	1
8345	**Zanclognatha laevigata** (Grt., 1872).	9
8499	**Metalectra discalis** (Grt., 1876).	3
8727	**Parallelia bistriaris** Hbn., 1818.	6
9065	**Leuconycta diphteroides** (Gn., 1852).	1
10288	**Orthodes detracta** (Wlk., 1857).	10
10919	**Diarsia jucunda** (Wlk., 1857).	17
11008	**Eueretagrotis perattenta** (Grt., 1876).	5

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Geometridae

6965	**Eugonobapta nivosaria** (Gn., 1857).	3
7009	**Nematocampa limbata** (Haw., 1809).	2

Sphingidae

7824	**Paonias excaecatus** (J. E. Smith, 1797).	1

Notodontidae

7915	**Nadata gibbosa** (J.E. Smith, 1797).	1
7957	**Dasylophia anguina** (J. E. Smith, 1797)	1
8005	**Schizura ipomoeae** Doubleday, 1841.	1

Arctiidae

8090	**Hypoprepia fucosa** Hbn., 1827-1831.	3

Noctuidae

8326	**Idia rotundalis** (Wlk., 1866).	2
8345	**Zanclognatha laevigata** (Grt., 1872).	12
	Hypenodes sp.	15
8499	**Metalectra discalis** (Grt., 1876).	3
9631	**Callopistria mollissima** (Gn., 1852).	1
10919	**Diarsia jucunda** (Wlk., 1857).	20

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Drepanidae		
6255	**Oreta rosea** (Wlk., 1855).	1
Geometridae		
6588	**Iridopsis larvaria** (Gn., 1857).	1
6656	**Hypagyrtis piniata** (Pack., 1870).	5
6796	**Campaea perlata** (Gn., 1857).	3
6965	**Eugonobapta nivosaria** (Gn., 1857).	14
7009	**Nematocampa limbata** (Haw., 1809).	2
7159	**Scopula limboundata** (Haw., 1809).	2
Sphingidae		
7821	**Smerinthus jamaicensis** (Drury, 1773).	1
7824	**Paonias excaecatus** (J. E. Smith, 1797).	1
Notodontidae		
7915	**Nadata gibbosa** (J.E. Smith, 1797).	8
7919	**Peridea basitriens** (Wlk., 1855).	3
8005	**Schizura ipomoeae** Doubleday, 1841.	4
Arctiidae		
8111	**Haploa lecontei** (Guér-Meneville, 1832).	3
8137	**Spilosoma virginica** (F., 1798).	1
8162	**Platarctia parthenos** (Harr., 1850).	1
Noctuidae		
8326	**Idia rotundalis** (Wlk., 1866).	6
8345	**Zanclognatha laevigata** (Grt., 1872).	15
8499	**Metalectra discalis** (Grt., 1876).	3
8727	**Parallelia bistriaris** Hbn., 1818.	1
8896	**Diachrysia aeroiodes** (Grt., 1864).	1
9047	**Lithacodia muscosula** (Gn., 1852).	2
10275	**Polia nimbosa** Gn., 1852.	3
10405	**Lacinopolia lorea** (Gn., 1852)	1
10578	**Pseudothodes vecors** (Gn., 1852).	1
10585	**Orthodes crenulata** (Butler, 1890)	1
10919	**Diarsia jucunda** (Wlk., 1857).	24
10928	**Graphiphora haruspica** (Grt., 1875)	2
11008	**Eueretagrotis perattenta** (Grt., 1876).	1

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Thyatiridae		
6235	**Habrosyne scripta** (Gosse, 1840).	1

Geometridae		
6740	**Xanthotype urticaria** Swett, 1918.	1
6912	**Sicya macularia** (Harr., 1850).	3
7009	**Nematocampa resistaria** (H.-S., 1855).	6
6965	**Eugonobapta nivosaria** (Gn., 1857).	15
7159	**Scopula limboundata** (Haw., 1809).	4
Notodontidae		
7915	**Nadata gibbosa** (J.E. Smith, 1797).	6
7919	**Peridea basitriens** (Wlk., 1855).	4
8005	**Schizura ipomoeae** Doubleday, 1841.	3
Arctiidae		
8090	**Hypoprepia fucosa** Hbn., 1827-1831.	7
Lymantriidae		
8314	**Orgyia definita** Pack., 1864.	3
Noctuidae		
8326	**Idia rotundalis** (Wlk., 1866).	21
8345	**Zanclognatha laevigata** (Grt., 1872).	13
8499	**Metalectra discalis** (Grt., 1876).	2
8727	**Parallelia bistriaris** Hbn., 1818.	1
8897	**Diachrysia balluca** Gey., 1832).	1
10275	**Polia nimbosa** Gn., 1852.	2
10919	**Diarsia jucunda** (Wlk., 1857).	1
11008	**Eueretagrotis perattenta** (Grt., 1876).	1

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Hepialidae		
31	**Korscheltellus gracilis** (Grt., 1864).	3
Geometridae		
6656	**Hypagyrtis piniata** (Pack., 1870).	2
6740	**Xanthotype urticaria** Swett, 1918.	1
6965	**Eugonobapta nivosaria** (Gn., 1857).	29
7009	**Nematocampa resistaria** (H.-S., 1855).	1
7159	**Scopula limboundata** (Haw., 1809).	3
7292	**Hydria prunivorata** (Fgn., 1955).	1
7399a	**Euphyia unangulata intermediata** (Gn., 1857).	1
Sphingidae		
7825	**Paonias myops** (J. E. Smith, 1797).	1
Notodontidae		
7915	**Nadata gibbosa** (J.E. Smith, 1797).	2
7919	**Peridea basitriens** (Wlk., 1855).	2
8005	**Schizura ipomoeae** Doubleday, 1841.	2

Arctiidae

8090	**Hypoprepia fucosa** Hbn., 1827-1831.	10
8111	**Haploa lecontei** (Guér-Meneville, 1832).	2
8137	**Spilosoma virginica** (F., 1798).	1

Lymantriidae

8314	**Orgyia definita** Pack., 1864.	2

Noctuidae

8326	**Idia rotundalis** (Wlk., 1866).	16
8345	**Zanclognatha laevigata** (Grt., 1872).	20
8499	**Metalectra discalis** (Grt., 1876).	4
8727	**Parallelia bistriaris** Hbn., 1818.	10
8896	**Diachrysia aeroiodes** (Grt., 1864).	1
9047	**Lithacodia muscosula** (Gn., 1852).	3
10275	**Polia nimbosa** Gn., 1852.	7
10891	**Ochropleura plecta** (L., 1761).	1
10919	**Diarsia jucunda** (Wlk., 1857).	15

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Hepialidae

31	**Korscheltellus gracilis** (Grt., 1864).	1

Geometridae

6965	**Eugonobapta nivosaria** (Gn., 1857).	1
7399a	**Euphyia unangulata intermediata** (Gn., 1857).	1

Notodontidae

7919	**Peridea basitriens** (Wlk., 1855).	3

Noctuidae

8326	**Idia rotundalis** (Wlk., 1866).	14
8345	**Zanclognatha laevigata** (Grt., 1872).	1
8727	**Parallelia bistriaris** Hbn., 1818.	2
10919	**Diarsia jucunda** (Wlk., 1857).	2

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Pyralidae

4949	**Ostrinia nubilalis** (Hbn., 1796).	2

Geometridae

6588	**Iridopsis larvaria** (Gn., 1857).	1
6656	**Hypagyrtis piniata** (Pack., 1870).	1

Arctiidae

8090	**Hypoprepia fucosa** Hbn., 1827-1831.	2
8098	**Clemensia albata** Pack., 1864.	1

Noctuidae

8326	**Idia rotundalis** (Wlk., 1866).	19
8334	**Idia lubricalis** (Gey., 1832).	1
8345	**Zanclognatha laevigata** (Grt., 1872).	1
8727	**Parallelia bistriaris** Hbn., 1818.	3
10275	**Polia nimbosa** Gn., 1852.	1
11012.1	**Noctua pronuba** (L.)	1

7/24/96 Luminoc only

Geometridae

6965	**Eugonobapta nivosaria** (Gn., 1857).	9
7009	**Nematocampa resistaria** (H.-S., 1855).	2

Lasiocampidae

7701	**Malacosoma americanum** (F., 1793).	1

Sphingidae

7824	**Paonias excaecatus** (J. E. Smith, 1797).	2

Notodontidae

7915	**Nadata gibbosa** (J.E. Smith, 1797).	7
7919	**Peridea basitriens** (Wlk., 1855).	7
7921	**Peridea ferruginea** (Pack., 1864).	1

Arctiidae

8090	**Hypoprepia fucosa** Hbn., 1827-1831.	9

Lymantriidae

8314	**Orgyia definita** Pack., 1864.	1

Noctuidae

8326	**Idia rotundalis** (Wlk., 1866).	4
8499	**Metalectra discalis** (Grt., 1876).	3
8727	**Parallelia bistriaris** Hbn., 1818.	3
10405	**Lacinopolia lorea** (Gn., 1852)	1
10919	**Diarsia jucunda** (Wlk., 1857).	8

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Hepialidae

31	**Korscheltellus gracilis** (Grt., 1864).	2

Geometridae

6588	**Iridopsis larvaria** (Gn., 1857).	1
6656	**Hypagyrtis piniata** (Pack., 1870).	2
6863	**Caripeta divisata** Wlk., 1863.	1
6965	**Eugonobapta nivosaria** (Gn., 1857).	7
7009	**Nematocampa resistaria** (H.-S., 1855).	6
7292	**Hydria prunivorata** (Fgn., 1955).	1

Lasiocampidae			
	7701	**Malacosoma americanum** (F., 1793).	1
Notodontidae			
	7919	**Peridea basitriens** (Wlk., 1855).	6
	8005	**Schizura ipomoeae** Doubleday, 1841.	4
Arctiidae			
	8090	**Hypoprepia fucosa** Hbn., 1827-1831.	6
Notodontidae			
	7915	**Nadata gibbosa** (J.E. Smith, 1797).	4
Noctuidae			
	8326	**Idia rotundalis** (Wlk., 1866).	8
	8345	**Zanclognatha laevigata** (Grt., 1872).	17
	8499	**Metalectra discalis** (Grt., 1876).	6
	8727	**Parallelia bistriaris** Hbn., 1818.	2
	9047	**Lithacodia muscosula** (Gn., 1852).	2
	10919	**Diarsia jucunda** (Wlk., 1857).	16

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Pyralidae			
	4949	**Ostrinia nubilalis** (Hbn., 1796).	1
Geometridae			
	6273	**Itame pustularia** (Gn., 1857).	2
	6588	**Iridopsis larvaria** (Gn., 1857).	5
	6597	**Ectropis crepuscularia** (D. & S., 1775).	1
	6965	**Eugonobapta nivosaria** (Gn., 1857).	1
	7159	**Scopula limboundata** (Haw., 1809).	1
Notodontidae			
	7919	**Peridea basitriens** (Wlk., 1855).	1
	7995	**Heterocampa biundata** Wlk., 1855.	1
Arctiidae			
	8090	**Hypoprepia fucosa** Hbn., 1827-1831.	12
Noctuidae			
	8326	**Idia rotundalis** (Wlk., 1866).	28
	8334	**Idia lubricalis** (Gey., 1832).	2
	8345	**Zanclognatha laevigata** (Grt., 1872).	1
	8727	**Parallelia bistriaris** Hbn., 1818.	2
	10275	**Polia nimbosa** Gn., 1852.	1

Table 11. Non-target moths caught in traps baited with spruce budworm pheromone, 1996. Species name, author, and publication date are followed by common name and number of moths collected.

Argyesthiidae	
Argyresthia oreasella (Clem., 1860). (cherry shootborer)	1
Geometridae	
Caripeta divisata Wlk., 1863. (gray spruce looper)	3
Ectropis crepuscularia (D. & S., 1775). (saddleback looper, the small engrailed	1
Eugonobapta nivosaria (Gn., 1857). (snowy geometer)	1
Eulithis explanata (Wlk., 1862). (white eulithis)	1
Homochlodes disconventa (Wlk., 1860).	22
Lambdina fiscellaria (Gn., 1857). (hemlock looper)	2
Perizoma basaliata (Wlk., 1862). square-patched carpet)	1
Semiothisa fissinotata (Wlk., 1863). (hemlock angle)	1
Lymantriidae	
Lymantria (=Porthetria) dispar (L., 1758). (gypsy moth)	12
Noctuidae	
Diarsia jucunda (Wlk., 1857). (smaller pinkish dart)	1
Enargia infumata (Grt., 1874). (birch-aspen noctuid)	2
Phlogophora periculosa Gn., 1852. (brown angle shades)	1
Zanclognatha laevigata (Grt.), 1872). (variable zanclognatha)	1
Pterophoridae	
Oidaematophorus lacterodactylus (Cham., 1873).	1
Pyralidae	
Anageshna primordialis (Dyar, 1907)	14
Thyatiridae	
Pseudothyatira cymatophoroides (Gn., 1852). (tufted thyatirid, birch and alder caterpillar)	1

Table 12. Non-target moths caught in multipher traps baited with fall hemlock looper pheromone, 1996. Species name, author, and publication date are followed by common name and number of moths collected.

Lymantriidae	
Lymantria (=Porthetria) dispar L., 1758 (gypsy moth)	94
Noctuidae	
Papaipema inquaesita (G. & R., 1868) (sensitive fern borer moth)	1
Pseudoaletia unipuncta Haw., 1809. (armyworm, whitespeck or American wainscot moth)	1

Table 13. Lepidoptera species caught in light trap, Merck Forest, Rupert, July-August 1996. Grateful acknowledgement is extended to Tyler Reihert for operating the trap and collecting specimens.

7/7/96

Geometridae	
Epirrhoe alternata (Muller, 1764). (white-banded toothed carpet)	1
Euphyia unangulata intermediata (Gn., 1857). (sharp angled carpet)	1
Homochlodes lactispargaria (Wlk., 1861).	1
Hydrelia inornata (Hulst, 1896). (unadorned carpet, birch looper)	1
Noctuidae	
Eueretagrotis perattenta (Grt., 1876). (two-spot dart)	12
Euplexia benesimilis McD., 1922. (American angle shades)	1
Idia aemula (Hbn., 1813). (common idia)	1
Lacinopolia lorea (Gn., 1852). (bridled arches)	3
Lithacodia muscosula (Gn., 1852). (large mossy lithacodia)	3
Orthodes cynica Gn., 1852. (cynical quaker)	2
Polia detracta (Wlk., 1857).	3
Polia latex (Gn., 1852).	1
Notodontidae	
Phlogophora iris Gn., 1852. (olive angle shades)	1

7/11/96

Geometridae	
Epirrhoe alternata (Muller, 1764). (white-banded toothed carpet)	5
Eusarca confusaria Hbn., 1813. (confused eusarca)	1
Homochlodes lactispargaria (Wlk., 1861).	3
Scopula cacuminaria (Morr., 1874). (frosted tan wave)	1
Noctuidae	
Eueretagrotis perattenta (Grt., 1876). (two-spot dart)	9
Lacinopolia lorea (Gn., 1852). (bridled arches)	5
Ochropleura plecta (L., 1761). (flame-shouldered dart)	1
Oligia exhausta (Sm., 1903).	3
Orthodes cynica Gn., 1852. (cynical quaker)	1
Polia detracta (Wlk., 1857).	1
Raphia frater Grt., 1864. (the brother, yellowmarked caterpillar)	1
Xestia smithii (Snell., 1896). (Smith's dart)	2

7/18/96

Arctiidae	
Ctenucha virginica (Esp., 1794). (Virginia ctenucha)	1
Pyrrharctia isabella (J. E. Smith, 1797). (banded woollybear, Isabella tiger moth)	1
Geometridae	
Caripeta divisata Wlk., 1863. (gray spruce looper)	1
Eugonobapta nivosaria (Gn., 1857). (snowy geometer)	1
Euphyia unangulata intermediata (Gn., 1857). (sharp-angled carpet)	2
Homochlodes lactispargaria (Wlk., 1861).	1
Nematocampa limbata (Haw., 1809).	1
Perizoma basaliata (Wlk., 1862). (square-patched carpet)	1
Noctuidae	
Apamea amputatrix (Fitch, 1857). (yellow-headed cutworm)	2
Autographa precationis (Gn., 1852). (common looper moth, plantain looper)	1
Eueretagrotis attenta (Grt., 1874).	1
Eueretagrotis perattenta (Grt., 1876). (two-spot dart)	3
Euplexia benesimilis McD., 1922. (American angle shades)	1
Homorthodes furfurata (Grt., 1875). (scurfy quaker)	3
Idia americalis (Gn., 1854). (American idia)	1
Idia concisa (of Forbes)	9
Leucania insueta Gn., 1852.	1

Oligia exhausta (Sm., 1903).	8
Orthodes cynica Gn., 1852. (cynical quaker)	2
Polia detracta (Wlk., 1857).	2
Polia nimbosa Gn., 1852. (stormy arches)	1
Spaelotis cladestina (Harr., 1862). (W-marked cutworm, clandestine dart)	1
Zanclognatha laevigata (Grt., 1872). (variable zanclognatha)	3

7/19/96

Arctiidae

Apantesis (= Grammia) virgo (L., 1758). (virgin tiger moth)	1
Ctenucha virginica (Esp., 1794). (Virginia ctenucha)	1

Noctuidae

Diarsia jucunda (Wlk., 1857). (smaller pinkish dart)	1
Eurois astricta Morr., 1874.	1
Homorthodes furfurata (Grt., 1875). (scurfy quaker)	1

Notodontidae

Clostera albosigma Fitch, 1856. (sigmoid prominent, rustylined leaftier)	1

7/28/96

Geometridae

Epirrhoe alternata (Muller, 1764). (white-banded toothed carpet)	1
Scopula cacuminaria (Morr., 1874). (frosted tan wave)	1

Noctuidae

Diarsia jucunda (Wlk., 1857). (smaller pinkish dart)	1
Homoglaea hircina (Morr., 1876). (goat sallow)	1
Idia rotundalis (Wlk., 1866). (rotund idia)	1
Lithacodia muscosula (Gn., 1852). (large mossy lithacodia)	1
Oligia exhausta (Sm., 1903).	2

8/6/96

Geometridae	
Epirrhoe alternata (Muller, 1764). (white-banded toothed carpet)	1
Itame subcessaria (Wlk., 1861).	1
Nematocampa limbata (Haw., 1809).	2
Scopula limboundata (Haw., 1809). (larger lace wave, large lace-border)	1
Xanthorhoe ferrugata (Cl., 1759). (red twin-spot)	1
Noctuidae	
Caenurgina crassiuscula (Haw., 1809). (clover looper)	1
Hypena humuli Harr. 1841. (hop looper)	1
Idia aemula (Hbn., 1813). (common idia)	2
Oligia exhausta (Sm., 1903).	4
Pseudorthodes vecors (Gn., 1852). (small brown quaker)	1
Notodontidae	
Peridea basitriens (Wlk., 1855). (oval-based prominent, redmarked caterpillar)	1
Sphingidae	
Sphecodina abbottii Swainson, 1821. (Abbot's sphinx)	1
Tortricidae	
Archips cerasivorana (Fitch, 1856). (uglynest caterpillar)	7

8/12/96

Geometridae	
Epirrhoe alternata (Muller, 1764). (white-banded toothed carpet)	1
Iridopsis larvaria (Gn., 1857). (bent-lined gray)	1
Mesoleuca ruficillata (Gn., 1857). (white-ribboned carpet)	1
Xanthorhoe ferrugata (Cl., 1759). (red twin-spot)	1
Noctuidae	
Hypena humuli Harr. 1841. (hop looper)	1
Idia lubricalis (Gey., 1832). (glossy black idia)	1
Oligia exhausta (Sm., 1903).	2
Xestia bicarnea (Gn., 1852). (pink-spotted dart)	1
Tortricidae	
Archips cerasivorana (Fitch, 1856). (uglynest caterpillar)	3

8/16/96

Geometridae	
Euphyia unangulata intermediata (Gn., 1857). (sharp-angled carpet)	4
Noctuidae	
Achatodes zeae (Harr., 1841). (elder shoot borer, corn spindleworm)	1
Caenurgina crassiuscula (Haw., 1809).	1
Cryptocala acadiensis (Bethune, 1870).	1
Enargia decolor (Wlk., 1858).	1
Idia aemula (Hbn., 1813). (common idia)	1
Idia americalis (Gn., 1854). (American idia)	1
Idia lubricalis (Gey., 1832). (glossy black idia)	1
Polia purpurissata (Grt., 1864). (purple arches)	1
Xestia bicarnea (Gn., 1852). (red twin-spot)	2
Tortricidae	
Archips cerasivorana (Fitch, 1856). (uglynest caterpillar)	2

OTHER MISCELLANEOUS INSECTS AND ARTHROPODS

INSECT	HOST(S)	LOCALITY	REMARKS
Bark Lice *Psocids*	Sugar Maple	Hyde Park Waterbury	Heavy colonies in sugarbush.
Clusterflies *Pollenia rudis*	Household	Statewide	Numbers of inquiries are up from previous years, possibly because their host organisms, earthworms, were present in greater numbers.
Fleas *Ctenocephalides spp.*	Dogs & Cats	Statewide	Flea populations appear to be down this year.
Head Lice *Pediculus humanus capitis*	Humans	Statewide	Numbers of requests for information on head lice were up considerably from past years. Because this is not a reportable condition, the Vermont Department of Health does not keep statewide statistics on head lice incidence.
Honeybees		Most areas outside the Champlain Valley	Populations very low.

Forest Diseases

STEM DISEASES

Beech Bark Disease, caused by *Cryptococcus fagisuga* and *Nectria coccinea var. faginata*, continued to cause beech decline and stem defect. In northern Vermont, it was difficult to detect this year because of beech dieback related to oystershell scale and possibly last year's drought. Elsewhere, ample moisture probably reduced the amount of chlorosis and limited the amount of damage visible from the air. Only 199 acres were mapped statewide, compared to 9,250 in 1995 (Table 14).

Table 14. Mapped acres of 1996 beech decline and mortality due to beech bark disease.

