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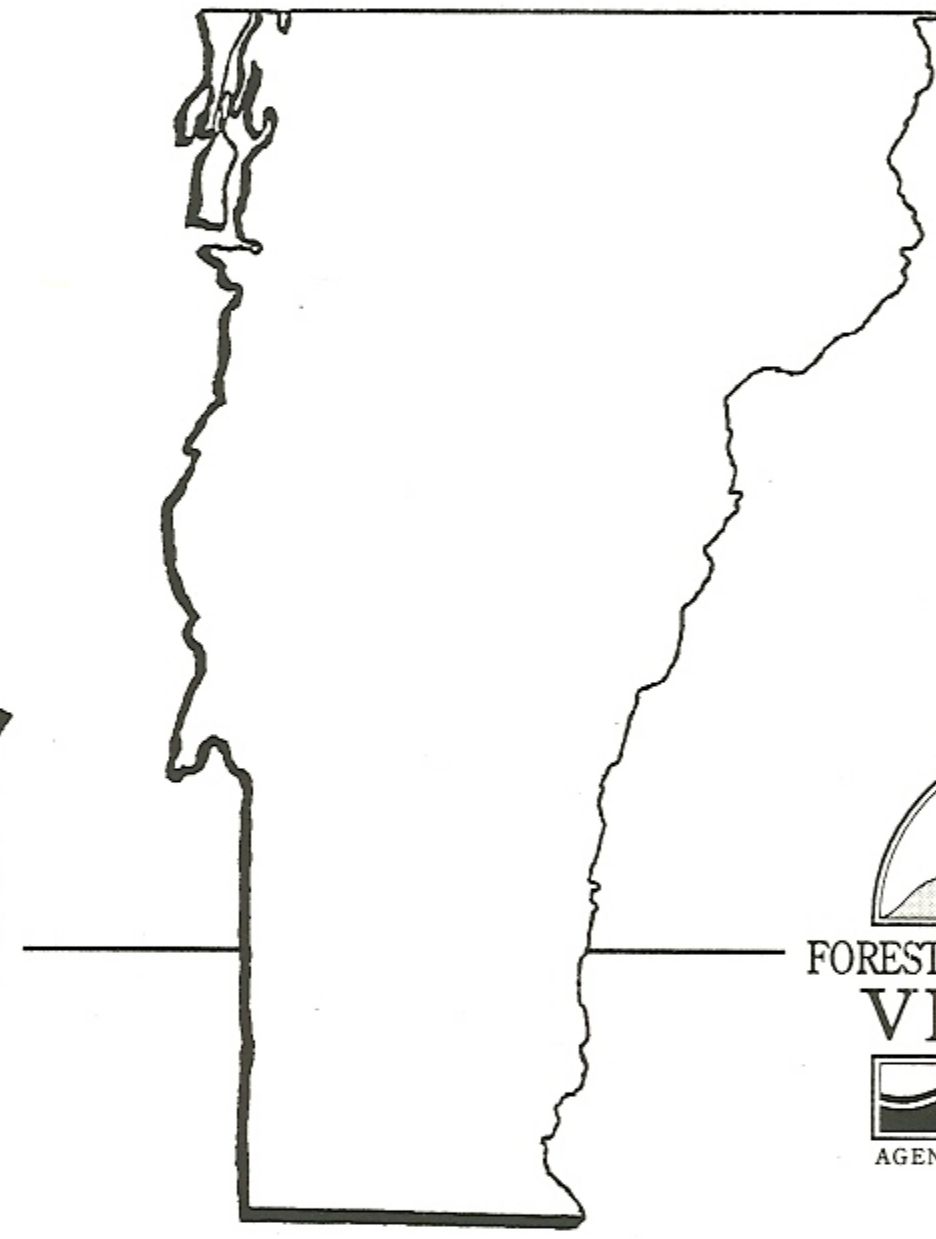
FOREST INSECT AND DISEASE CONDITIONS IN VERMONT 1995