County	Damage Pattern		Total Acres
	<30% of Area Affected	>50% of Area Affected	
Caledonia	80		80
Essex	71		71
Orleans	33	15	48
Total	**184**	**15**	**199**

Tree condition declined in four of seven monitoring plots, although wax cover and Nectria were both generally lower than in 1995 (Figure 15). This is not unexpected, given the likelihood that scale insects were washed off tree boles by the frequent rainfall this year.

In a survey of nineteen trees in Parker's Gore with the Vermont Department of Fish and Wildlife, the number of beech nuts found by searching for one minute under a tree was found to be negatively correlated ($r=-.46$, $p=.05$) with the average number of beech bark disease symptoms per face of that tree (Figure 16).

Butternut Canker, caused by *Sirococcus clavigignenta-juglandacearum*, remains a common cause of mortality. Trees without cankers were occasionally observed in heavily infected stands. A planting of over 400 apparently resistant butternuts is being maintained by the GMNF in Hancock. Research continues at the University of Vermont, including an investigation into possible insect vectors. The results of a study on spatial analysis suggest that the disease may be managed silviculturally.

Delphinella Tip Blight of fir, caused by *Delphinella balsamae*, has steadily increased on Christmas trees since its first report in 1994. Of the 541 acres of fir surveyed in northern Vermont, 57% of the balsam fir was lightly infected and 12% was moderately infected. Fraser fir exhibited slight resistance, with only 25% of its total acreage lightly infected. One plantation in Wolcott received the heaviest damage. At this site, tall fir trees bordering the plantation were raining spores onto Christmas trees. At two sites in the Montpelier area, where the disease was quite active for the past two years, there was little evidence of current infection. This organism was also discovered causing severe damage to subalpine fir in Wolcott, a new host record.

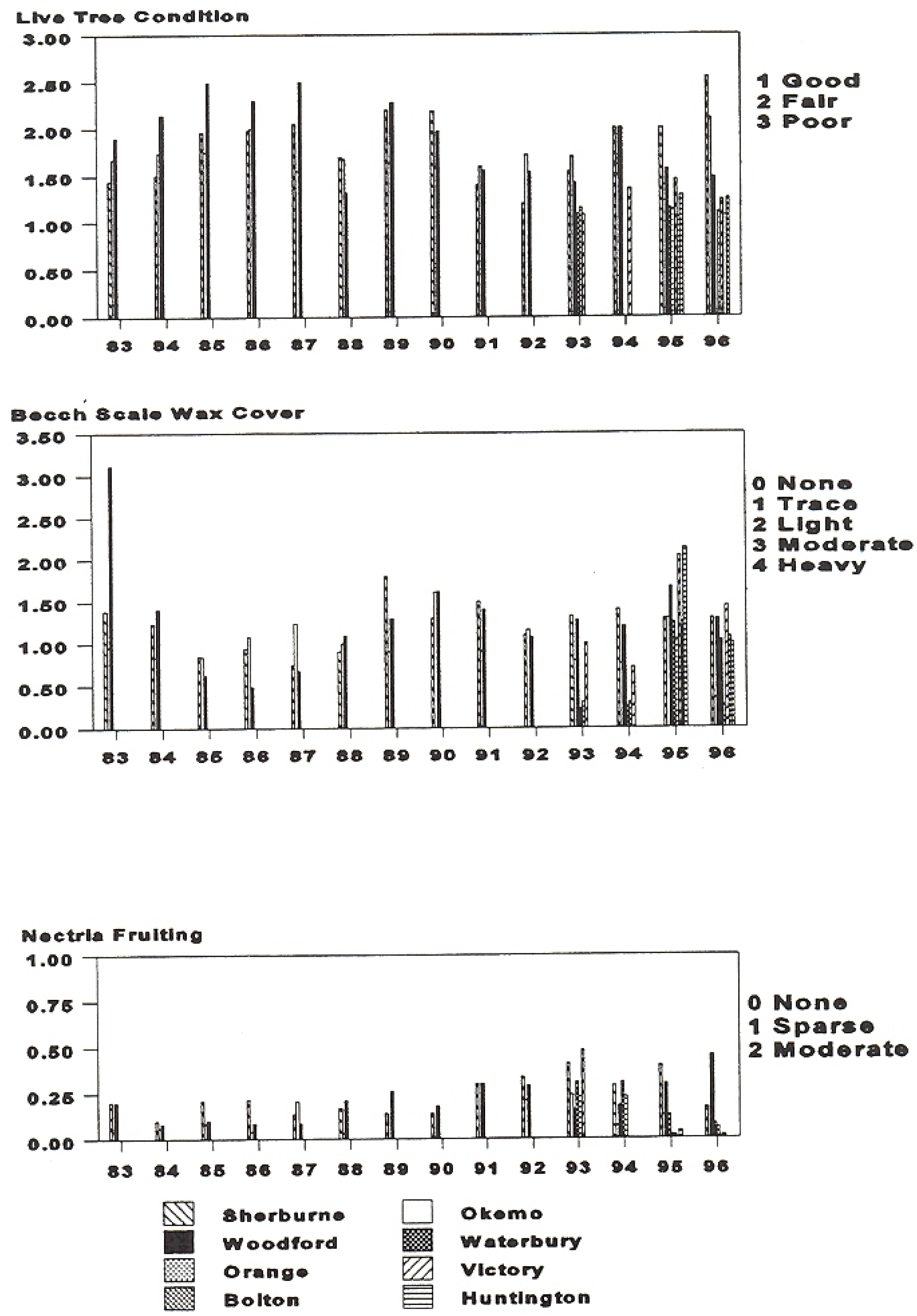


Figure 15. Average live tree condition, beech scale wax cover, and Nectria fruiting ratings in six locations, 1982-1996. No crown ratings available for Waterbury and Groton in 1994, or Waterbury in 1996.

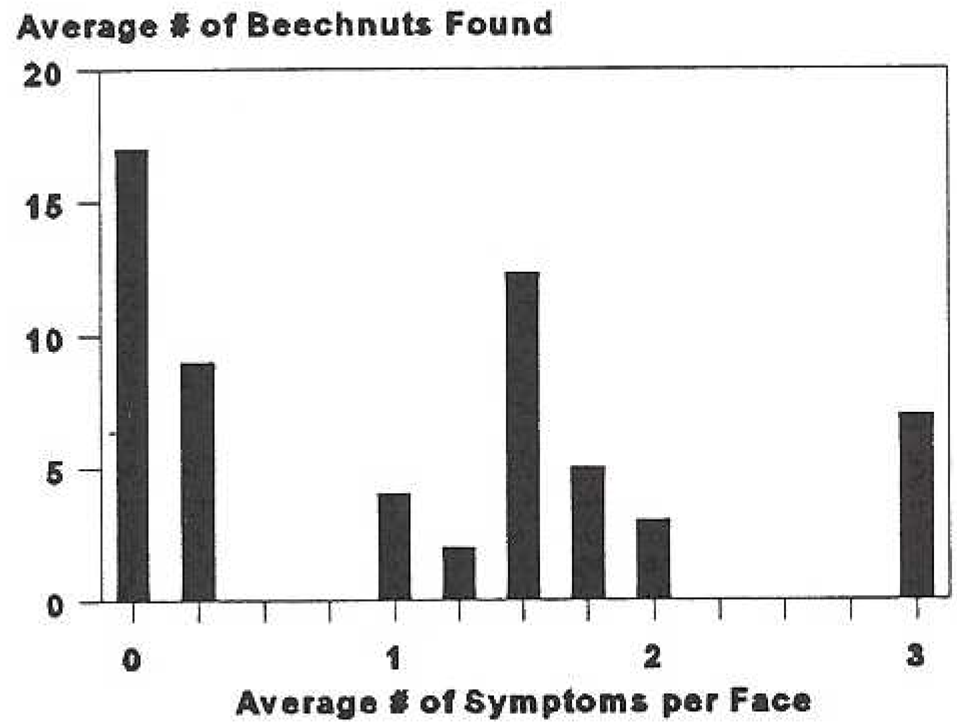


Figure 16. Average number of beechnuts found during a one minute search under beech trees, by the average number of beech bark disease symptoms per face. Symptoms considered were blocky bark, sunken lesions, raised lesions, and dead patches. Data are from 19 trees in Parker's Gore.

Diplodia (Sphaeropsis) Tip Blight, caused by *Diplodia pinea*, caused widespread scattered shoot mortality of pine, and of balsam and fraser fir. The frequency of the disease has continued to increase. Dry conditions in 1995 may have led to the success of the fungus on infected tissue, while wet conditions in spring of 1996 provided good conditions for new infections. Thirty percent of the pine and fir acreage surveyed in northern Vermont were infected. Scots pine had the most infection. In one plantation in Waterbury, the Scots pine was heavily infected while the damage on balsam and fraser fir, comprising 44% of all the infected trees, was all light.

Scleroderris Canker, caused by *Asocalyx abietina*, was not found in any new towns for the tenth consecutive year. A total of 26 Christmas tree plantations within the quarantine zone (Figure 17) and 25 red and Scots pine plantations in 15 towns bordering the quarantine area, were surveyed for the presence of the disease, all with negative results.

The total number of plantations in the state known to be infected remains at 126, consisting of 107 red pine and 19 Scots pine plantations. This represents 845 and 152 acres, respectively, for a total of 997 acres infected. Another six plantations were infected at one time, but have since had the disease eradicated or the trees cut. Some recent infection can be found within most of the quarantine zone, but remains less noticeable than in the past.

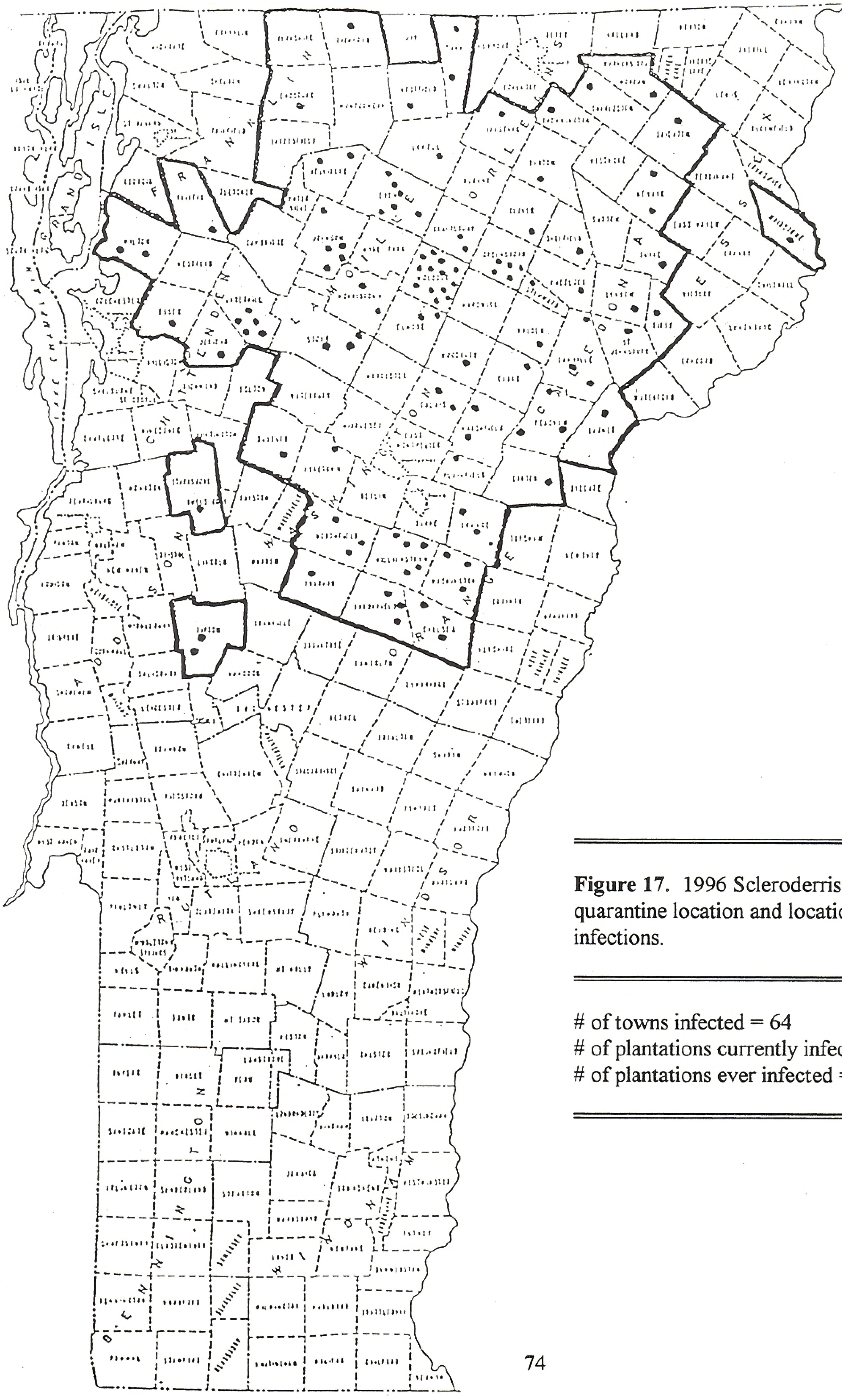


Figure 17. 1996 Scleroderris canker quarantine location and locations of positive infections.

# of towns infected = 64
# of plantations currently infected = 126
# of plantations ever infected = 130

OTHER STEM DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Annual Canker *Fusarium sp.*	Sugar Maple	Montpelier	On stressed ornamentals.
Ash Yellows *Mycoplasma-like organism*	White Ash	Southern Vermont	Disease increase less than previous years, but dieback remains common.
Balsam Fir Shoot Blight & Canker *Phomopsis sp.* *Aureobasidium sp.* *Cytospora sp.*	Balsam Fir Fraser Fir Balsam Fir	Rutland Bennington Shrewsbury Wolcott	Scattered branch or top mortality on Christmas trees by late spring. Probably brought on by 1995 drought.
Bacterial Blight of Lilac *Pseudomonas syringae*	Lilac	Morrisville St. Johnsbury Danville	Heavy damage.
Beech Bark Disease *Cryptococcus fagisuga* and *Nectria coccinea var. faginata*			See narrative.
Black Knot *Dibotryon morbosom*	Black Cherry	Throughout	Common.
Butternut Canker *Sirococcus clavigignenta-juglandacearum*			See narrative.
Caliciopsis Canker *Caliciopsis pinea*	White Pine	Throughout	Remains common but less prevalent than in past years.
Cedar Apple Rust *Gymnosporangium juniperi-virginianae*	Eastern Red Cedar	Addison County	
Chestnut Blight *Cryphonectria parasitica*	American Chestnut	Barnard	A 20" tree which had escaped infection is now dying.
		Rockingham	A 16" tree died summer 1996.
		Stockbridge	An individual tree remains healthy.
		Colchester	Moderate cankering.

OTHER STEM DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Coral Spot Canker *Nectria cinnabarina*	Honeylocust Ash Maple	Pawlet Barnard	Cankers on recent transplants. Fruiting on dead twigs.
Cytospora Canker *Leucostoma kunzei*	Blue Spruce	Throughout	Common at light levels.
Delphinella Tip Blight of Fir *Delphinella balsamae*			See narrative.
Diplodia Shoot Blight *Diplodia pinea* (*Sphaeropsis pinea*)	Mugo Pine Austrian Pine Fir and Pine Christmas trees	Morrisville Addison	Heavy on scattered ornamentals. See narrative.
Dutch Elm Disease *Ceratocystis ulmi*	American Elm	Throughout	Appears stable. Mortality of young roadside elms commonly observed.
Eastern Dwarf Mistletoe *Arceuthobium pusillum*			Not observed.
Eutypella Canker *Eutypella parasitica*	Sugar Maple	Andover Hartford Whitingham	Remains common in scattered stands.
Fireblight *Erwinia amylovora*	Flowering Crabapple Apple	Widespread	Damage reported on numerous ornamentals.
Hemlock Shoot Blight *Unknown cause*	Hemlock	Pomfret	Scattered yellow shoots in occasional trees.
Hypoxylon Canker *Hypoxylon pruinatum*	Aspen	Throughout	Remains a common cause of tree mortality and breakage.
Kabatina Blight *Kabatina juniperi*	Juniper	Newport	Ornamental.
Maple Canker *Steganosporium ovatum*	Sugar Maple	Lyndonville	On ornamental. Less widespread and common than in 1995.

OTHER STEM DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Oak Wilt *Ceratocystis fagacearum*			Not observed during aerial surveys.
Phomopsis Twig Blight *Phomopsis sp.*	Juniper	Bennington Shaftsbury	Heavy damage.
Red Ring Rot *Phellinus pini*	White Pine Norway Spruce	Grafton Sharon Groton	Associated with wounds from previous thinning. In plantation at New Discovery campground.
Sapstreak *Ceratocystis coerulescens*			Not observed.
Scleroderris Canker *Asocalyx abietina*			See narrative.
Sirococcus Shoot Blight *Sirococcus strobilinus*	Red Pine Blue Spruce	Peacham	Remains light in Groton State Forest. Light damage increasing on Christmas trees; present in 60% of Spruce plantation acres surveyed.
Tomentosus Butt Rot *Inonotus tomentosus*			Not observed.
Verticillium Wilt *Verticillium albo-atrum* or *V. dahliae*	Sugar Maple	Chittenden County	Light dieback.
White Pine Blister Rust *Cronartium ribicola*	White Pine	Throughout	Appears stable. Scattered light mortality. Found in 53% of the white pine Christmas tree acres surveyed. Common in young stands and plantations.
Woodgate Gall Rust *Endocronartium harknessii*	Scots Pine	Throughout	Decreasing. Present in 40% of Scots pine Christmas tree acres surveyed. Heavy on individual trees.

OTHER STEM DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Yellow Birch Witches Broom *Taphrina americana*	Yellow Birch	Westminster	Heavy on some understory and occasional overstory trees. No foliage problems seen in July.
Yellow Witches Broom Rust *Melampsorella caryophyllacearum*	Balsam Fir	Northern Vermont	Remains common. Present in 30% of balsam Christmas tree areas surveyed.

FOLIAGE DISEASES

Anthracnoses were extremely common this year due to the unusually wet weather. Maple Anthracnose, caused principally by *Gloesporium* and *Apiognomonia spp.*, was mapped on nearly 25,000 acres (Table 15, Figure 18). Elsewhere, it caused early browning and leaf drop, especially along roadsides and on scattered regeneration.

Table 15. Mapped acres of hardwood anthracnose.

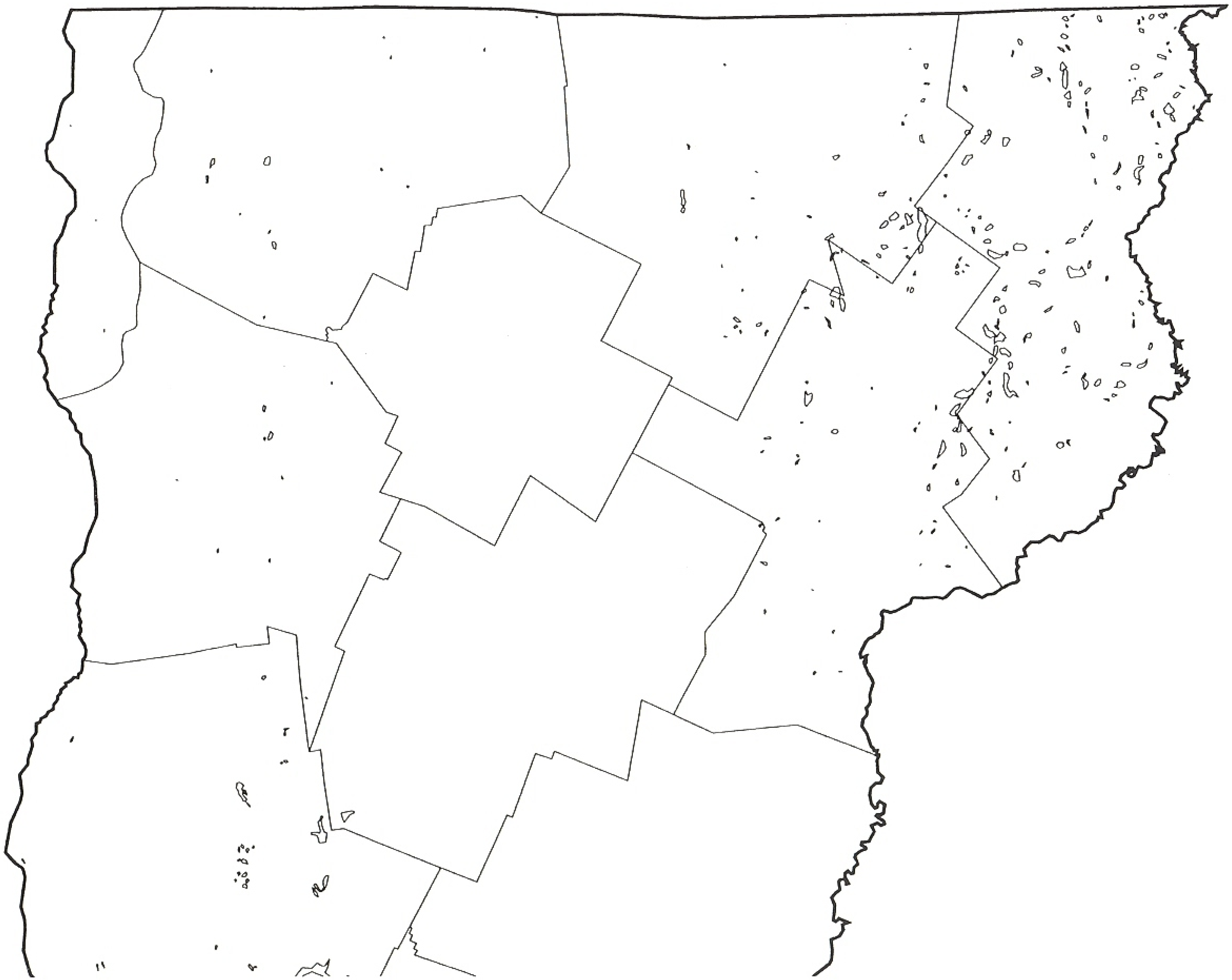
County	Severity			Total
	Light	Moderate	Heavy	
Addison	3,622	229		3,851
Caledonia	56	3,642	47	3,745
Chittenden	200	80		280
Essex		11,554	39	11,593
Franklin	283	268		551
Grand Isle		18		18
Orleans	136	3,183		3,319
Rutland	747			747
Washington	274			274
Windham		65		65
Windsor	498	47		545
Total	**5,816**	**19,086**	**86**	**24,988**

Birch Anthracnose on paper birch, caused by *Marsonnina betulae* and *Septoria sp.*, was mapped on 4,725 acres (see Birch Defoliation under Hardwood Defoliators (Table 3, Figure 5)). Actual birch defoliation by the fungus was much more extensive. Much damage occurred in the same stands as birch leaf miners, and other defoliation occurred later than the aerial surveys. Damage was especially widespread at mid- to upper elevations. Damaged and senescing leaves frequently supported heavy populations of the aphid, *Euceraphis betulae*, in early autumn.