VERMONT
FOREST RESOURCE PROTECTION

FORESTS, PARKS & RECREATION
VERMONT
AGENCY OF NATURAL RESOURCES

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FOREST INSECT AND DISEASE CONDITIONS IN VERMONT

CALENDAR YEAR 1995

PREPARED BY

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AGENCY OF NATURAL RESOURCES

DEPARTMENT OF FORESTS, PARKS AND RECREATION

Division of Forestry

Forest Resource Protection Section

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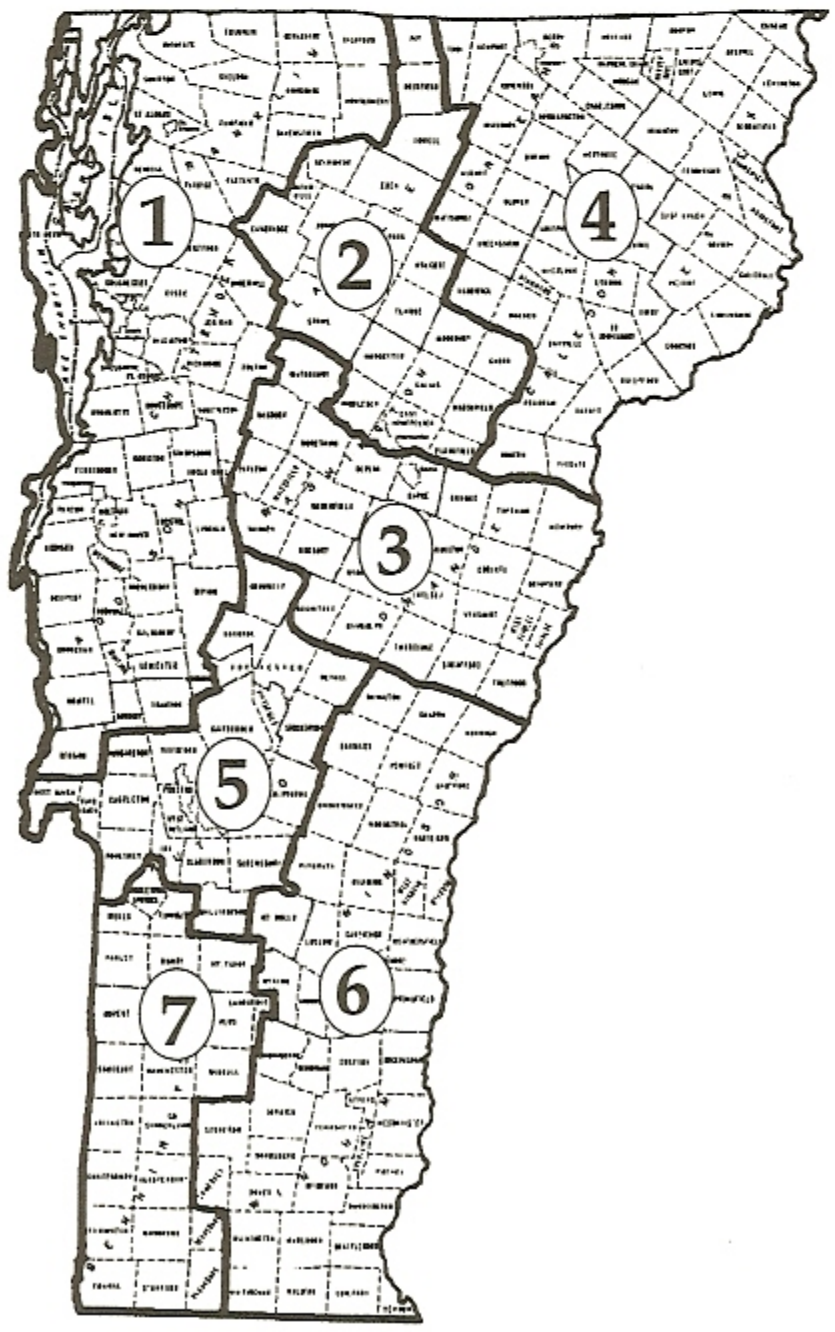

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5.	John Barrows	483-2314 (B)
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	N. Springfield	875-2279 (R)
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1995 Forest Insect & Disease Highlights

Ash Dieback from ash yellows remains common statewide. In a monitoring plot in Woodstock, dieback increased in trees which did not have dieback related to a heavy seed crop in 1993.

Balsam Gall Midge populations increased. Light damage was detected in scattered northern Vermont Christmas tree plantations.

Balsam Shootboring Sawfly has been steadily increasing, although populations peak in even years. Most damage was to balsam fir. Lorsban, Dimilin, and Merit were tested for control. Heavier damage is expected in 1996, especially to fraser fir.

Balsam Twig Aphid damage was more noticeable than in 1994. The dry weather may have led to better survival.

Beech Bark Disease symptoms were more noticeable, with 9,250 acres mapped, compared to 770 acres in 1994, and the disease increased in monitoring plots.

Birch Decline was mapped on 650 acres. Paper birch condition stayed the same in some monitoring plots and improved in others.