Other anthracnose diseases seen in widely scattered locations included Ash Anthracnose, caused by *Gloeosporium aridum*, Butternut Anthracnose, caused by *Gnomonia leptostyla*, and Oak Anthracnose, caused by *Apiognomonia quercina*.

Poplar Leaf Blight, caused by *Marssonina spp.*, caused widespread heavy damage to quaking aspen and balsam poplar. By September 1, many trees had no green leaf tissue remaining. *Marssonina sp.* was confirmed to be present on quaking aspen by the University of Vermont Forest Pathology Laboratory. This was very common on roadside trees, but was also mapped on 858 acres, often riparian areas (Table 16, Figure 19). Ground checking revealed that crown area affected averaged 50 to 90% for the quaking aspens and 75 to 95% for the balsam poplars in the areas mapped.

ANTHRACNOSE



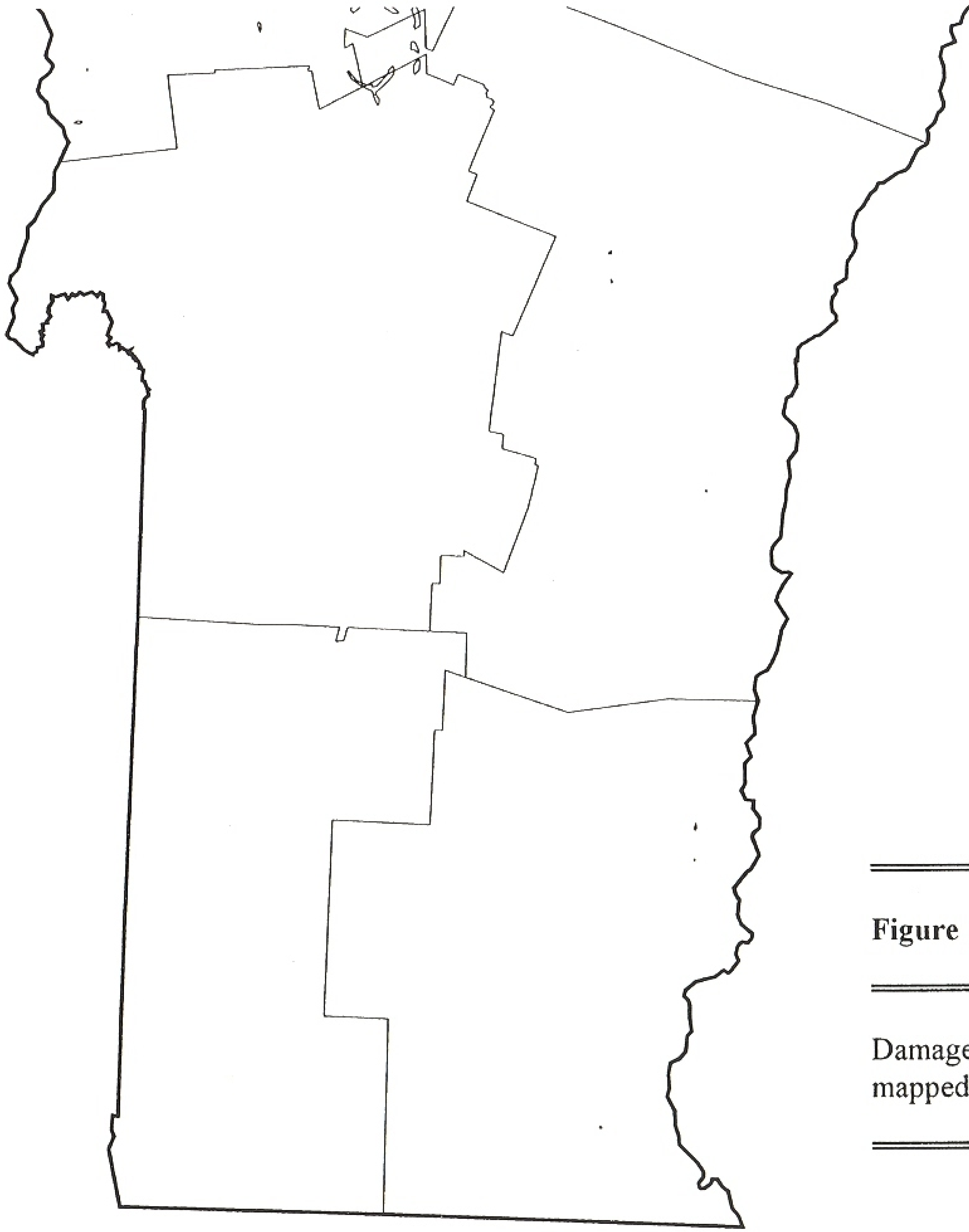
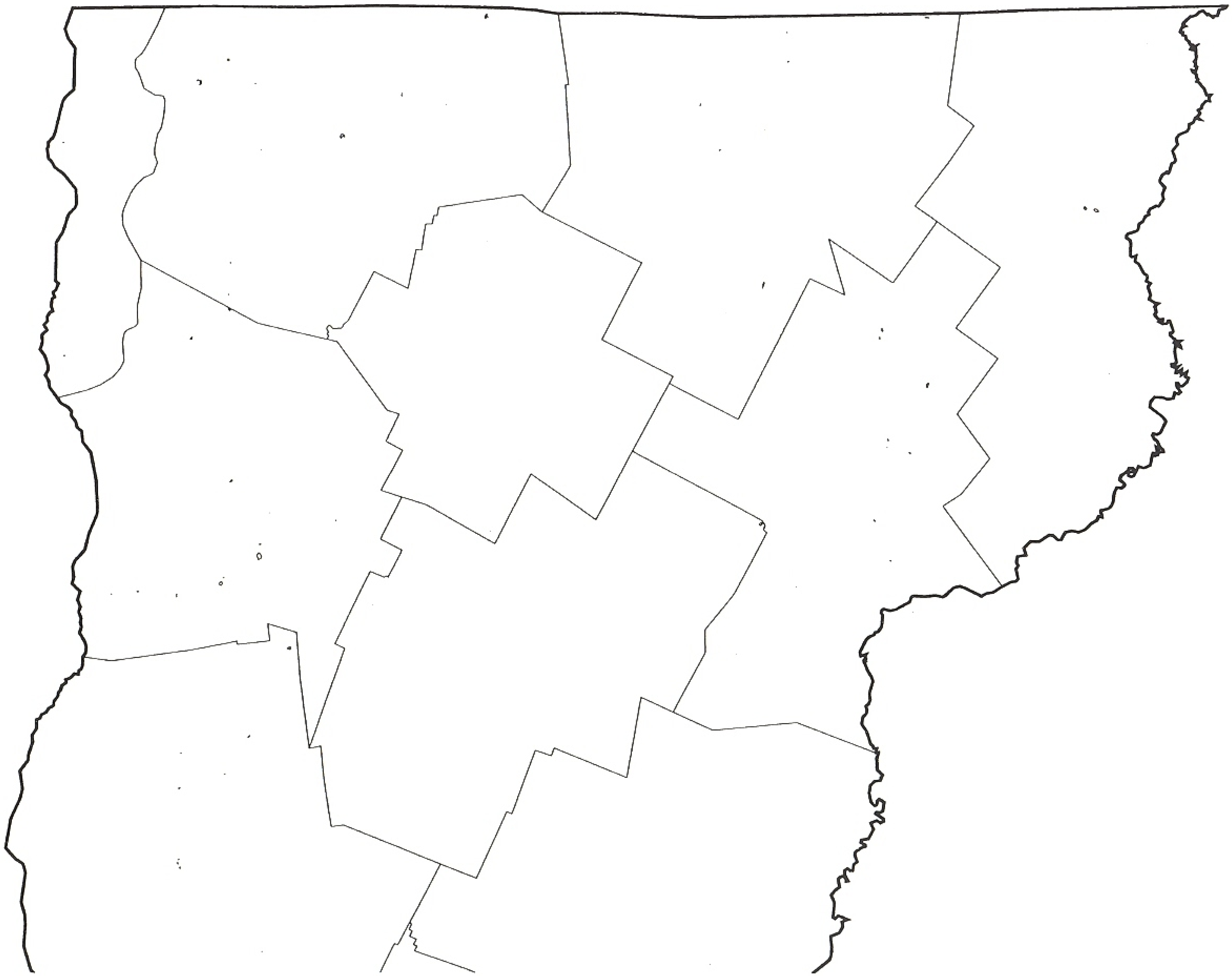


Figure 18. 1996 hardwood anthracnose.

Damage area approximate location. Total damage mapped in 1996 = 24,988 acres.

POPLAR LEAF BLIGHT



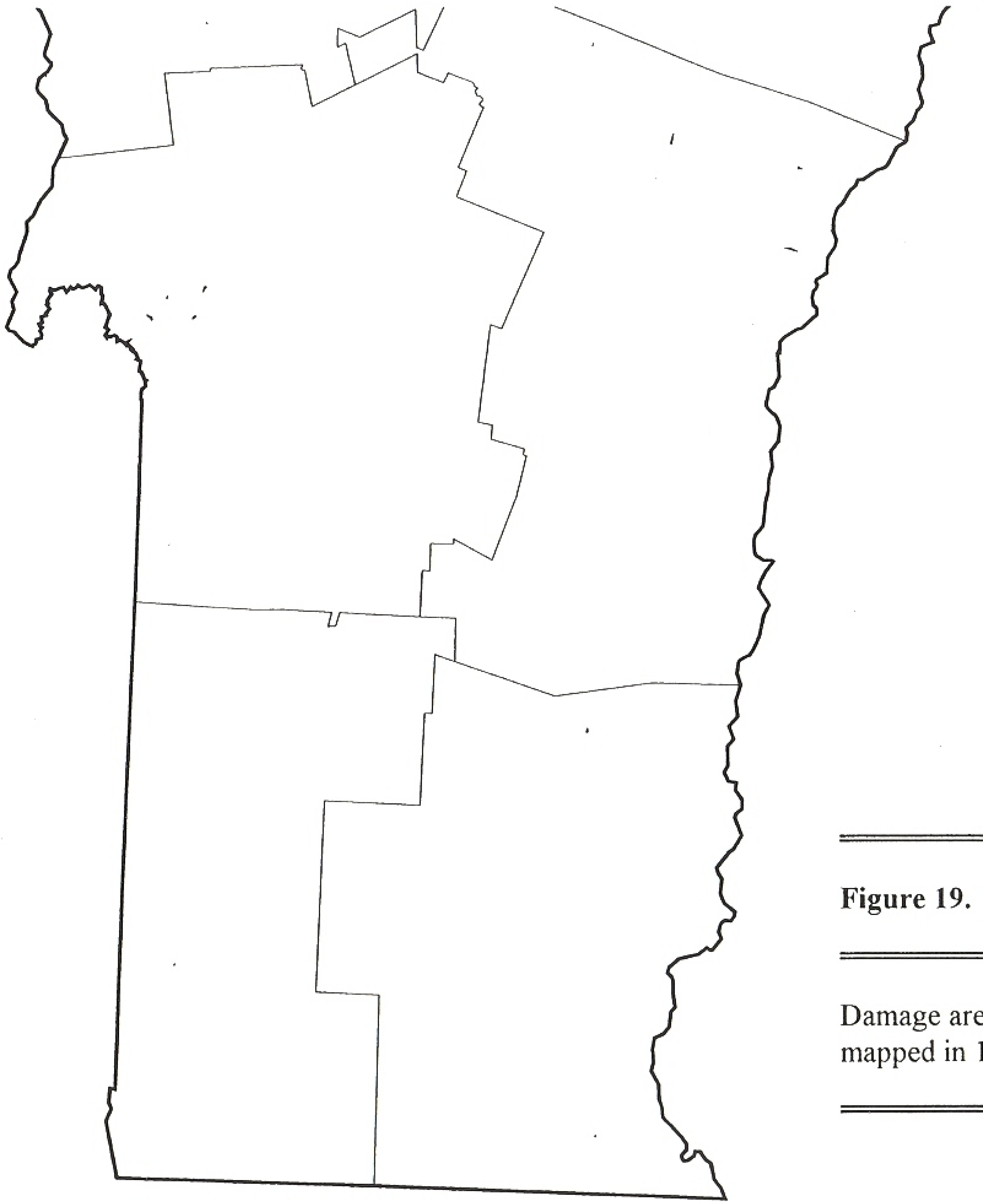


Figure 19. 1996 poplar leaf blight.

Damage area approximate location. Total damage mapped in 1996 = 858 acres.

Table 16. Mapped acres of poplar leaf blight in 1996.

County	Severity		Total
	Moderate	Heavy	
Addison	36	44	80
Bennington	6		6
Caledonia	72		72
Chittenden	121	79	200
Essex		73	73
Franklin	83	55	138
Grand Isle		7	7
Orleans	55	14	69
Rutland	87	2	89
Windham	28		28
Windsor	30	66	96
Total	**518**	**340**	**858**

Rhizosphaera Needle Disease of Fir, caused by *Rhizosphaera pini*, caused needle browning and droop in a 25 acre fir Christmas tree plantation in Danville. Identification was confirmed by the University of Vermont Forest Pathology Laboratory. Damage was so heavy that 700 of the balsam fir trees planned for sale were no longer marketable by early autumn. Fraser firs interplanted among the balsams appeared to be much less susceptible. This is the first time that this fungus has been discovered to be causing a problem, although it has been isolated elsewhere in association with Delphinella tip blight. Rhizosphaera was also associated with fall needlecast of 2-3 year old needles on Christmas trees in Weathersfield, confirmed by the Penn State Forest Pathology Laboratory.

OTHER FOLIAGE DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Anthracnose *Gloeosporium spp.*			See narrative.
Apple Scab *Venturia inequalis*	Apple	Throughout	Up dramatically from 1995. Heavy damage in scattered locations. Common elsewhere.
Aspen Leaf Rust *Melampsora sp.*	Quaking Aspen	Pomfret	Riparian areas.

OTHER FOLIAGE DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Balsam Fir Needlecast *Lirula nervata*	Balsam Fir	Weston Cabot	Damage to Christmas trees increased from 1995 by early July. Suspected cause of needlecast in Christmas trees.
Botrytis Blight *Botrytis cinerea*	Rhododendron	Wilmington	Ornamental.
Brown Spot Needle Blight *Scirrhia acicola*			Not observed.
Bulls Eye Spot *Cristulariella pyramidalis*	Boxelder	Norwich	
Cedar-Apple Rust *Gymnosporangium juniperi-virginianae*	Crab Apple	Springfield Castleton	Aecial stage.
Coccomyces Leaf Spot *Blumeriella jaapii*	Black Cherry	Rutland Lamoille Washington Caledonia Orleans Counties	Increasing. Some moderate damage on young trees.
Cyclaneusma Needlecast (formerly Naemacylcus) *Cyclaneusma minus*	Scots Pine	Throughout	Remains common. Damage levels vary in Christmas trees.
Delphinella Tip Blight of Fir *Delphinella balsamae*			See narrative.
Dothistroma Needlecast *Dothistroma pini*			Not observed.

OTHER FOLIAGE DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Eye Spot *Phyllosticta minima*	Sugar Maple	Sharon	Heavy on regeneration.
Fir-Fern Rust *Uredinopsis mirabilis*	Balsam Fir	Widespread	Mostly very light damage this year. Down from 1995. Most severe near wet areas.
Giant Tar Spot *Rhytisma sp.*	Norway Maple	Shaftsbury Springfield Bennington	Early leaf drop in Shaftsbury.
Hawthorn Leaf Rust *Gymnosporangium sp.*	Hawthorn	Milton	Causing leaf spot.
Horsechestnut Leaf Blotch *Guignardia aesculi*	Horsechestnut	Throughout	Heavy on ornamentals.
Lophodermium Needlecast *Lophodermium seditiosum*	Scots Pine	Throughout	Light damage on 85% of the Scots pine Christmas tree acres surveyed.
Maple Anthracnose *Gloeosporium sp.*			See Anthracnose.
Marssonina Leaf Spot *Marssonina sp.*			See Poplar Leaf Blight.
Phaeocryptopus Needlecast *Phaeocryptopus nudus*	Balsam Fir	Weston	Confirmed at Penn State Forest Pathology Laboratory.
Phyllosticta Needle Blight *Phyllosticta multicorniculata*	Concolor Fir	Wolcott	New host record identified by Penn State Forest Pathology Laboratory.
Plioderma Needlecast *Plioderma lethale*	Austrian Pine	Cabot	On nursery stock. New state record.

OTHER FOLIAGE DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Powdery Mildew *Eryiphaceae*	Honeysuckle Lilacs Flowers	Throughout	Unusually heavy this year.
Rhabdocline Needlecast *Rhabdocline pseudotsugae*	Douglas Fir	Northern Vermont	Light damage seen in all the Douglas fir Christmas tree plantations surveyed. Heavy damage seen in Charlotte.
Rhizosphaera Needle Disease of Fir *Rhizosphaera pini*			See narrative.
Rhizosphaera Needlecast *Rhizosphaera kalkhoffi*	Blue Spruce White Spruce	Throughout	Mostly light damage on 61% of spruce Christmas tree acres surveyed. Also heavy on occasional ornamentals.
Septoria Leaf Spot *Septoria sp.*	White Birch Yellow Birch	Widespread	Cause of early leaf drop at high elevations. 1300 acres mapped. See Early Birch Leaf Edgeminer.
Sooty Mold *Perisporiacae*	Balsam Fir		Unusually heavy sooty mold of trees heavily damaged by balsam twig aphid.
Swiss Needlecast *Phaeocryptopus gaumanni*	Douglas Fir	Widespread	Remains common on Christmas trees. Mostly light damage except for heavy damage seen in Charlotte.
Tar Spot *Rhytisma acerinum*	Red Maple Sugar Maple	Throughout	Occasional heavy damage to red maple.
Tar Spot *Rhytisma punctatum*	Sugar Maple	Lamoille County	Light damage.
Venturia Leaf Blight *Venturia acerina*	Sugar Maple	Middlebury	
White Pine Needle Blight *Canavirgella banfieldii*	White Pine	Northern Vermont	Moderate damage to 54% of white pine Christmas tree acres surveyed.
Willow Scab *Venturia saliciperda*	Willow	Widespread	Heavy browning in late summer. See Willow Leaf Beetle.

ROOT DISEASES

Tomentosus Root Rot, caused by *Polyporus tomentosus*, has been associated with white spruce decline in a Dummerston plantation which was thinned in 1990. Tree condition in a monitoring plot has generally declined since 1994 for trees within 6 feet of the nearest stump (Figure 20). The condition of other trees was generally the same.

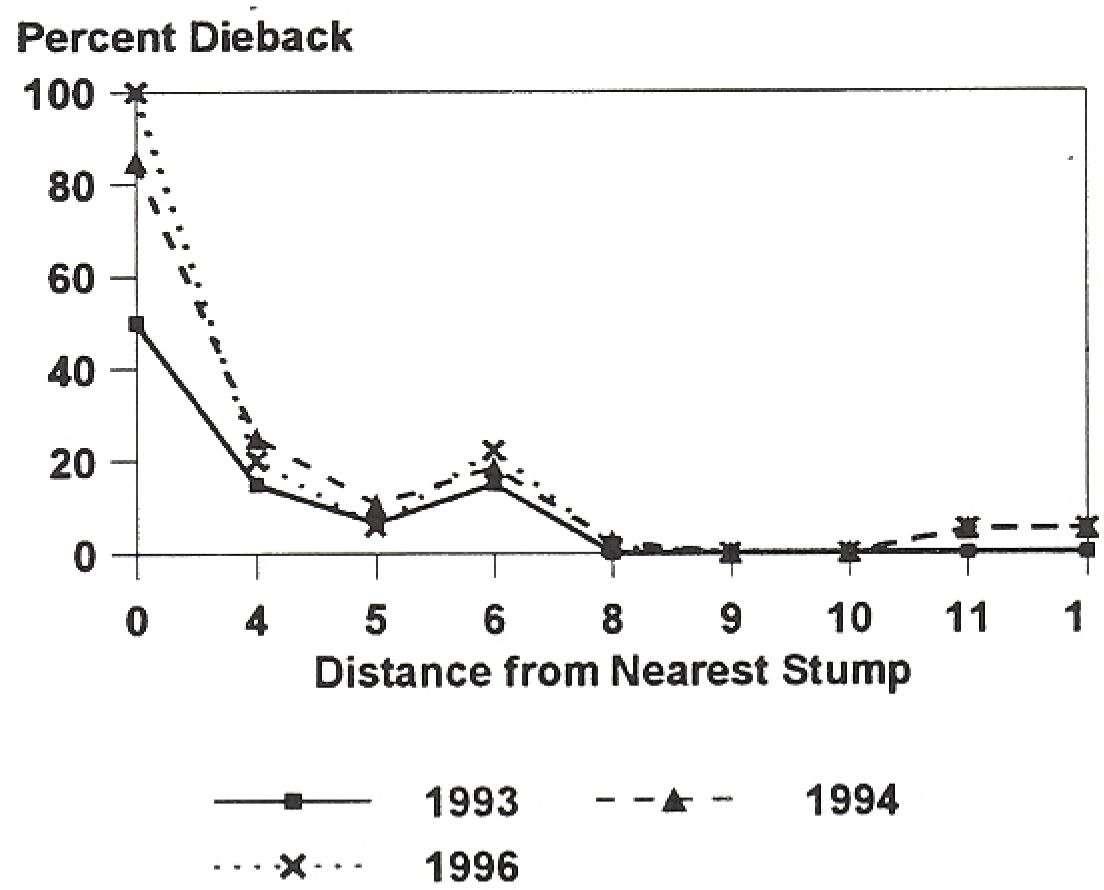


Figure 20. Percent of white spruce in a stand thinned in 1990 and infested with Tomentosus root rot by distance to nearest stump, 1993-1996. Data are from 30 trees in Dummerston.