Birch Defoliation remained minimal in the north, but was widespread in southern Vermont. 70,850 acres were mapped. Most damage was from the early birch leaf edgeminer.

Bruce Spanworm increased in area of defoliation but decreased in intensity. Defoliation is expected to decrease in 1996.

Eastern Spruce Gall Aphid damage to white spruce increased. Dry weather may have led to increased mortality of galled shoots.

Exotic Bark Beetles were not detected in a survey of Christmas tree plantations.

Fall Hemlock Looper caused only very light defoliation in widely scattered northern Vermont locations, although moths have been common statewide since 1991.

Fall Webworm damage was particularly heavy in the lower Connecticut River valley.

Fir Fern Rust increased throughout the state on Christmas trees.

Forest Tent Caterpillar populations continued to be very low statewide.

Drought conditions led to scattered mortality on rocky, high elevation sites and of recently planted trees. 7,060 acres of drought damage were mapped, mostly oak-hickory stands on ledgey sites. Decline, mortality, and secondary pest problems are expected to increase from the drought stress.

Gypsy Moth caterpillars were more numerous in northern urban areas, but populations remain low, and no defoliation was observed.

Hardwood Decline and Mortality increased with 41,160 acres mapped, compared to 20,430 in 1994.

Heavy Seed did not produce symptoms, since seed production was generally light due to dry conditions.

Hemlock Decline, thin crowns, and occasional mortality were observed in widely scattered southern Vermont locations.

Hemlock Woolly Adelgid was not observed. No adelgids were found in two surveys of the site where they were introduced in 1990.

Maple Leaf Cutter defoliation decreased with only 330 acres mapped in Washington and Orange Counties.

Oystershell Scale populations increased, which may lead to beech dieback in infested areas.

Pear Thrips populations remained very low, with no damage aerially detected. Going into 1995, overwintering soil populations were low, as were spring bud counts. By late fall, soil populations had increased in 69% of the locations sampled, but remained below levels expected to cause damage.

Pine Needle Midge increased, with 50% defoliation of upper crowns in a Wolcott Scots pine plantation.

Pine Shoot Beetle surveys were conducted, with no damage found.

Saddled Prominent populations remained low, with larvae rarely observed.

Sapsucker damage increased statewide.

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

Spring Hemlock Looper populations remained low. In plots which had been heavily defoliated in 1990-91, 83% of the hemlocks are now in good or fair condition, compared to 53% in 1993.

Spruce Budworm continued at low levels, with no defoliation detected. The number of moths trapped decreased considerably from 1994.

Spruce Spider Mite injury was more common in northern Vermont, but only occasionally high in southern Vermont. Hot, dry conditions encouraged outbreaks, but intense rains may have helped keep populations in check.

Unthrifty Crowns associated with logging activities were aerially mapped on 1,440 acres compared to 860 acres in 1994.

Wet Site conditions caused dieback and mortality which was mapped on 10,170 acres, similar to the 9,670 acres mapped in 1994.

White Pine Blister Rust was observed throughout. During a Rutland County survey, Ribes plants and white pine blister rust were found in all stands examined

White Pine Weevil remained widespread, with damage increasing in Christmas tree plantations.

Wind Damage from heavy windstorms in July and August occurred in scattered areas of southern Vermont, while heavy October and November winds caused scattered blowdown in northern Vermont.

Winter Injury to red spruce caused only occasional light damage. No impact has been detected in plots established to monitor the widespread injury that occurred in 1993.

Vermont
1995 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 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 - **Drought** was the major tree stressor in 1995. Rainfall was particularly low early in the growing season. By the end of July, total precipitation for the year was about six inches below average. When under drought stress, trees produce smaller leaves and less photosynthate. Fine roots die, diameter and height growth are reduced, and less food is stored. This leads to fewer leaves the following year, again resulting in lower sugar production, reduced growth, and less food storage. Because this cycle can continue for several years, symptoms may not show up until two or three years after a drought, and it can take several years for trees to recover.

During this period of recovery, trees are particularly vulnerable to additional stresses. It is especially important to limit soil disturbance, sudden opening, and wounds to stems and roots at this time. Vulnerable species, particularly on susceptible sites, should be disturbed as little as possible. Hemlock is frequently mentioned as a species that has historically died during droughts. Drought has also initiated diebacks of maple, oak, ash, beech and birch. Susceptible sites include ledge, extremely coarse soils, and wet sites. Shelterwood cuts are particularly risky in drought-stressed stands.