OTHER ROOT DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Annosus Root Rot *Heterobasidion annosum*	Red Pine	Dummerston	Resulted in a 1-2 acre clearcut due to mortality.
Beech Drops	American Beech	Throughout	Unusually common.
Crown Rot *Phytophthora sp.*	Rhododendron	Wilmington Reading	Causing mortality.

OTHER ROOT DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Shoestring Root Rot *Armillaria spp.*	Red Spruce Many	Andover Plymouth Throughout	Occasional mortality in stagnated stands. Common on stressed trees.
Tomentosus Root Rot *Polyporus tomentosus*			See narrative.

ANIMAL DAMAGE

ANIMAL	SPECIES DAMAGED	LOCALITY	REMARKS
Beaver	All	Throughout	Many trees, including occasional ornamentals, being felled by beavers. Inundation levels remain high due to low fur prices. See Wet Site.
Deer	Balsam Fir Fraser Fir	Southern Vermont	Heavy damage to Christmas trees.
	Hardwoods	Addison County	Noticeable damage.
Moose	Many Hardwoods	Essex County Green Mountains	Damage to regeneration in clearcut areas. Heavy stripping of red maple bark in upper elevation wintering areas.
Raccoon	Quaking Aspen	Pomfret	Small branches bitten off ornamental tree nightly. Approximately ¼ of branches damaged.
Sapsucker	White Birch Mountain Ash	Springfield	Persistent, attacking new trees.
	Hemlock	Brattleboro	Killing ornamentals.
	Sugar Maple	Weston	Top mortality of forest trees.
	Apple	Marlboro	Small orchard.
	Sugar Maple Crabapple	St. Johnsbury Lyndon Stowe	Damage to ornamentals.
Squirrel	Red Pine	Castleton	Wounds on ornamental trees.
	Tubing	Throughout	Occasional damage.
	Sugar Maple	Morgan	Heavy damage to large shade trees.

DIEBACKS, DECLINES, AND ENVIRONMENTAL DISEASES

Ash Dieback, mostly from ash yellows, remains common in southern Vermont and the Champlain Valley, but the rate of disease increase seemed slower than normal. Sixty-six acres of dieback were mapped in Addison, Chittenden, and Grand Isle Counties.

In the Woodstock monitoring plot established to follow the health of trees impacted by a heavy seed crop in 1993, crown density improved. However, the crowns which had heavy dieback related to seed production continued to be thinner than those which did not (Figure 21).

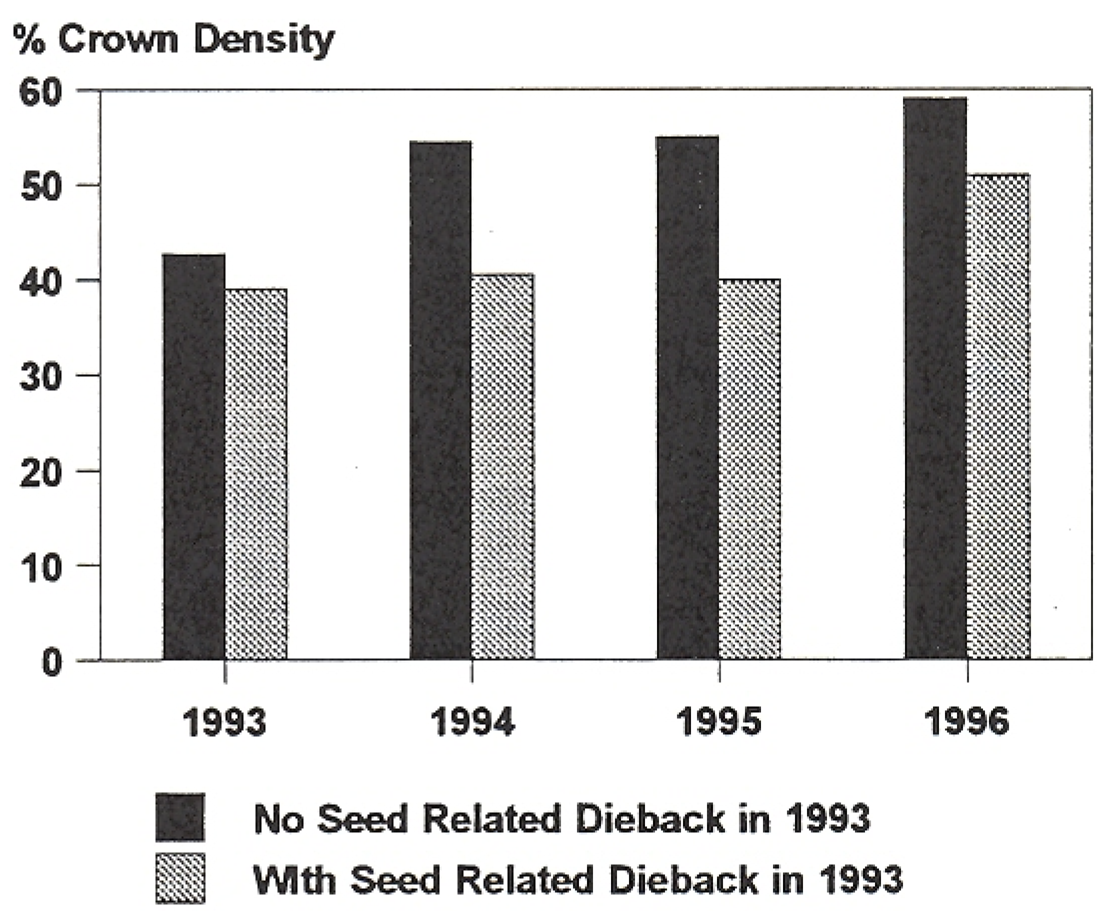


Figure 21. Average crown density 1993-1996. Ten white ash that had dieback related to seed production in 1993 are compared to 9 original trees 1993-1995, and 8 survivors in 1996, that did not have dieback related to seed.

Birch Decline remains evident at upper elevations in areas recently logged. Birch dieback and mortality were mapped on 510 acres compared to 650 acres in 1995 (Table 17).

Table 17. Mapped acres of birch dieback and mortality in 1996.

County	Pattern			Total
	<30% of Trees	30-50% of Trees	>50% of trees	
Addison	19			19
Caledonia	97			97
Chittenden			267	267
Essex		11		11
Lamoille			32	32
Orleans	9	39		48
Windsor	36			36
Total	**161**	**50**	**299**	**510**

Chlorosis of White Pine was widespread in southern Vermont. By late spring, occasional trees developed yellow foliage. Most affected trees were near roads, but occasional trees near openings had lower branches affected. Chlorotic needles dropped by early July, and new growth was normal. Similar symptoms were observed elsewhere in the northeast.

Curled Leaves were observed in many locations statewide on a variety of hardwood species. Sugar maples were most commonly affected, but curling was also observed on red maple, yellow birch, beech, grey birch, red oak, and white ash. The symptom was more severe in the upper crown of individual trees. Curling had occurred by mid-June, and some leaves remained symptomatic throughout the summer. Affected trees did not have above-average levels of other symptoms of stress, such as dieback or early fall color. The cause is unknown, although the 1995 drought, or cold weather during leaf development may be involved.

Drought was not a problem in 1996, but symptoms developed this year from dry conditions in 1995. Drought contributed to the overwintering mortality of red spruce on ledgey sites and recent transplants, and to dieback on wounded ornamentals, urban trees growing on limiting sites, and beech with oystershell scale. There was a larger than normal number of stress related cankers and shoot blights, including Diplodia, Phomopsis, and Cytospora on conifers, and Coral Spot Nectria on hardwoods. The drought is also thought to have contributed to the severity of salt damage on white pine, winter injury on red spruce, spring chlorosis of Christmas trees, and cupping of hardwood leaves.

Hardwood Decline and Mortality decreased substantially, with 10,440 acres mapped compared to over 41,000 mapped in 1995 (Table 18, Figure 22). This is probably due to a very wet season that led to dense crowns, and masked much of the dieback that was visible in 1995. Early fall color was generally rare, but was observed in Glastonbury.

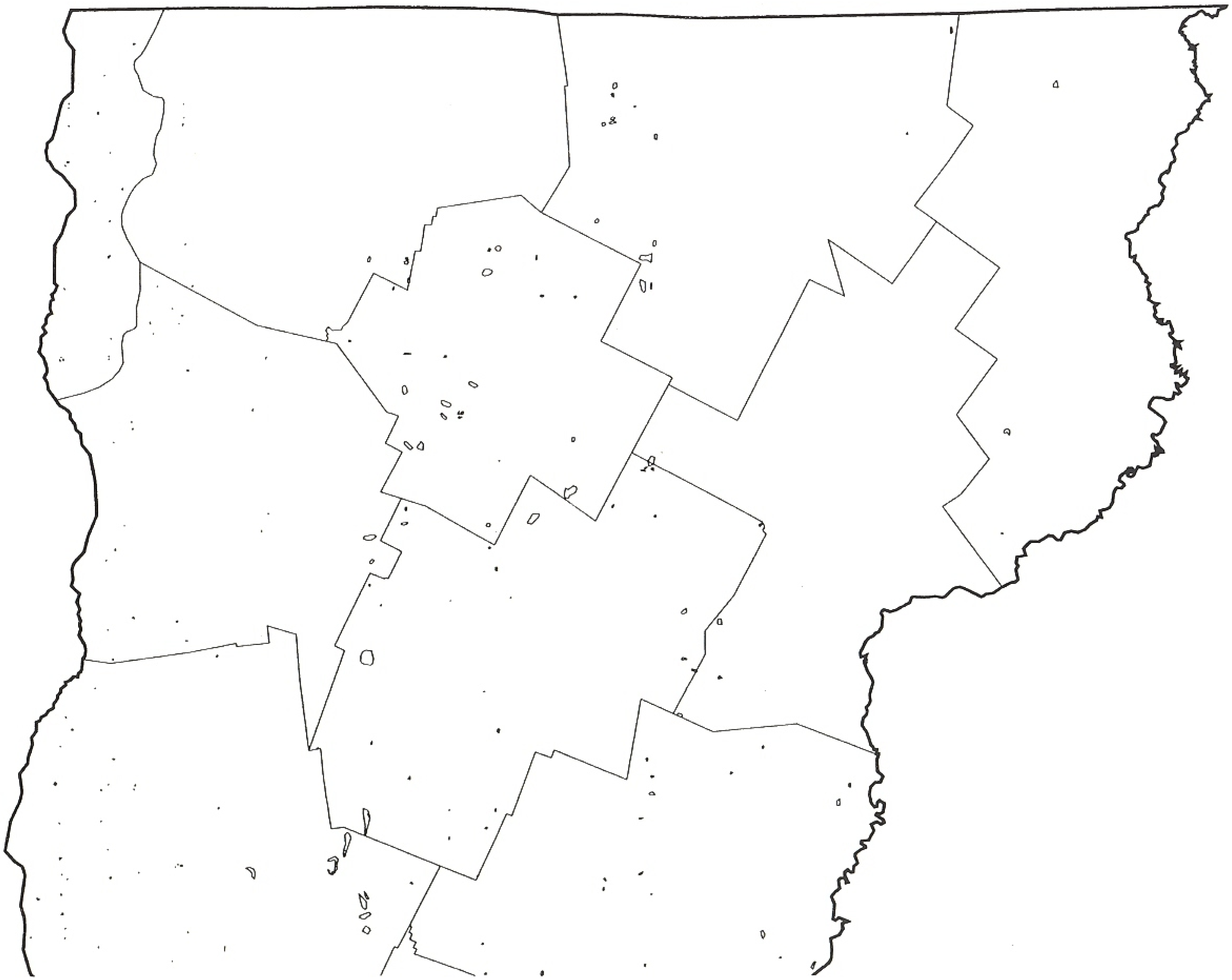
Table 18. Mapped acres of hardwood dieback, mortality, thin crowns, chlorosis, and early color in 1996.

County	Damage Pattern			Total Acres
	<30% of Trees	30-50% of Trees	>50% of Trees	
Addison	1,639	21	66	1,726
Bennington	433	52		485
Caledonia	99	259		358
Chittenden	86	78	225	389
Essex	9	99	100	208
Franklin	21	119	54	194
Grand Isle	107	17	1	125
Lamoille	312	1,659	4	1,975
Orange	449	403	30	882
Orleans	63	1,022		1,085
Rutland	226	177		403
Washington	576	859	654	2,089
Windham	283	18	8	309
Windsor	142	70		212
Total	**4,445**	**4,853**	**1,142**	**10,440**

A **Late Second Flush** of tree growth was observed on several species in the Champlain Valley including maple, boxelder, oak, and locust. Some of the late growth was as long as a foot. This may die back next year if it did not adequately harden off before the end of the growing season.

Spruce Mortality and dieback primarily of upper elevation red spruce, combined with some balsam fir, was mapped on 3,669 acres compared to 1,710 acres in 1995 (Table 19, Figure 23). This increase is probably due to dry conditions in 1995. Mortality was particularly common on ledgey sites.

HARDWOOD CHLOROSIS, EARLY COLOR, THIN CROWNS, DIEBACK and MORTALITY



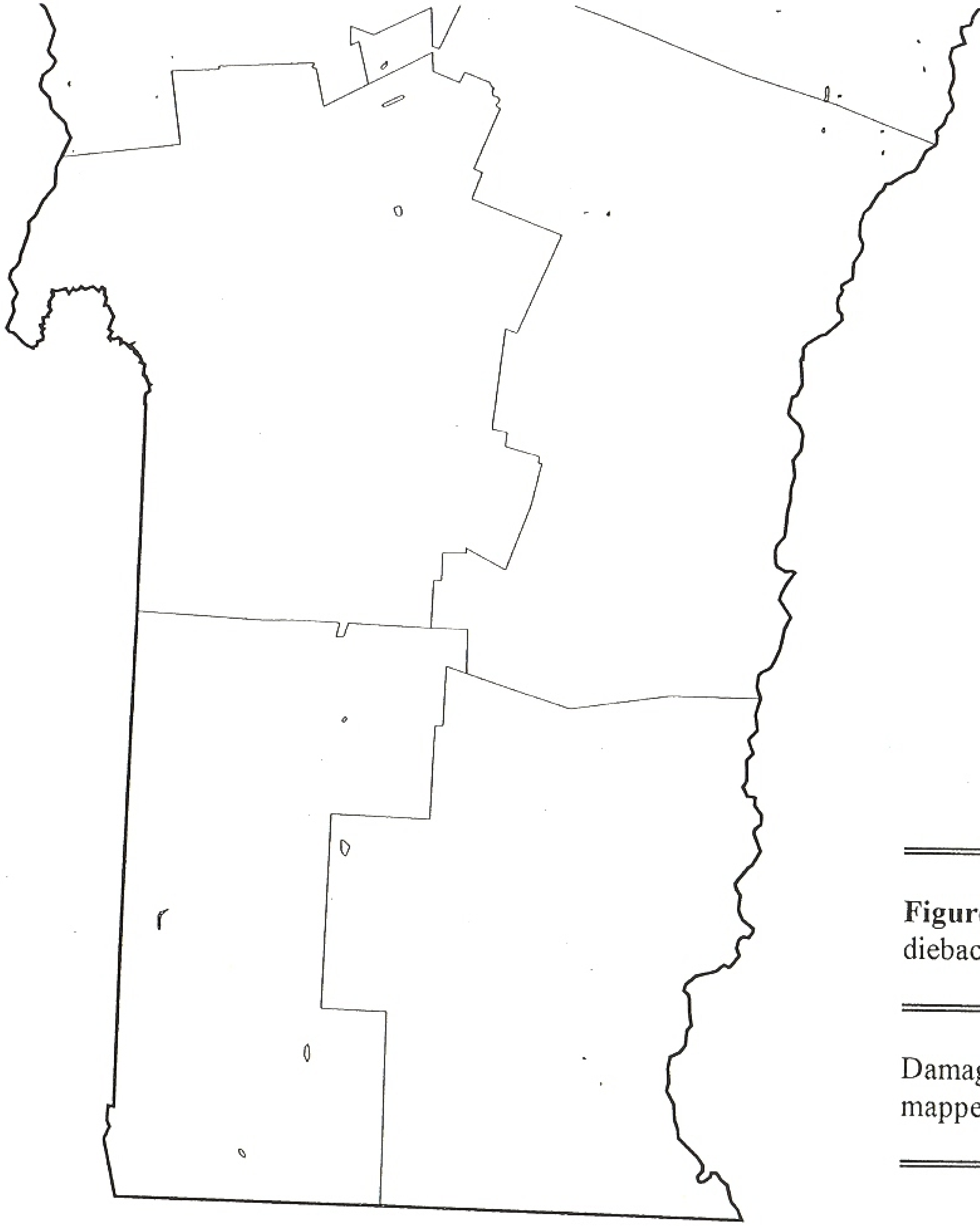
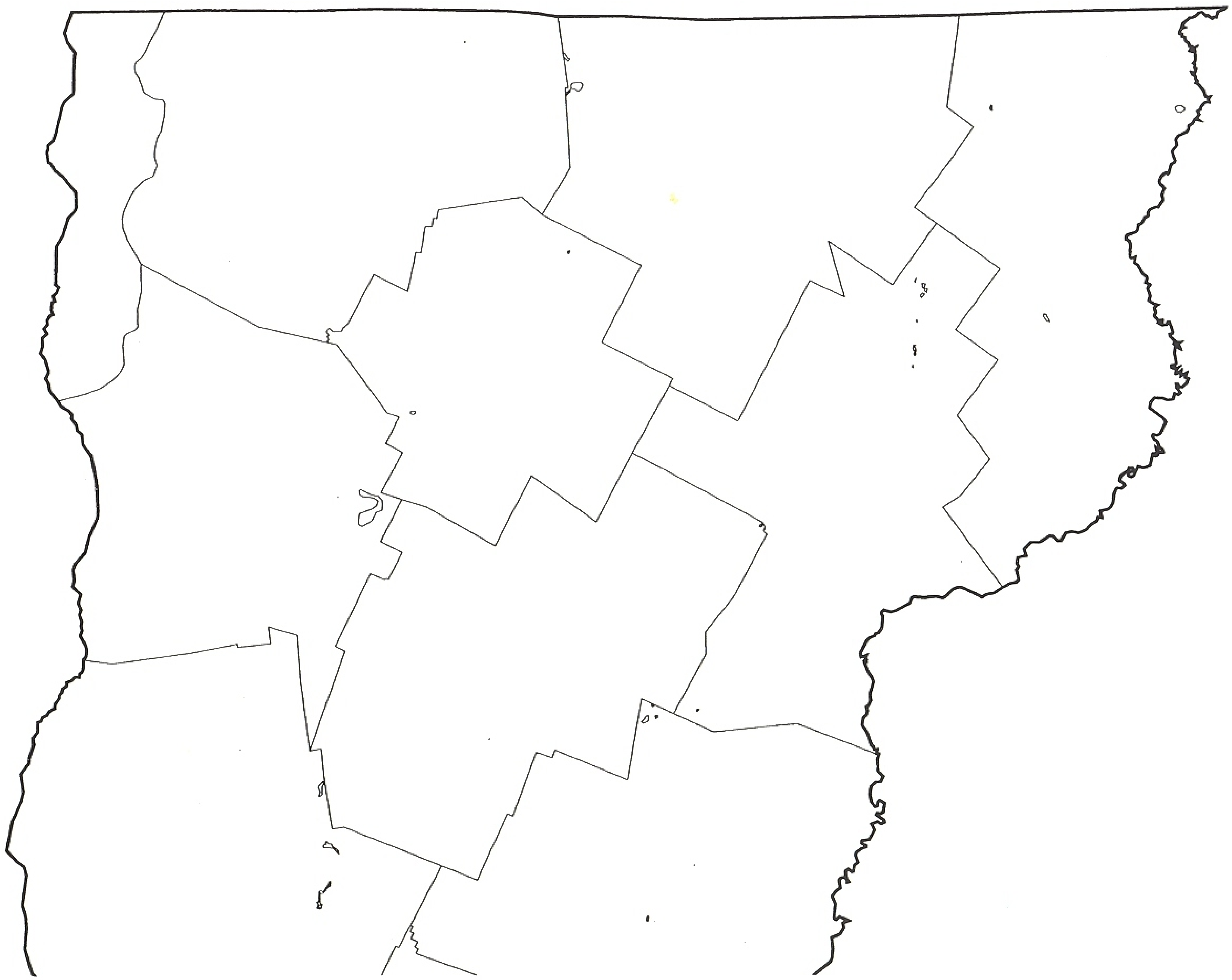


Figure 22. 1996 hardwood chlorosis, early color, dieback, mortality, and thin crowns.

Damage area approximate location. Total damage mapped in 1996 = 10,440 acres.

SPRUCE-FIR DIEBACK and MORTALITY



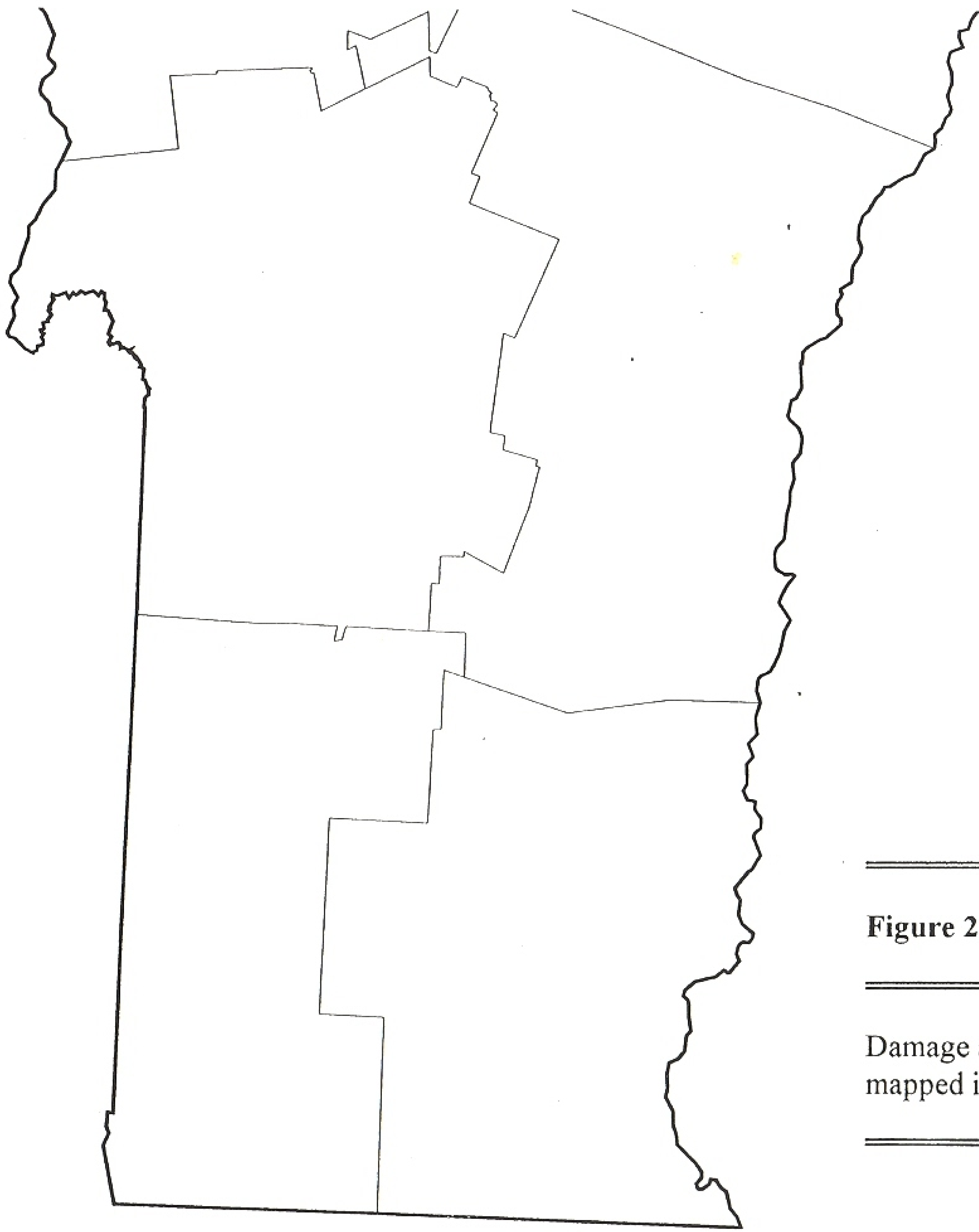


Figure 23. 1996 spruce/fir dieback and mortality.

Damage area approximate location. Total damage mapped in 1996 = 3,669 acres.

Table 19. Mapped acres of spruce dieback and mortality in 1996.

County	Severity			Total
	Light	Moderate	Heavy	
Addison	629	69		698
Caledonia		25	286	311
Chittenden		1,475		1,475
Essex		216	139	355
Franklin			8	8
Lamoille			92	92
Orange	51	44	135	230
Orleans			477	477
Washington			6	6
Windsor			17	17
Total	**680**	**1,829**	**1,160**	**3,669**

Unthrifty Crowns Associated with Logging were mapped on 678 acres this year, mostly in northeastern Vermont (Table 20). Most of this was due to heavy cutting in hardwoods. This is a decrease from the 1,440 acres mapped in 1995. The difference may be due to ample growing season moisture. Improved tree condition and dense crowns masked existing dieback.

Table 20. Mapped acres of unthrifty crowns associated with logging in 1996.

County	Pattern		Total
	<30% of Trees	>50% of Trees	
Addison		4	4
Essex	151	324	475
Orleans	4	195	199
Total	**155**	**523**	**678**

Wet Site dieback and mortality were mapped on 9,422 acres, similar to the 10,170 acres mapped in 1995 (Table 21, Figure 24). Although some increase was expected as 1995 drought conditions affected the shallow rooted trees on these sites, increased foliage density on living trees this year may have compensated for new symptoms.

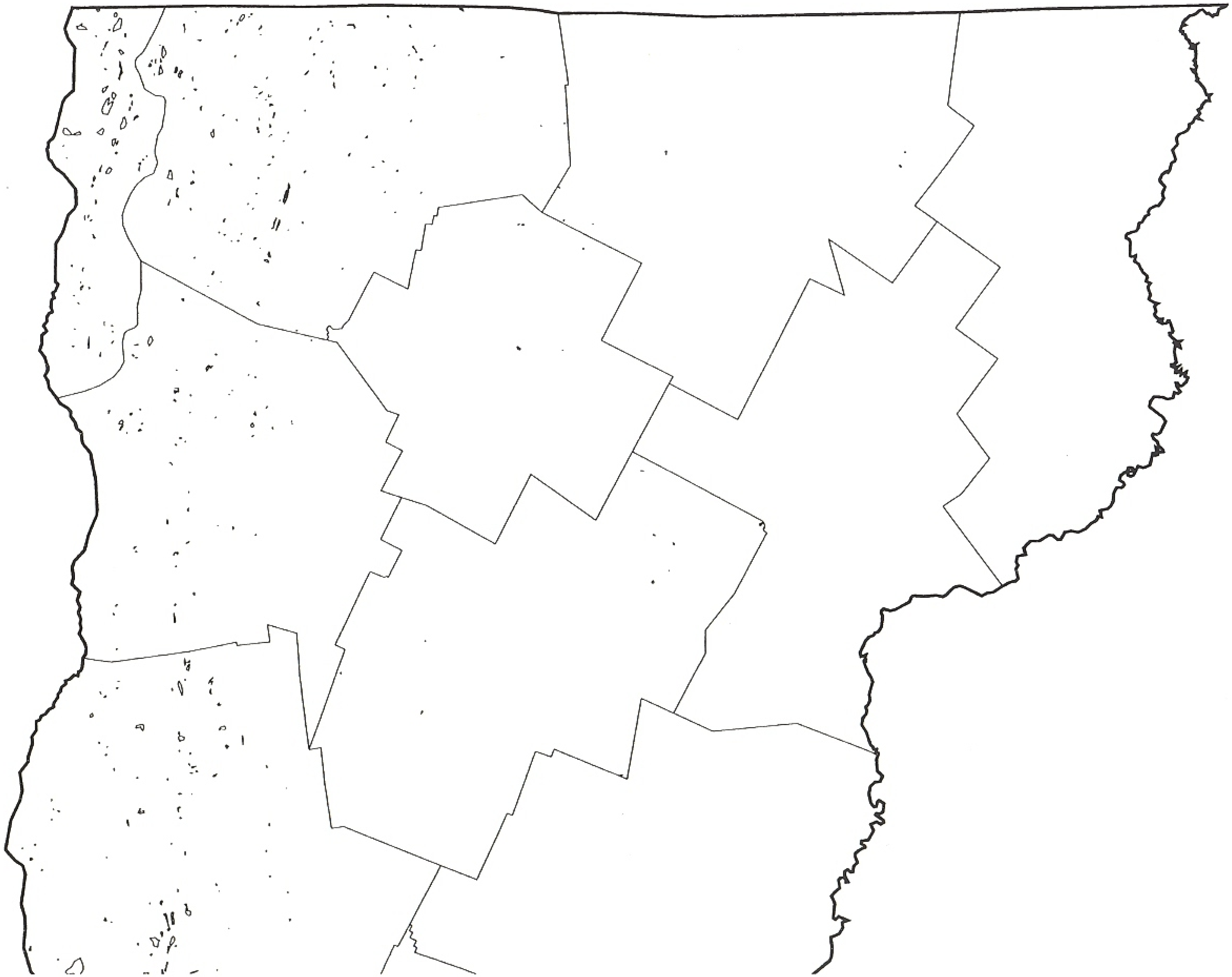
Table 21. Mapped acres of dieback and mortality due to wet site in 1996.

County	Pattern			Total
	<30% of Trees	30-50% of Trees	>50% of Trees	
Addison	1,158	75	2,207	3,440
Caledonia			1	1
Chittenden	77	5	773	855
Franklin	413	8	1,611	2,032
Grand Isle	621	428	1,323	2,372
Lamoille		34	23	57
Orange			2	2
Orleans			31	31
Rutland	53	17	426	496
Washington			83	83
Windham		27	14	41
Windsor			12	12
Total	**2,322**	**594**	**6,506**	**9,422**

Wet site conditions, coupled with previous drought, did contribute to recent dieback and mortality observed on the ground in forest-grown hemlock in Wardsboro, recent balsam fir transplants in Springfield, and sugarbush maples in Jamaica.

Winter Injury of Red Spruce was mapped on 9,500 acres, mostly in southern Vermont (Table 22, Figure 25). Damage was most severe on south- and west-facing slopes at high elevations, and was heavy on individual trees in both the over- and understory. Severity of symptoms was probably exacerbated by the 1995 drought, especially on ledgey sites where there was also some recent spruce mortality. Little winter injury was observed in northern Vermont.

WET SITE DIEBACK and MORTALITY



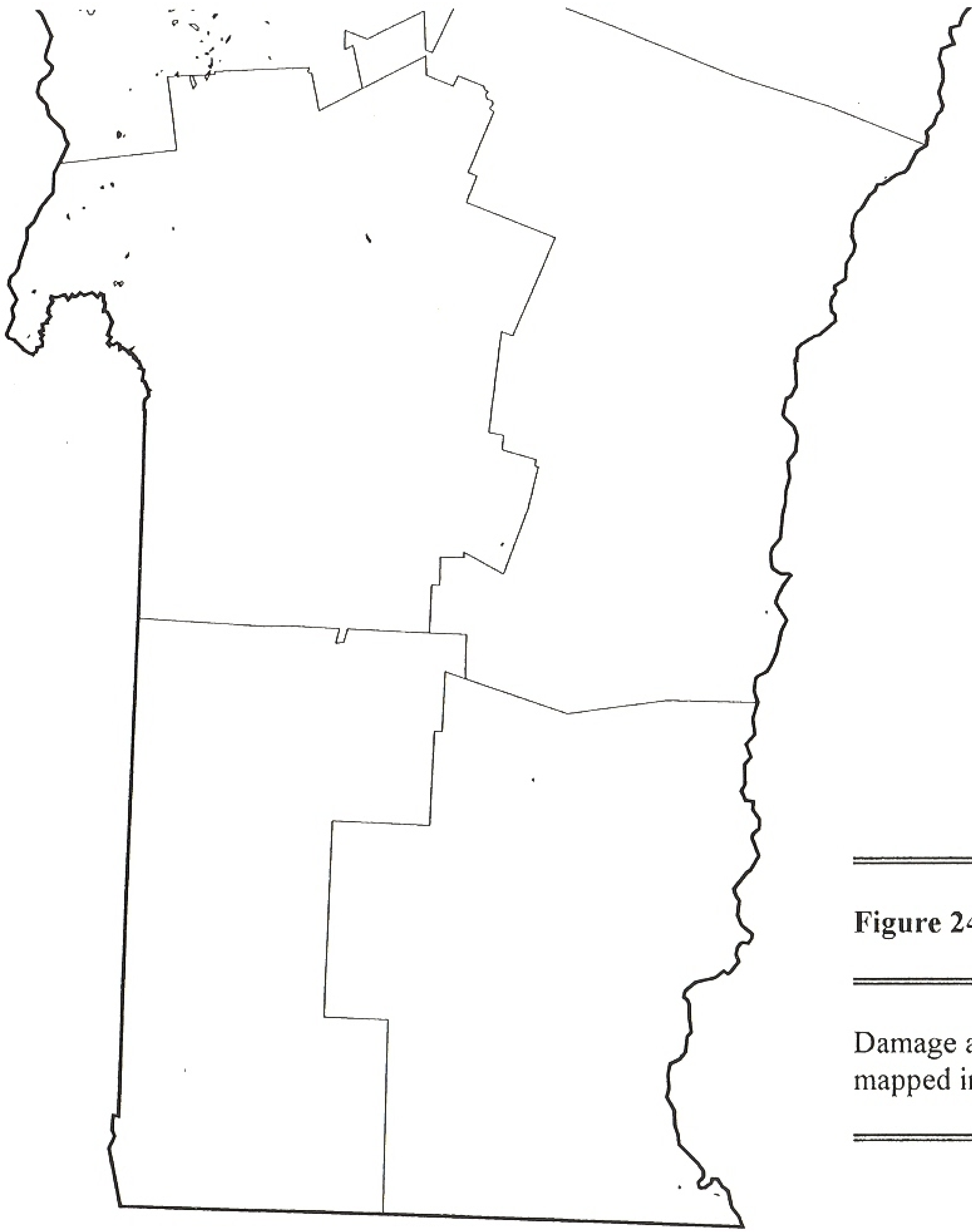
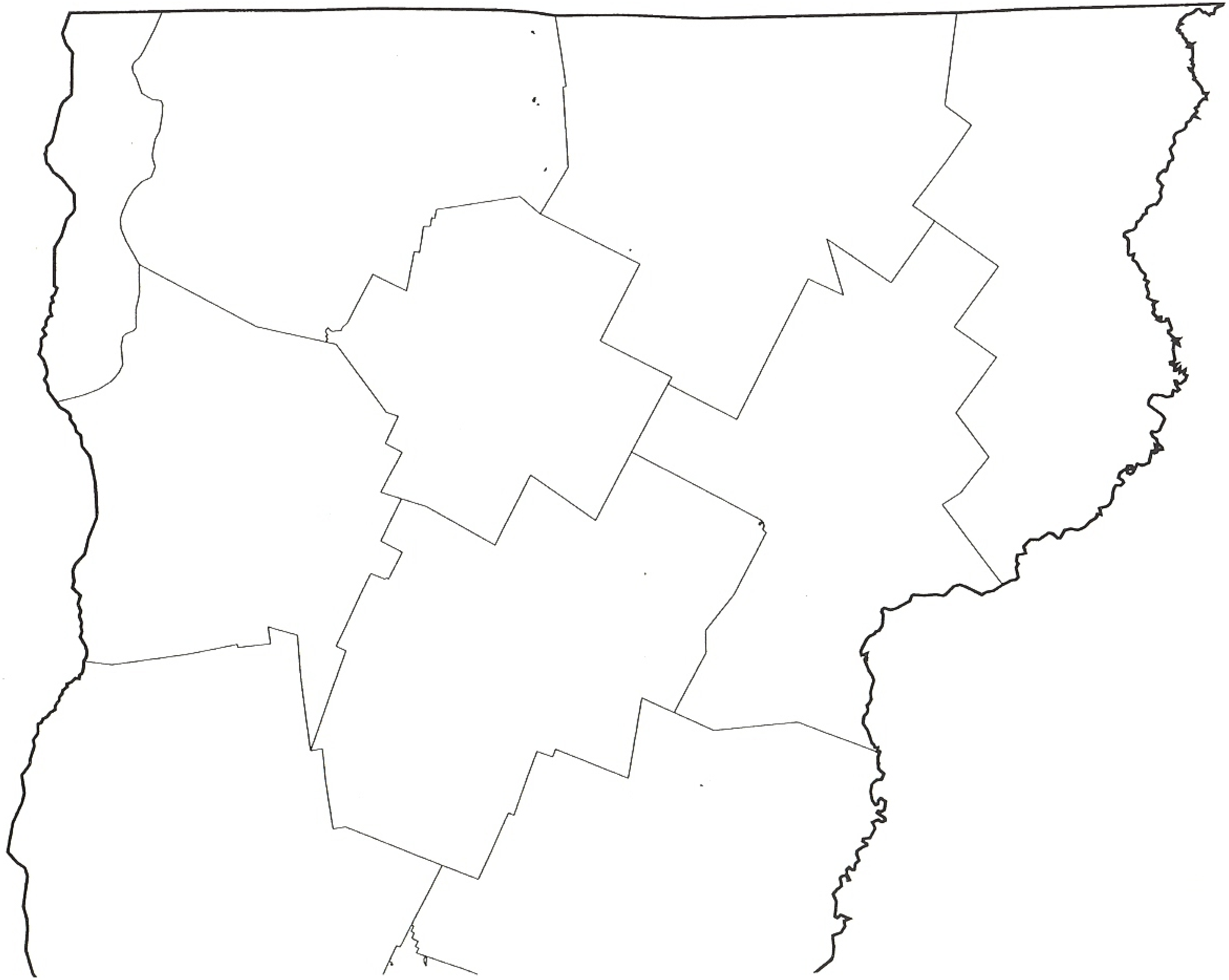


Figure 24. 1996 dieback and mortality due to wet site.

Damage area approximate location. Total damage mapped in 1996 = 9,422 acres.

SPRUCE WINTER INJURY



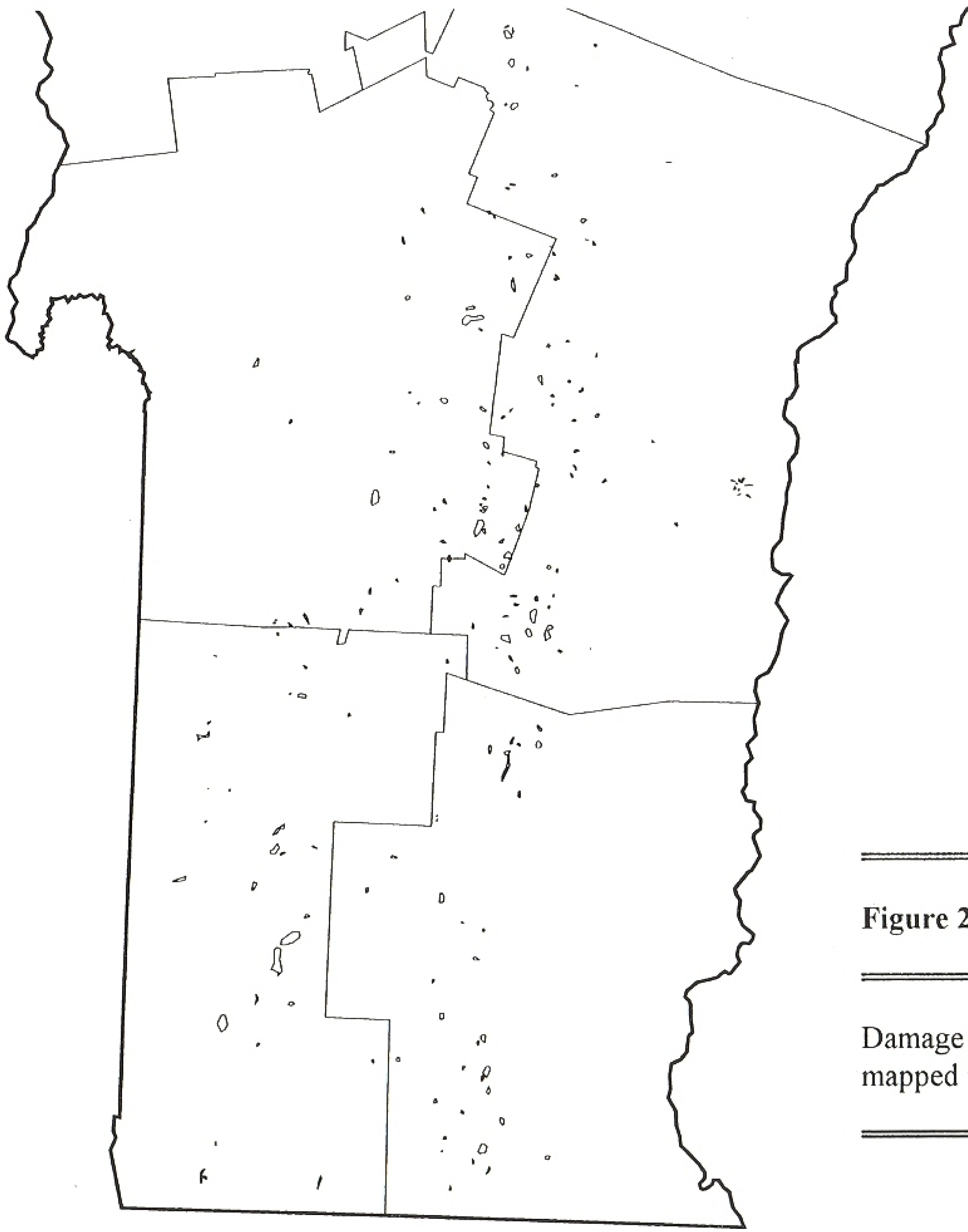


Figure 25. 1996 winter injury of red spruce.

Damage area approximate location. Total damage mapped in 1996 = 9,500 acres.

Table 22. Mapped acres of winter injury of red spruce mapped in 1996.

County	Severity			Total
	Light	Moderate	Heavy	
Bennington	225	1,314	879	2,418
Franklin		78		78
Orange			5	5
Orleans			7	7
Rutland	361	2,117	102	2,580
Washington		1	6	7
Windham	183	1,669	9	1,861
Windsor	207	2,244	93	2,544
Total	**976**	**7,423**	**1,101**	**9,500**

An increase in dieback occurred in some of the monitoring plots established to monitor the impact of widespread winter injury in 1993 (Figure 26). This may be due to dry conditions in 1995. In other plots, tree condition generally improved. The change in dieback between 1993 and 1996 was correlated ($p=.05$) to the severity of winter injury in 1993.

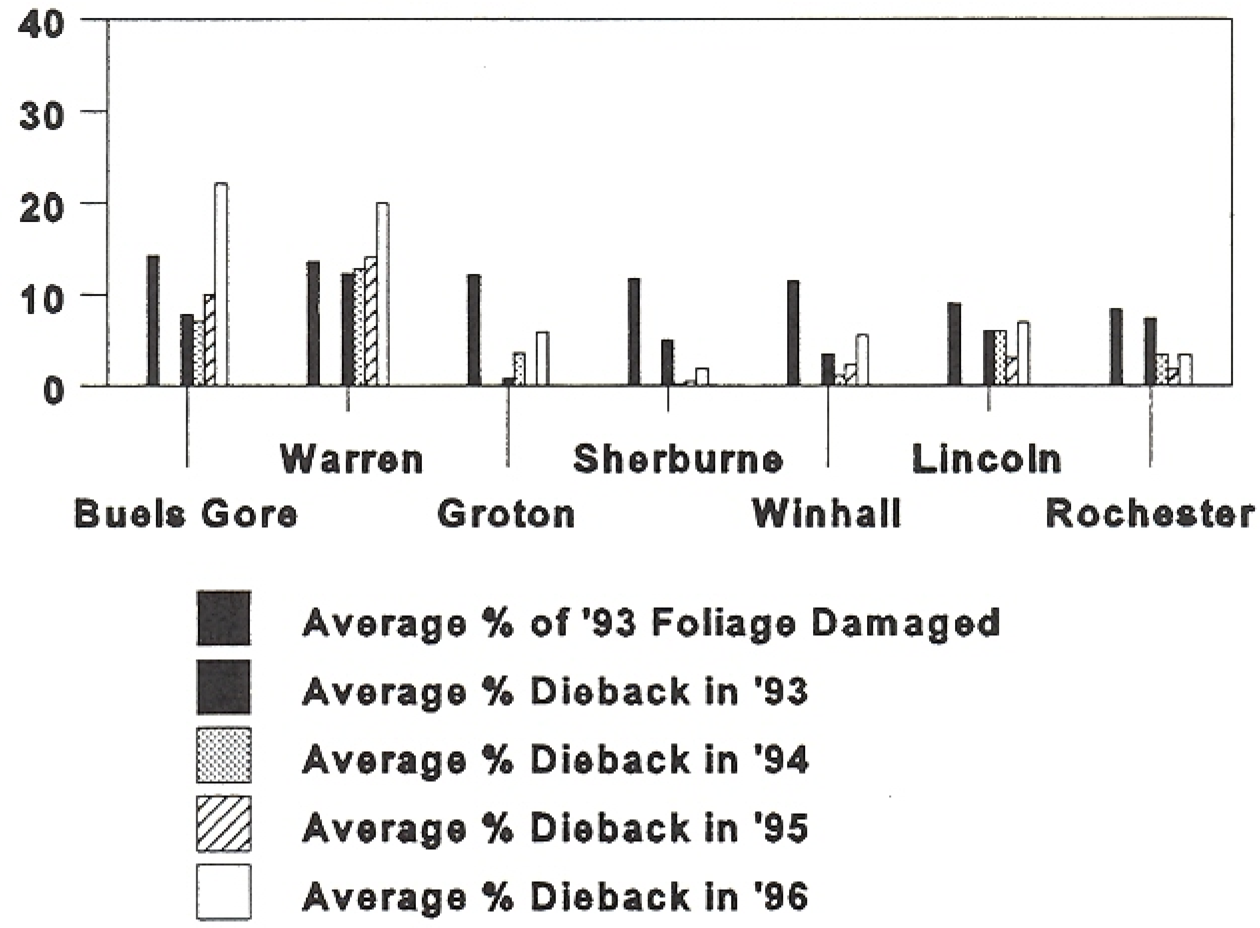


Figure 26. Average percent of foliage damaged by winter injury in 1993 and percent dieback in 1993 through 1996 on live red spruce from seven plots established to assess the winter injury impact.

OTHER DIEBACKS, DECLINES, AND ENVIRONMENTAL DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Ash Dieback			See narrative.
Birch Decline			See narrative.
Chlorosis of White Pine			See narrative.
Curled Leaves			See narrative.
Drought			See narrative.

OTHER DIEBACKS, DECLINES, AND ENVIRONMENTAL DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Fertilizer Injury			Not observed.
Fire Damage	Many	Addison Orleans Windham Counties	Damage from past burns mapped on 32 acres.
Frost Damage	Sugar Maple	Essex	Early June frost damaged trees late in leafing out.
	Balsam Fir	Widely scattered	Light damage on Christmas trees, especially in low lying areas.
	White Ash	Tinmouth	Damage from 5/24 frost.
Girdling Roots	Norway Maple	Springfield	Too late in tree's life to remove.
	Sugar Maple	Shrewsbury	Exacerbated drought impact.
Hardwood Decline and Mortality			See narrative.
Heavy Seed Causing Dieback			Not observed, although heavy seed crops were reported on many species, especially on red maple and beech.
Hemlock Decline	Hemlock	Woodstock	Density and dieback were unchanged in a plot established to monitor thin hemlocks in 1995.
Improper Planting	Ornamentals	Throughout	Planting too deep is the most common problem. Small root balls exacerbated by drought led to nearly complete mortality of a 1995 planting.
Larch Decline	Eastern Larch	Northeast Kingdom	Continues but at a slow rate. 89 acres mapped in Essex and Orleans Counties.
		Rutland County	Less than previous years.
Late Second Flush			See narrative.
Lightening	White Pine	Wardsboro	Initiated stand opening.

OTHER DIEBACKS, DECLINES, AND ENVIRONMENTAL DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Maple Decline			See Hardwood Decline and Mortality.
Mechanical Injury	Ornamentals	Throughout	String trimmers and lawn mowers a common cause of damage.
Ozone Injury	Black Cherry Pin Cherry White Ash	Widely scattered	Injury to sensitive species only (in openings) seen in 12 of 15 monitoring locations. No damage was seen on mature trees or from aerial surveys.
Pesticide Injury	Fraser Fir	Pownal	Princep/Aatrex. Yellowing of older foliage appeared in early spring. Soil around yellow trees had 3x as much triazine as the soil around normal trees.
	Balsam Fir	Ludlow	Off-color foliage in July from Princep.
	White Ash	St. Johnsbury	Herbicide injury to trees bordering treated walkway.
Salt Damage	Conifers	Widespread	Unusually heavy, particularly on white pine, due to heavy snow and warm winds. Many trees far from roadways affected by aerosolized spray.
Snow Breakage	All Christmas Tree Species	Widely scattered	Broken branches common from winter 1995-96, particularly in the upper whorls. Pines received heaviest damage.
	Many, especially White Pine	Southern Vermont	Broken branches common from heavy wet snow in early December '96.
Spruce Mortality			See narrative.

OTHER DIEBACKS, DECLINES, AND ENVIRONMENTAL DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Maple Decline			See Hardwood Decline and Mortality.
Mechanical Injury	Ornamentals	Throughout	String trimmers and lawn mowers a common cause of damage.
Wind Damage	Hardwoods	Champlain Valley	330 acres of scattered damage mapped from late fall windstorms.
		Bennington County	Some breakage from 1995 storms still visible.
	Spruce-Fir	Northeast Kingdom	52 acres of blowdown mapped from the air.
Winter Injury	Black Birch	Chester	Cracks in pole-sized stand attributed to cold injury 6-7 years ago. Stand is at edge of species range.
	Magnolia	Williston	Ornamental.
	Balsam Fir	Springfield	Winterburn of recent planting.
Winter Injury of Red Spruce			See narrative.

TRENDS IN FOREST HEALTH

Data from the **North American Maple Project**, indicates that sugar maple health over the last eight years has been generally stable. An unusually dry spring in 1995 created stress on trees, and some lingering symptoms, such as curling leaves, clumped foliage and thin crowns, were still evident in 1996. But good growing conditions helped tree recovery, and nearly 93% of Vermont trees surveyed were healthy (Figures 27-28).

Other species surveyed in 1996 also showed an improvement over 1995. Ash, red maple and yellow birch trees all had over 90% of trees in a healthy condition. Beech, however, continues to show symptoms of poor vigor, with nearly 25% of trees in an unhealthy condition

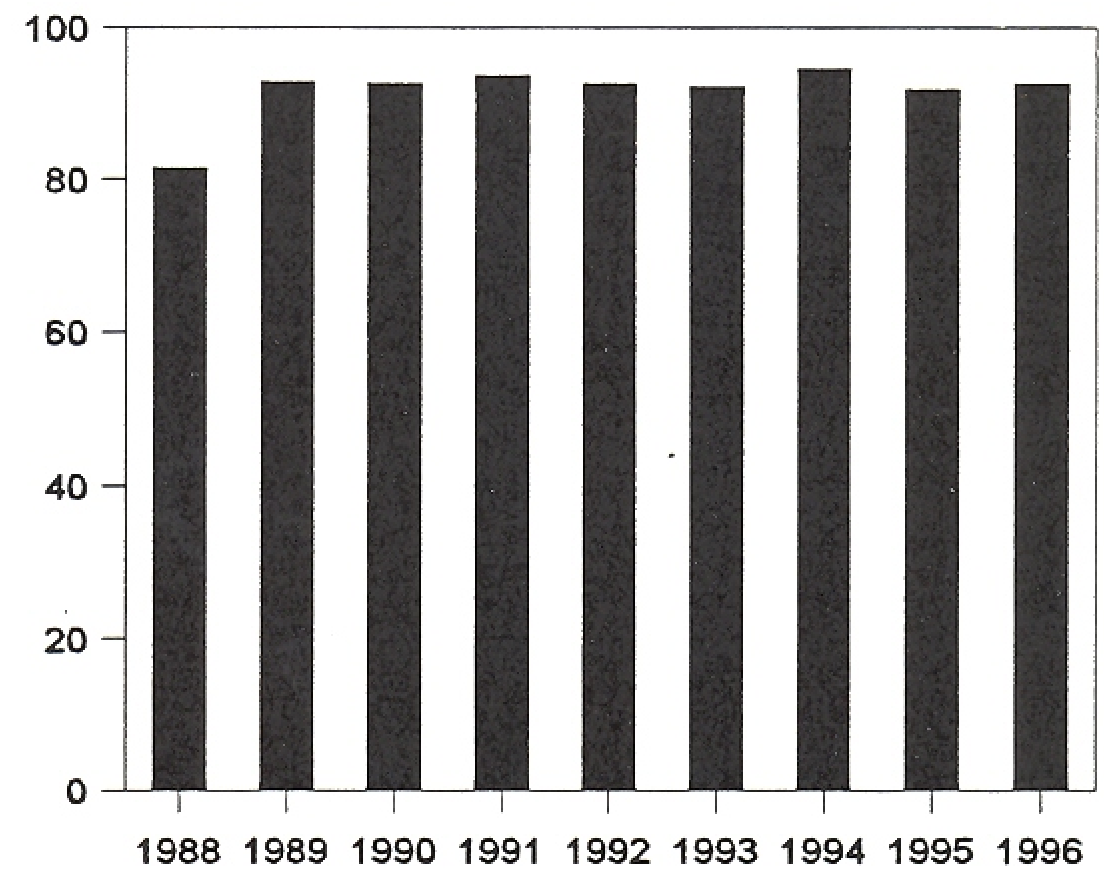


Figure 27. Percent of overstory sugar maple trees in North American Maple Project plots with ≤15% dieback (considered healthy), 1988-1996.

The **Vermont Hardwood Tree Health Survey**, which examines statewide tree health every five years by evaluating aerial photos covering 61,000 acres and 84 ground plots, was completed for the third time. The aerial photography shows continued improvement in the health of hardwood forests. The area of moderate mortality on the 1995 photography decreased more than 73 percent since 1990.

Preliminary ground plot data also show continued overall improvement in crown condition (Figure 29). Maples had a small decrease in crown condition in 1996 compared to 1991 (Figure 30). This is similar to the trend seen in data from the North American Maple Project plots, and may be related to precipitation patterns, particularly since the 1991 survey followed a very wet year and the 1996 survey followed a very dry year.

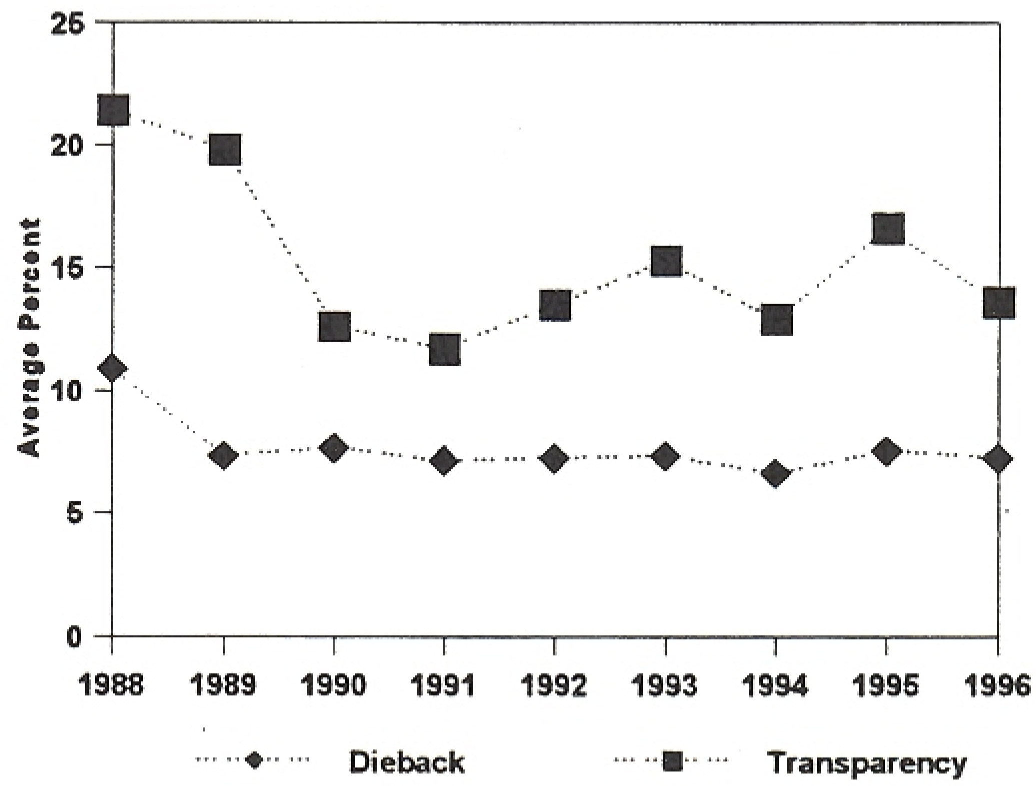


Figure 28. Average percent transparency (amount of light coming through foliage) and dieback of overstory sugar maple trees on the North American Maple Project plots, 1988-1996. Data are from 1,964 trees.

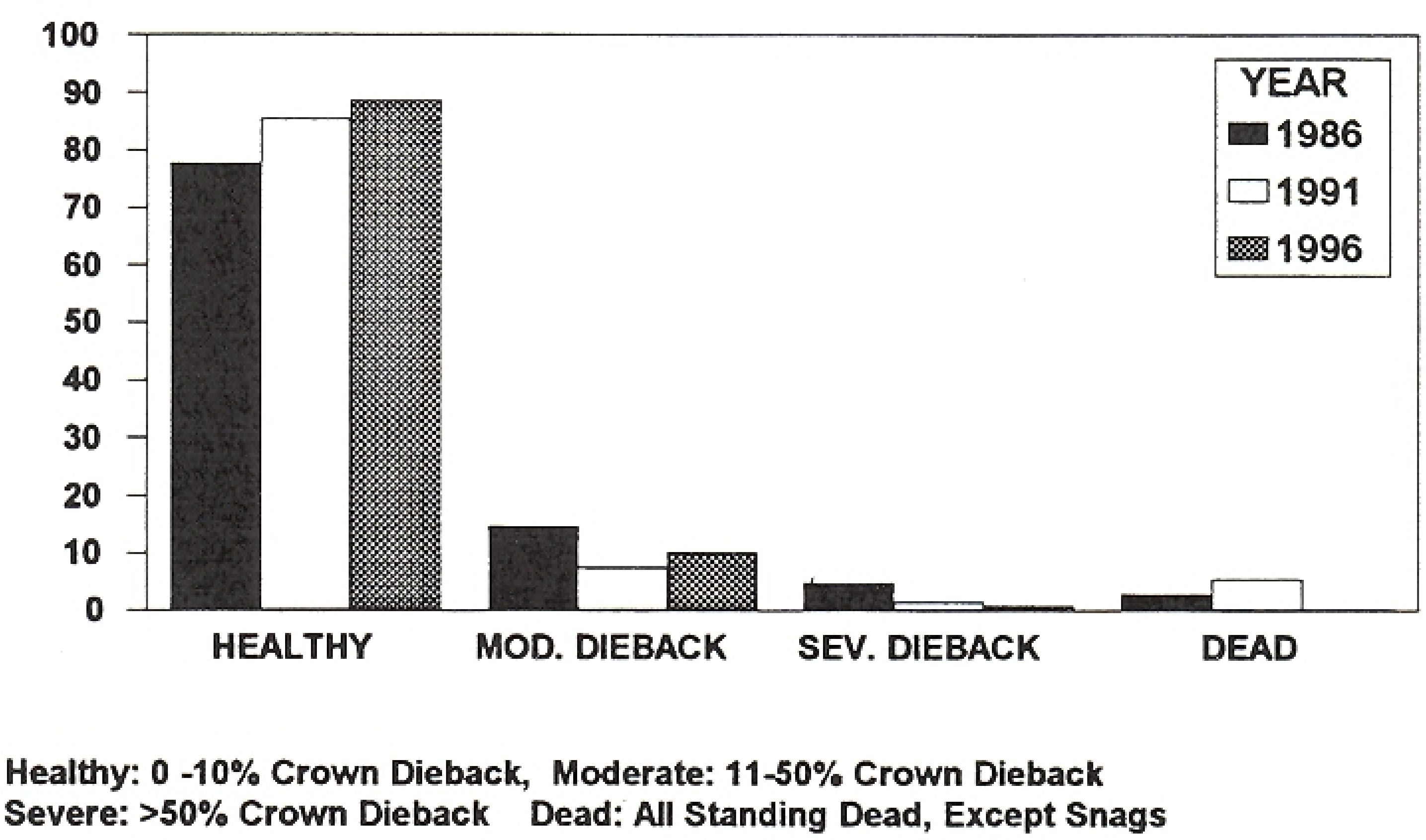
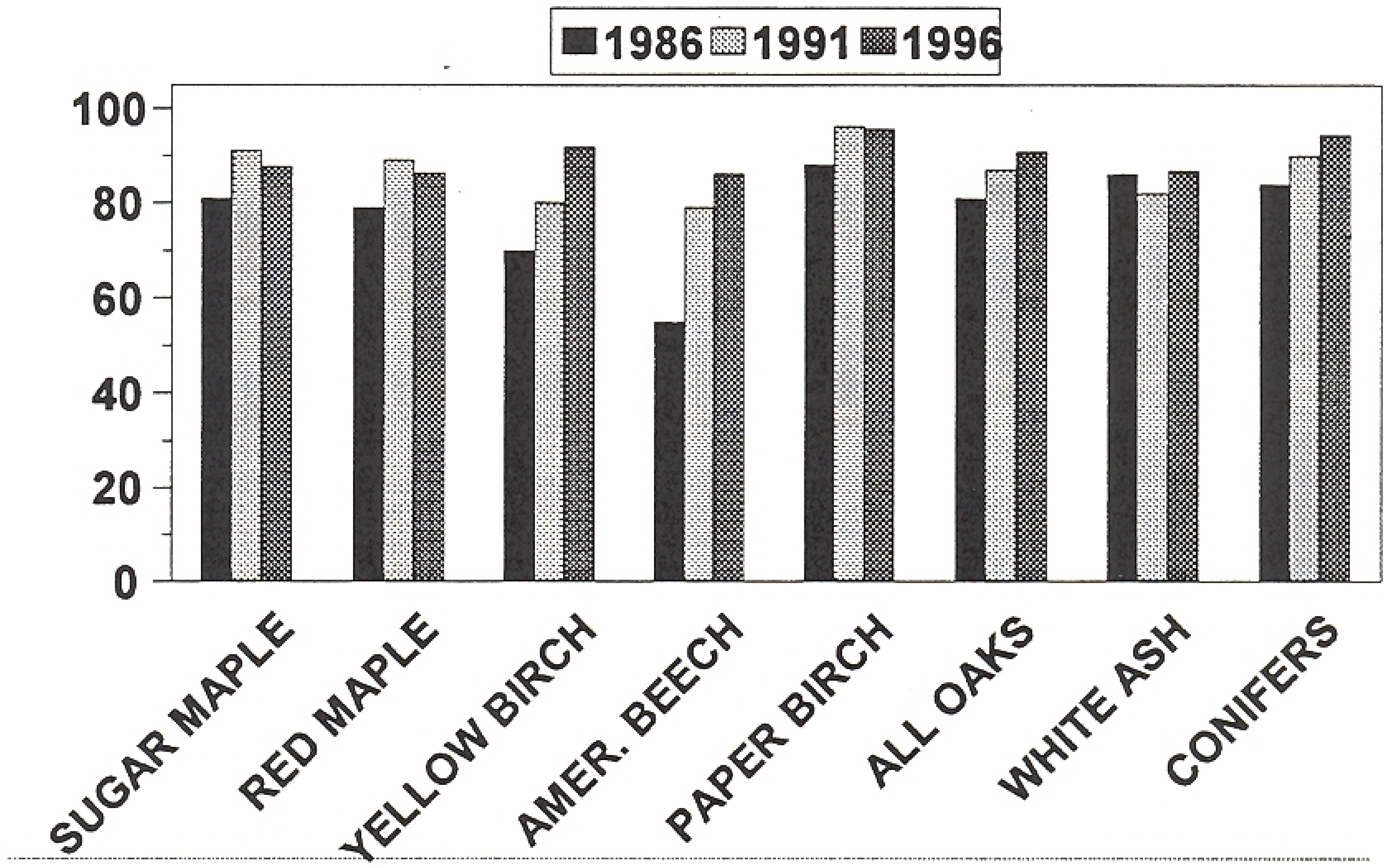


Figure 29. Percent of dominant and codominant trees in Vermont Hardwood Tree Health Survey plots in each of four crown condition classes, 1986-1996.



Healthy: 0-10% Crown Dieback
Average Number Healthy = 108.5 Trees/Acre in 1986, 109.9 Trees/Acre

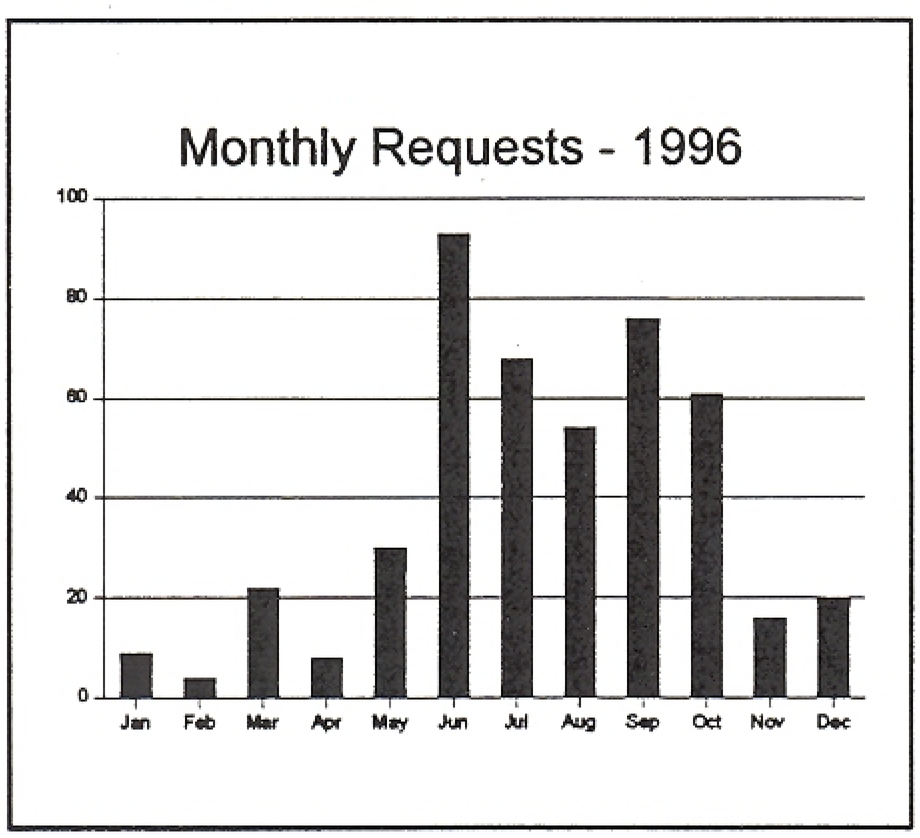
Figure 30. Percent of live dominant and codominant trees healthy by species in Vermont Hardwood Tree Health Survey plots, 1986-1996.

FOREST BIOLOGY LABORATORY - 1996

The Forest Biology Lab serves forest management professionals and the public through complementary programs in research, public education, and extension activities. Major efforts include direct information transfer through responses to requests for diagnoses and information, as well as projects which make available research-generated information in formats useful to the forest health practitioner.

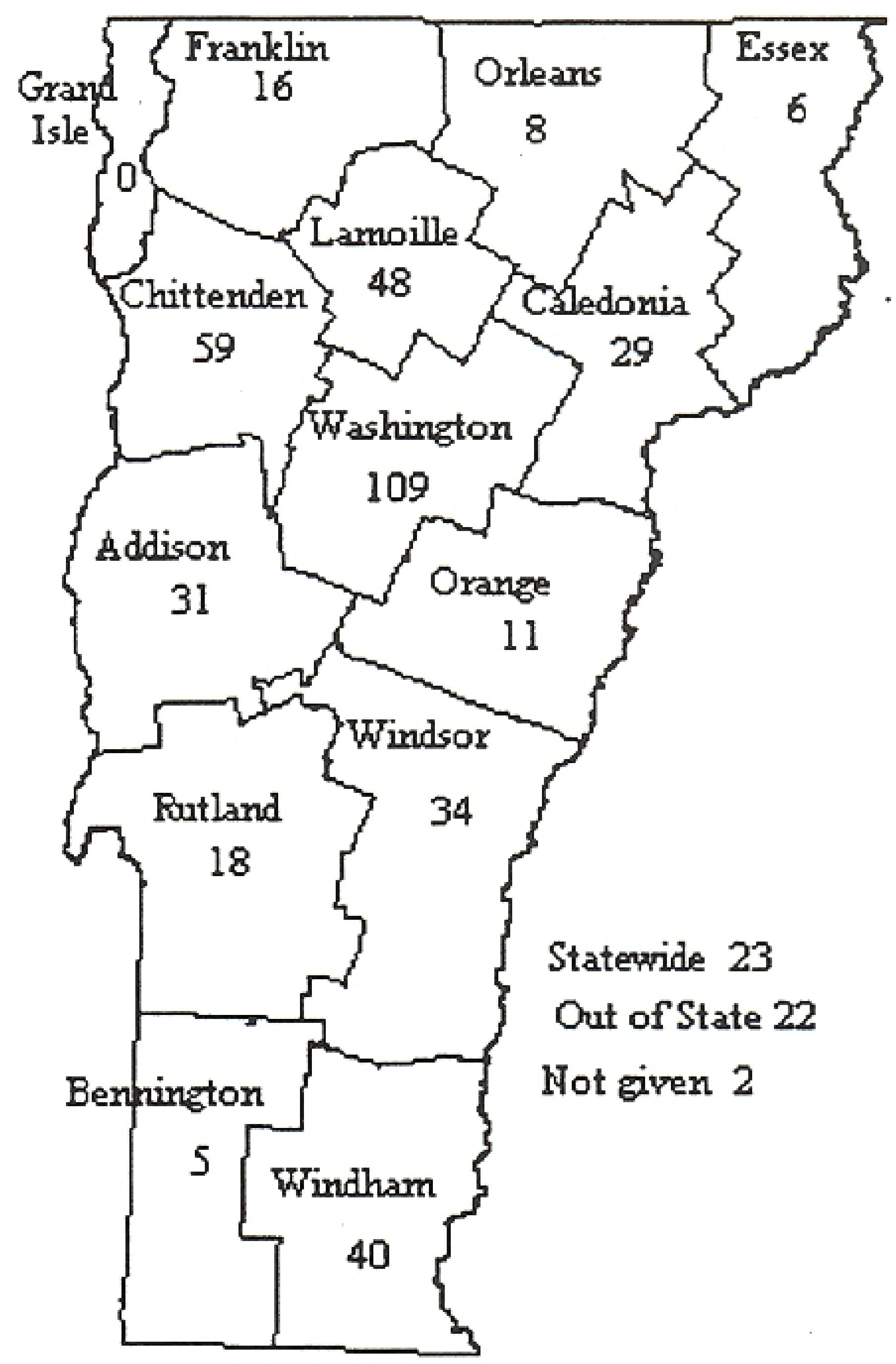
Correct identification of organisms involved remains the most important factor in eliminating unnecessary control actions. In response to inquiries about control strategies, we recommend, when possible, safer alternatives to synthetic organic pesticides, or, when chemicals are deemed necessary, we provide information on products registered for specific uses, their toxicity, mode of action, and safety guidelines.

The Forest Biology Laboratory received 461 requests for identifications, advice and information in 1996, with the highest number of requests (93) made in June.



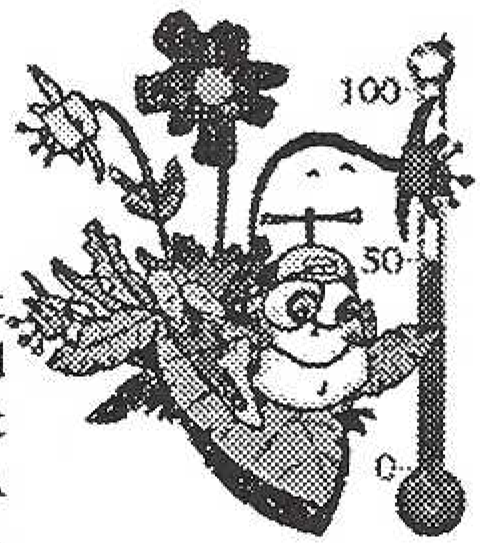
The majority of requests had to do with insects and diseases (biotic and abiotic) of trees. Many of these were requests for educational materials, without need for initial identification of the insect or disease involved. In addition, a number of school groups, teachers, and students, from elementary to college level, sought information on specific insects, management strategies and available resources through the Forest Biology Lab.

The number of requests per county ranged from 0 (Grand Isle) to 109 (Washington County).



Data on insects and diseases submitted to the Forest Biology Lab are included in appropriate sections of the *Conditions Report*. Most non-tree insects (eg., pests of households, aquatic insects) are not listed by species in the document. Interested people can obtain details from the Forest Biology Lab.

PHENOLOG: A Phenological Database



In 1996, the Forest Biology Lab received a focus funding grant from the USDA Forest Service, Northeastern Area State and Private Forestry, Forest Health Protection, to compile a phenological database to help provide forest managers, tree health specialists and extension workers with direct, immediate and automated access to information on insects and correlated plant phenology. Existing databases and selected phenological data from several sources in the NE have been incorporated into the PhenoLog program.

The PhenoLog database can be used to answer common questions about what to expect in terms of insect and plant development, and will generate standard reports on these activities. By providing daily maximum and minimum temperatures, managers and specialists will be able to obtain a list of insects of concern to forest and shade trees, as well as associated plant species at specified stages of phenology such as bud break or full bloom.

> **PhenoLog**
> **System Requirements**
>
> Windows 3.1
> 8 Mb RAM
> 6 Mb Storage Space
>
> PhenoLog is available on four 3 ½" diskettes or on the Internet via anonymous FTP (File Transfer Protocol)

PhenoLog requires input of daily maximum and minimum temperatures that can be collected on-site by the program user or obtained from local National Weather Service records. In addition to collecting temperature data, the database is structured to collect phenological data.

How to Access PhenoLog

To acquire PhenoLog via internet

1.) FTP>capita.wustl.edu
2.) Change directory to VMC\phenolog\
3.) Get phenolog.zip (Binary transfer mode) (Note: 3.9 Mb zipped, 9.0 Mb unzipped)
4.) Get pkunzip.exe (Binary transfer mode)
5.) Close FTP

To unzip file

1.) In DOS or Windows: \File\Run
2.) pkunzip <Directory> phenolog.zip -d <Destination directory> (This creates a Pheno directory with the necessary installation files.)

To install PhenoLog

1.) Open Windows
2.) Get File\Run command
3.) Type <Destination Directory>\setup
4.) Choose OK.

Requesting Assistance from the Forest Biology Lab

When making requests for assistance, remember that fresh specimens accompanied by good background data on the site or host on which the specimen was collected aid in our abilities to diagnose problems. Please include the date of collection and any cultural aspects that may be of importance. If you are requesting identification of an insect, try to send several specimens. Immatures and soft-bodied insects should be placed in alcohol. Live insects can be sent in containers with host foliage. Leaf samples can be laid flat between pieces of cardboard. Entire plants can be dug. Try to include a range of symptoms in infected plants.

> Forest Biology Lab
> 103 S. Main Street
> Waterbury, VT 05671

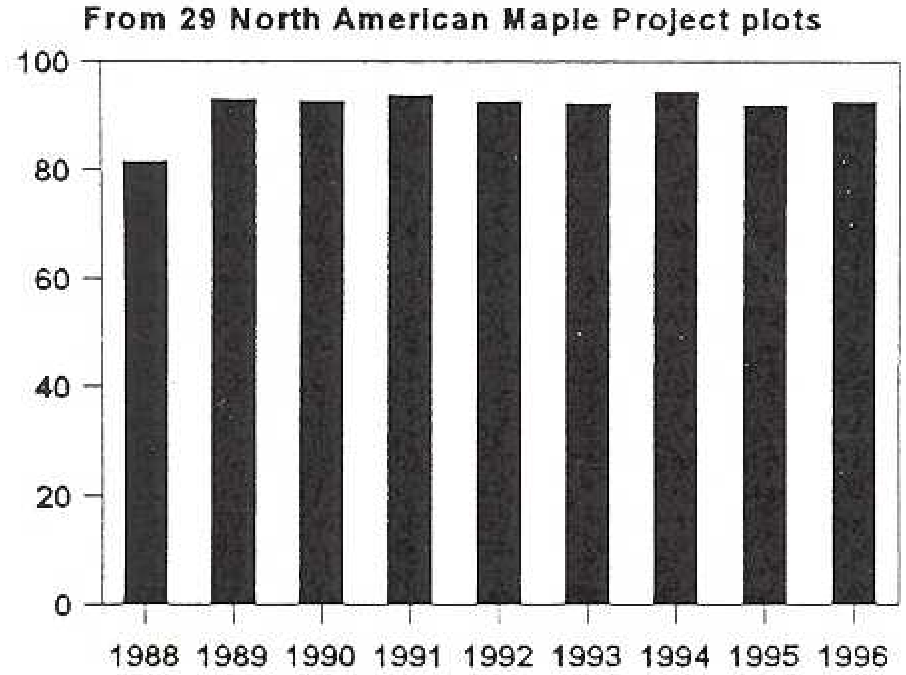
HEALTH OF SUGAR MAPLE IN VERMONT - 1996

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 Vermont Department of Forests, Parks, and Recreation, the University of Vermont and the U.S. Forest Service.

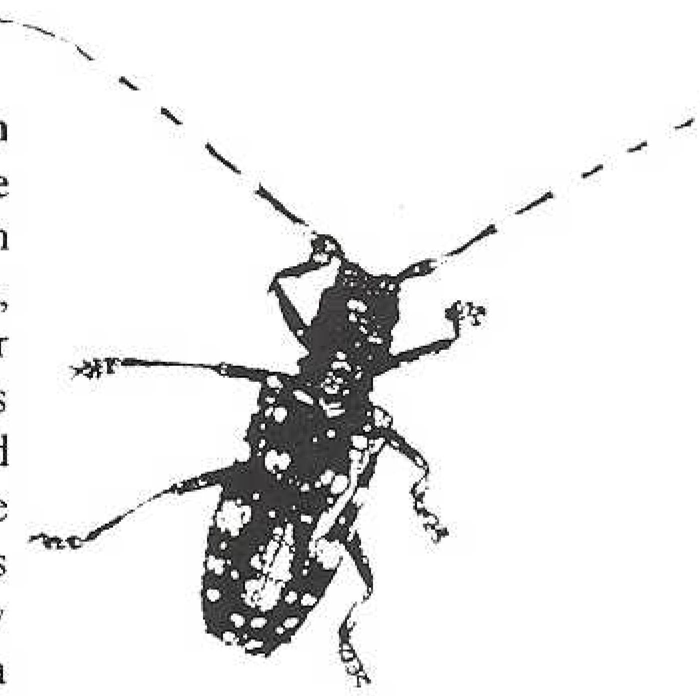
The **General Condition** of maples was average for the past eight years according to the North American Maple Project (the international effort to follow changes in maple health (see graph). Ample rain led to dense foliage, but some trees continued to show symptoms brought on by dry weather in 1995. Leaf size and color were generally good. Occasional trees had curled leaves in the upper crown all summer.

Percent of Sugar Maples Healthy: Vermont
From 29 North American Maple Project plots



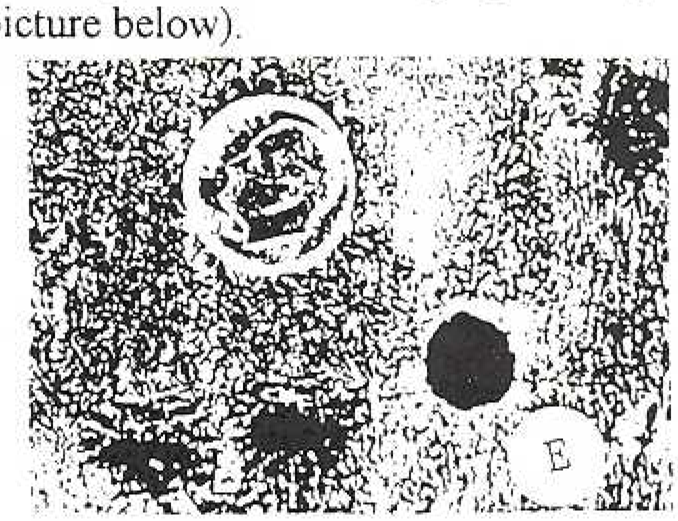
Sugar maples, like many tree species, produced a lot of seed in 1996. The late onset of fall color was attributed to generally warm weather in late summer, and good growing conditions.

The **Vermont Hardwood Tree Health Survey**, which examines statewide tree health every 5 years, was completed for the third time. Aerial photographs covering 61,000 acres showed continued improvement in the health of hardwood forests. The area of moderate mortality visible in 1995 decreased more than 73% from 1990. Data taken in 1996 on 84 ground plots is currently being analyzed.



The **Asian Longhorned Beetle** does not occur in Vermont. However, it was detected for the first time this year in Brooklyn and Long Island. The insect was inadvertently imported from Asia several years ago. It is important to sugarmakers because it thrives on sugar maple. Efforts are underway to prevent this insect from spreading in North America. Infested trees are being cut and destroyed.

Eggs are laid in small circular wounds in the bark. The beetle grubs make tunnels under the bark and excavate galleries in the wood. Infested trees dieback, and branches break. The adult beetle emerges through holes resembling tapholes (At "E" in the picture below).

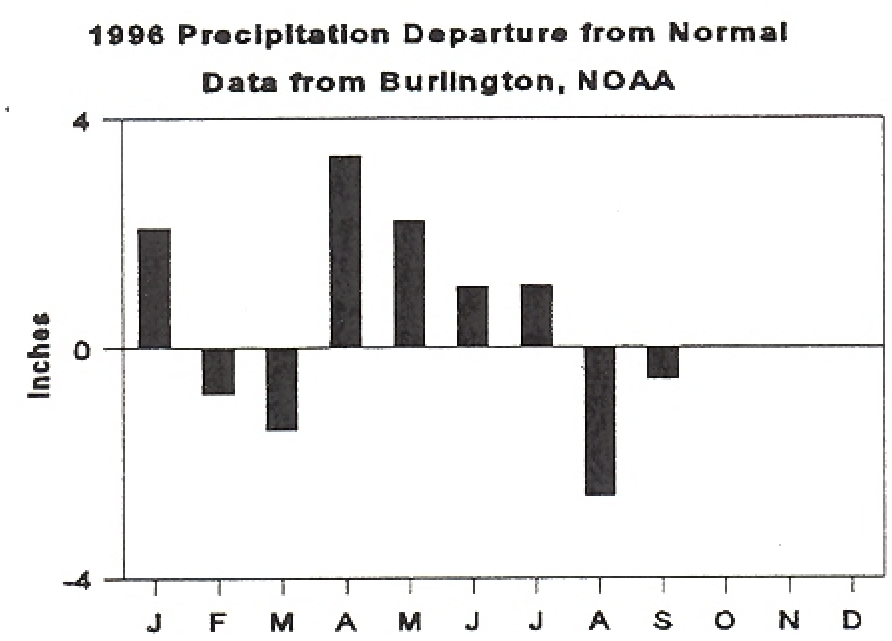


Although it's unlikely that the Asian longhorned beetle has spread to Vermont, keep an eye out for insect damage to branches. Encourage visitors from New York City and Long Island to leave their firewood at home.

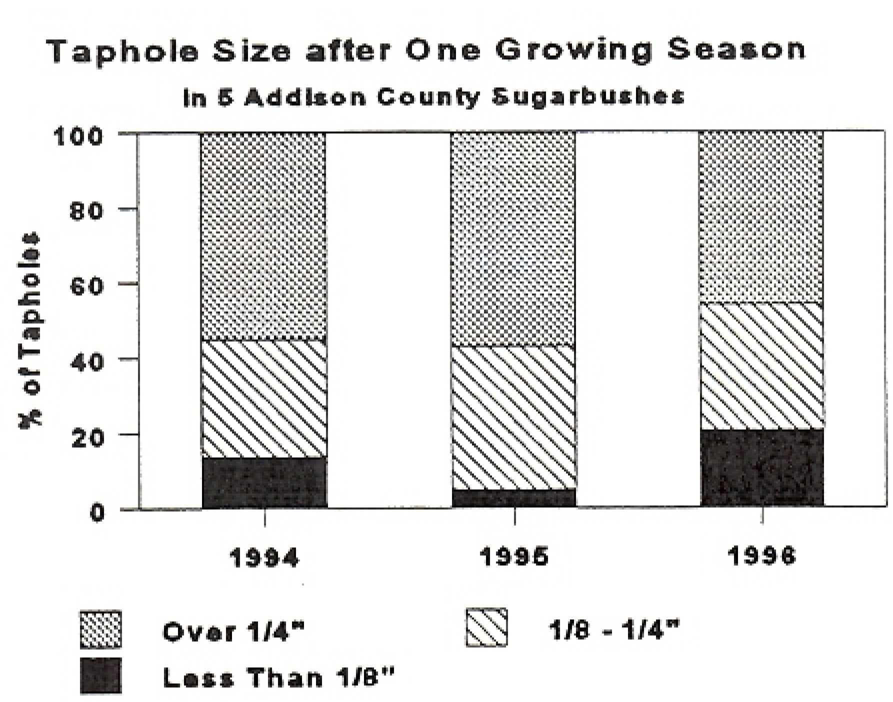
Maple Defoliator populations remained low in 1996. **Saddled Prominent** may be increasing in southern Vermont and the Northeast Kingdom, where occasional larvae and light defoliation were observed. **Maple Leaf Cutter** caused heavy browning to maple stands in widely scattered locations. Anthracnose increased the amount of browning on leaves with maple leaf cutter damage.

Bruce Spanworm, populations decreased, with only very light feeding in most locations. One sugarbush in Sheldon was heavily infested for the second straight year. Although aerially treated with Bt, caterpillar numbers were reduced by only 50%.

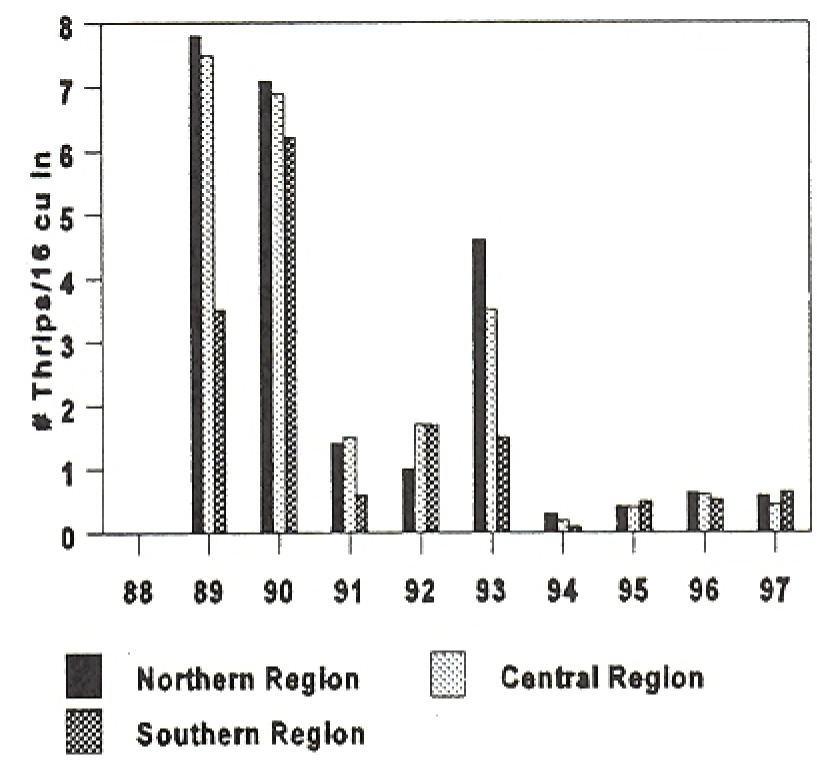
Wet Conditions in the growing season allowed trees to recover from the 1995 drought, but also promoted fungus diseases. **Anthracnose**, which causes leaf browning and premature leaf drop, was mapped on 25,000 acres. the damage was particularly noticeable in low-lying areas and along roadsides. Because most of the browning occurred late in the season, the impact on tree condition is not expected to be significant.



The rate of **Taphole Closure** is an indicator of tree health. Since 1994, several sugarmakers in Addison County have been measuring the rate of taphole closure. The data from five sugarbushes show that taphole closure was rapid in 1996, when moisture was plentiful. In 1995, the year of prolonged drought, closure was slower (see graph). After two growing seasons about 3/4 of the tapholes were fully closed, and all were closed after three growing seasons. To find out more about evaluating taphole closure, contact the Addison County Forester at 388-4969.



Pear Thrips populations remained low. Very little damage was observed, in spite of the slow spring development. No significant defoliation has been observed since 1993. Preliminary counts of thrips in the soil going into the winter suggest that populations will be similar in 1997.



Scientists at the University of Vermont are trying to determine what insect causes **Perforated Tubing**. The circular holes are about the diameter of pencil lead. They are caused by a beetle, or other insect with chewing mouthparts. If you have this kind of damage, contact the Entomology Laboratory at 656-5440.

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	372-1217
Caledonia	748-8787
Chittenden	879-6565
Essex	334-7325/748-8787
Franklin	524-6501/879-6565
Grand Isle	524-6501/879-6565
Lamoille	888-5733
Orange	479-3241
Orleans	334-7325/748-8787
Rutland	483-2314
Washington	479-3241
Windham	257-7967/886-2215
Windsor	296-7630/886-2215

COMMON PESTS OF CHRISTMAS TREES IN VERMONT 1996 REPORTED BY THE DEPARTMENT OF FORESTS, PARKS AND RECREATION

INTRODUCTION

Information in this report is based largely on a systematic annual survey of Christmas trees in northern Vermont as part of the Scleroderris quarantine and a smaller survey in southern Vermont. This year, over 1300 acres were surveyed in northern Vermont and 150 acres were surveyed in southern Vermont. Observations by forest resource protection personnel throughout the state are also incorporated. Acreage trend information reported refers to changes in surveyed plantations in northern Vermont and are not statewide totals.

INSECTS

Balsam Gall Midge populations increased again this year and damage was detected in half of the balsam fir Christmas tree plantations surveyed in northern Vermont. A number of growers reported noticeable damage for the first time in many years. Damage is expected to be heavy enough to affect tree marketability in 1997.

Growers who had damage this year should monitor their trees for adult midges laying eggs soon after bud break in 1997 and be prepared to treat their trees when new growth averages 1½ to 2 inches long, if adults are present.

Balsam Shootboring Sawfly continues to be a common problem in fir Christmas tree populations in northern Vermont. Damage from this sawfly was observed in every location where it was previously detected, but trees were not damaged as extensively as in 1994 or 1995. Overall, fraser fir tended to receive the heaviest damage. This year 42% of the fraser fir plantations infested had moderate damage compared to 31% in 1995. Conversely, 25% of the balsam fir plantations had moderate damage compared to 29% in 1995. Although this sawfly has been less of a problem in southern Vermont, occasional damage to balsam fir was observed in Weston and Ludlow. **Damage should decrease in 1997.**

Adults began emerging April 22 in Stowe and May 1 in Wolcott and Elmore, but moderate numbers were not observed on trees in Elmore until May 7, one week later than in 1995. Females emerged first, with first male emergence 6 days later. Emergence in Elmore was completed by May 9, but this was followed by an extended period of cold, windy, rainy, snowy weather. Peak egg laying did not take place until about May 20, and adults were visible until May 24 after most balsams had broken bud and 50 percent of the frasers were at green bud stage. This is in sharp contrast to 1995 when adults were gone by the time balsams broke bud in mid-May. The adverse weather when adults should have been laying eggs may be responsible for the damage being less than predicted for this year.

Spray trials to control shootboring sawfly damage were conducted in Elmore again this year. Two applications of Lorsban 4L, at 1 quart per acre, were applied by the grower with a tractor-mounted mist blower. NU-film 17 was added as a spreader sticker. The first treatment was on May 10, after all female sawflies had emerged and 2 days after the first male emergence. This should have been ideal timing based on our experience from 1995 but because of the cold weather, adults surprised us by delaying activity until a week later when a few days of warm weather finally arrived. The second application was on May 21 about mid-way through the egg-laying periods (based on adults caught on sticky cards in host trees). Treated trees had 50 percent fewer buds killed by sawfly than untreated trees. So a split application should give good control if the first treatment is delayed until adults are just beginning to lay eggs, with a second treatment 3-5 days later. The difficulty comes in monitoring closely enough to determine this timing. Small yellow sticky cards placed at mid-crown in host trees appear to be useful in making this determination.

Balsam Twig Aphid populations were the heaviest seen throughout the state in many years, causing heavy needle curling on many fir Christmas trees where control measures were lacking or inadequate. Heavy sooty mold developed on many damaged trees due to the wet weather and abundant honeydew secreted by the aphids. Mostly moderate to heavy damage was detected in all of the balsam fir Christmas tree plantations surveyed. Some fraser-balsam crosses suffered moderate to heavy damage and even fraser firs in some locations had noticeable damage. Impact of twig aphid was often less than first observed by growers early in the season. The summer's growth and shearing helps to mask damage. Control for this pest is most effective while the first generation of aphids are present near budbreak. Aphids present beyond mid-June are likely to be the non-damaging stage that lays eggs for the next year, so control at this time will not reduce damage. Beating surveys to detect newly hatched aphids should be conducted in the spring of 1997, beginning just before buds break but are showing green through the sheath. We recommend beating a mid-crown branch above a square foot board for a minimum of 30 trees per block. If no aphids are detected, repeat the survey a few days later. If any aphids are detected, damage may be heavy enough to warrant control.

Cinara Aphids were detected lightly infesting 95 acres of pine and balsam fir. This is a decrease from last year, but incidence on balsam fir increased. Still, very seldom does damage result when clusters are small, as they were this year.

Eastern Spruce Gall Adelgid damage to white spruce decreased this year. Forty-seven acres were moderately infested. This is about 50 percent of the white spruce acreage surveyed.

Unlike last year, shoot mortality was not observed.

Pales Weevil damage to fraser fir was detected on 15 percent (32 acres) of the total fraser area surveyed. While incidence of damage decreased, adult feeding resulted in dieback of the upper crowns of trees from 1½ to 3 feet tall.

Pine Leaf Adelgid damage to white pine decreased and was barely detected this year. Red spruce (the alternate host for this insect) bordering Christmas trees, did receive some injury. Damage to red spruce appears as reddened, elongate "cones" which are actually galled shoots with flattened needles.

Pine Needle Midge damage to Scots pine decreased this year. Of the 222 acres of Scots pine surveyed, 32 percent had light damage and 5 percent had moderate damage. At about mid-summer, look for needles in the upper crown that bend at the fascicle.

Introduced Pine Sawfly injury to Scots and white pine was not observed this year. Light damage was reported on 98 acres in 1995.

Pine Bark Adelgid was seen on white and Scots pine in scattered locations statewide but only at light levels.

A Pine Fascicle Mite was unusually heavy again this year, causing small spots of yellow discoloration on shoots of white pine scattered throughout the state. These spots darken and become less noticeable by the time trees are harvested.

Pine Root Collar Weevil was observed killing white pine nursery stock in Bennington. The trees averaged about 3 to 4 feet tall and approximately 5 percent of them were affected.

Pine Spittlebug on Scots and white pine was present in approximately 8 percent of the mixed pine and fir plantations in the northern Vermont survey and was at light levels in southern Vermont. At most sites, spittlebugs were not numerous and no direct injury was observed.

Pine Shoot Borer injury to Scots and white pine was markedly reduced. This is not a surprise since these moth larvae survive best in hot, dry seasons - unlike this summer. These shoot borers were occasionally observed on drier sites. Look for flagged branches in the upper half of the crown, these shoots may bend at the site of a small entrance hole.

Pine Thrips moderately damaged Scots pine at two plantations for a total area of 14 acres. At one site in Wolcott where the thrips were observed early, shoot stunting and curling was common. At the other site in Craftsbury, mainly foliage was affected and shoot length was normal.

Pine Tortise Scale continued its presence on Scots Pine in Barre and was also observed in light numbers in Dummerston. Progress of the insect in Barre has been slow and no tree mortality has yet been observed. A predatory lady-bird beetle was collected from this site and reared to the adult stage. Identification is pending.

Red Headed Pine Sawfly caused light damage to occasional Scots pine Christmas trees in Bennington, Pownal and Shaftsbury.

Sawyer Beetles were responsible for light balsam fir twig mortality in widely scattered locations throughout northern Vermont.. Reducing brush and slash is the best prescription to discourage this pest. Feeding injury appears as chewing of thin twigs within the crown on the underside of branches, usually very distinct from mechanical injury such as by shearing or mowing.

Spruce Spider Mite injury was down statewide this year. Occasionally, they were found on white spruce and fraser fir but without any noticeable damage. One plantation in Bennington did receive damage to fraser fir just after the rains ended. This site had plenty of mature white spruce which is a preferred host of this pest. Monitoring of spider mites can be done by shaking branches over a white board. Look for tiny eight-legged insects that stain red when squashed. Best chemical controls are those that kill eggs as well as adults.

White Pine Weevil damage to white and Scots pine and blue and white spruce totaled 348 acres. This is about half of the surveyed spruce acreage for all these varieties. White pine was lightly damaged on 155 acres. Scots pine was lightly to moderately damaged on 57 acres. Blue spruce received moderate damage on 100 acres. White spruce is the least planted species in the survey but received heavy damage on 20 acres. Prevalence of this pest is steady and damage to untreated leaders is expected throughout the region. Best non-spray management is pruning of infested leaders. In early summer, look for leaders with numerous punctures along with pitch flow and drooping shoots. Feel for soft and mined bark. Peeling back tissue will reveal frass and grublike larvae.

DISEASES

A Balsam Fir Needlecast caused by *Lirula nervata* was the suspected cause of browning and premature needlecast in a fir plantation in Cabot. Damage in a Weston plantation had already increased over 1995 levels by early July.

Cylaneusma Needlecast (formerly *Naemacyclus*) of Scots pine remained common within 70 percent of the Scots pine area surveyed. Extent of infection was entirely light.

Delphinella Tip Blight of fir has steadily increased since its first report in 1994. Of the 541 acres of fir surveyed, 57 percent of the balsam fir was lightly infested and 12 percent was moderately infested. Fraser fir exhibits slight resistance with only 25 percent of its total acreage lightly infested. One plantation in Wolcott received the heaviest damage. At this site, tall fir trees bordering the plantation were raining spores onto Christmas trees. At two sites in the Montpelier area where the disease was quite active for the past two years, there was little evidence of current infection. This organism was also discovered causing severe damage to subalpine fir in Wolcott. This is a new host record.

Diplodia (Sphaeropsis) Tip Blight caused widespread scattered shoot mortality of pine and fir throughout the state. Frequency of the disease has continued to increase. Extent of the injury has increased primarily on the pines. A total of 307 acres or 30 percent of the entire pine and fir acreage surveyed were infested. Scots pine had the most infection followed by balsam and fraser fir (montly light on 44% of the fir acreage). One ten-acre plantation in Waterbury had heavy infection in its Scots pine. Another plantation in Bennington had moderate shoot mortality in young fraser firs. In order to reduce infection, growers should cull or prune infected materials. On pine, look for shoots about one-third normal length that are dead and pitchy. On fir, look for shoots which may be of normal length but have a reddened spot or band somewhere along their length. These spots soften allowing the shoot to bend and eventually break.

Fir-fern Rust infection returned to normal levels after last year's widespread outbreak. Of the entire 541 acres of fir surveyed 70 percent had trace to light infection. One 10-acre plantation in Albany that had heavy damage last year had moderate damage this year. Plantations near wet areas in Springfield and Shaftsbury also had moderate damage.

Lophodermium Needlecast on Scots pine increased some in northern Vermont since last year, with 190 acres of light infection. This is 85 percent of the entire Scots pine acreage surveyed. Damage in southern Vermont was generally less than in 1995.

Phaeocryptopus Needlecast of balsam fir was confirmed present in a Weston plantation by pathologists at Penn. State University.

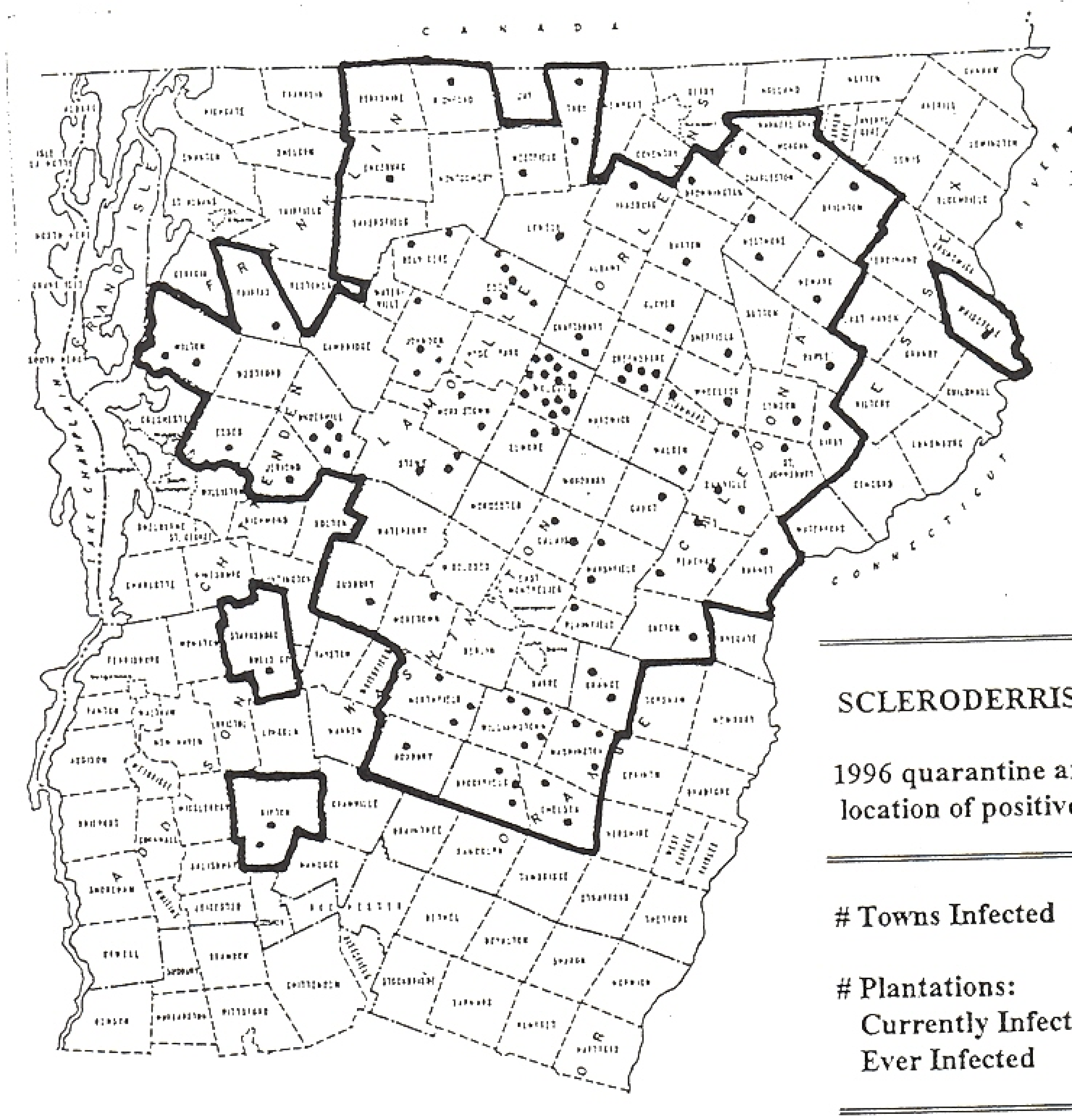
Ploioderma Needlecast was found infecting lower branches of Austrian pine in Cabot, mainly due to overcrowding and poor drying. Infected needles had numerous fruiting bodies on the distal portion while the basal part of the needle remained green. This is a new state record.

Rhabdocline Needlecast of Douglas-fir was observed on the entire 30 acres surveyed in northern Vermont. Most infection was light.

Rhizosphaera Needlecast of blue and white spruce remains common statewide. It was present in 61 percent (163 acres) of the total spruce acreage surveyed. All of this was light except for one plantation in Barre with older trees that have been infected for a long time. However, most infection was limited to lower branches.

Rhizosphaera Needle Disease of Fir, caused by *Rhizosphaera pini*, was discovered causing needle browning and droop in a 25 acre fir Christmas tree plantation in Danville. Identification was confirmed by the forest pathology laboratory at the University of Vermont. Damage was so heavy that 700 of the balsam fir trees planned for sale were no longer marketable by early autumn. Fraser firs interplanted among the balsams appeared to be much less susceptible. This is the first time that this fungus has been discovered to be causing a problem, although it has been isolated from several other locations where *Delphinella* was the major culprit.

Scleroderris Canker has not been found in any new towns since 1986. Twenty-six Christmas tree plantations within the quarantine zone were inspected this year and found free of the disease.



SCLERODERRIS CANKER

1996 quarantine area and location of positive infection

# Towns Infected	= 64
# Plantations:	
Currently Infected	= 126
Ever Infected	= 130

Sirococcus Shoot Blight increased over 1995 levels and was detected in 81 acres or 30 percent of the blue and white spruce acres surveyed. Sixty percent of the infection occurred on blue spruce and 40 percent occurred on white spruce. All infection was light and limited to only a few shoots per plantation except for one 2-acre site in Cabot. Here the main contributing factor was overcrowding.

Swiss Needlecast of Douglas-fir remained constant in northern plantations with 30 acres of infection, all of which was light. It was causing moderate damage in a Townshend plantation.

White Pine Blister Rust damage remains common throughout the survey area. Fifty-three percent of the white pine acreage surveyed had infection, generally restricted to scattered lateral branches. Timely pruning of infected limbs will curb losses. Eradication of *Ribes* is the next step.

White Pine Needlecast, formerly called White Pine Needle Blight, remains common. This year 138 acres or 54 percent of the white pine acres surveyed were reported with moderate levels of infection. The fungus responsible for this blighting of current year needles of susceptible individual trees has been identified as *Canavirgella banfieldii*. Infection occurs in late June to early July, with infected needles turning yellowish tan, then reddish brown, but with a green base.

Woodgate Gall Rust damage to Scots pine continued to decrease and was detected on 40 percent of the entire Scots pine acreage surveyed. Continued culling of Scots pine due to lack of marketability has contributed to the decrease.

Yellow Witches Broom Rust of balsam fir remains common in plantations where it has been reported in the past. This year, about 30 percent of the total balsam area surveyed was found to contain witches brooms. These are usually small and inconspicuous. However, if not removed when small, brooms will grow large and leave the tree unsightly. The fungus must infect chickweed before going back to fir. Because of this, eradication of chickweed is the most effective control. Look for brooms in the spring, for they break bud earlier and are off-color, thus easier to spot.

Frost Injury was reported for 85 percent of the balsam fir acres surveyed in northern Vermont (285 Acres), but damage was very light. Some damage was also reported for balsam in scattered low-lying areas in southern Vermont.

Heavy Snow broke branches of Christmas trees in scattered northern locations. All species received some injury but damage to pines was the most noticeable. This damage typically occurred as broken branches of the upper whorls.

Pesticide Injury was observed in widely scattered locations. In Pownal early spring yellowing of older fraser foliage was attributed to 1995 Princep/Aatrex applications. Soil around affected trees had three times as much triazine as soil around normal trees. In Ludlow, off-color balsam foliage in July was thought to be related to an earlier Princep application.

Wet Sites had higher mortality rates than normal for young or newly planted trees. A balsam fir plantation in Springfield had mortality associated with the drought of 1995 and a new planting of a fraser/balsam cross in Morrisville had scattered mortality that was heaviest in the wettest spots or for trees planted a little too deep.

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