Keep an eye out for insect and disease problems. Many defoliating caterpillars prefer drought-stressed leaves. Canker fungi and bark beetles are also more successful on trees which are drought-stressed. Although seed production may be reduced during a drought, in the recovery period, scarce carbohydrate reserves may be allocated to flower and seed production, and heavy seed years may occur. This reduces the carbohydrates available for normal tree growth and maintenance.

Wind Damage was also a scattered problem. Most vulnerable to damage were shallow sites, hilltops, upper, west-facing slopes, and the edges of recent clearings. In most cases, salvage of blowdown areas from the storms of '95 is well underway. Where damage has occurred, guidelines from the US Forest Service Bulletin, *"How to Evaluate and Manage Storm Damage Forest Areas"* may be helpful. This is available from the USDA Forest Service Southern Region, 1720 Peachtree Road NW, Atlanta, GA 30367-9102. Hardwoods with broken tops or broken branches over 3" in diameter and trees with major wounds or root damage should be salvaged, as they are poor bets for crop trees. Bent trees over 15' in height are unlikely to straighten up. In addition to rapid salvage, it's best to salvage in a continuous operation. This prevents buildup of beetles in the slash which may move into nearby storm-stressed trees.

It's appropriate to think about windproofing stands from further damage. A lot of windproofing gets done in the course of improving a timber stand. Trees with defects are removed, and regular thinning helps trees develop taper and the large root systems they need to resist damage. However, if trees have been crowded for a long time, avoid drastic opening, especially on shallow or exposed sites.

Beech - With increases in beech bark disease and oystershell scale, and its susceptibility to drought, beech may be less healthy than normal this year. On droughty sites, delay release of resistant trees, especially if the objective is to obtain resistant sprouts.

Birch - Monitoring plots indicate that birch health is good in spite of repeated defoliation by birch leaf miner. However, birch is unusually susceptible to high soil temperatures. On dry sites, where drought has caused fine root mortality, avoid exposing crop trees.

Hemlock - Scattered areas of thin hemlock crowns were observed in 1995. Its historical susceptibility to drought suggests that stands where hemlock looks thin should not be disturbed until they have a chance to recover from the dry conditions.

Spruce-Fir - Monitoring plots indicate that a single year of winter injury does not cause noticeable symptoms of decline. Although winter conditions in 1995-96 may be conducive to additional winter injury, management adjustments do not appear to be necessary.

Sugar Maple - Populations of defoliators remain low. We are still concerned about the potential for a buildup of forest tent caterpillar, so watch for these insects in June. The furry blue caterpillars with white spots will cluster during the day on trunks and branches.

Vermont Forest Health Insect & Disease Publications: 1995

For copies of the publications listed below, contact the authors or Forest Resource Protection personnel (page 1).

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Parker, B.L., M. Skinner, and R.H. Adamowicz. 1995. Induced emergence of pear thrips for populations monitoring in forest soil, pp. 579-582. *In* B.L. Parker, M. Skinner & T. Lewis [eds.], Thrips Biology and Management, Proc. *The 1993 Int. Conf. on Thysanoptera*. NATO ASI Ser. Vol. 276, Plenum Pub. Corp., New York.

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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, in cooperation with the US Forest Service, was in late June-July to detect any early to mid-season defoliators. The last survey was flown in late August to early September, and targeted defoliation by maple leaf cutter and birch defoliators.

A ground survey is conducted annually on about 1800 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.

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. Diagnostic assistance and other data was provided by Dale Bergdahl, Shari Halik, John Grehan, and Margaret Skinner from the University of Vermont; John 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 U.S.D.A. Forest Service, Northeastern Area State & Private Forestry that enables us to conduct the surveys and publish the results in this report.

WEATHER

Winter was mild with little extreme cold and generally thin snow cover. Temperatures soared into the 60s in mid-January, and then gradually returned to colder weather.

Spring started early. Temperatures remained cool through April, which led to a prolonged sugaring season. However, syrup production was generally low due to poor weather and very low sap sweetness.

Bud development stalled after the initial swell in mid-April. Although May temperatures were average, precipitation that was well below normal delayed leaf and flower production. Between lack of snow cover and low rainfall, spring runoff was very limited (typically 70% below normal), and farmers were plowing and planting early. Frost damage to developing foliage was rare. Although the spring phenology was generally late, full green-up was complete, as normal, in early June.

Weather was unusually hot and dry throughout the growing season. June was the driest in 101 years of records. It was the second warmest summer on record for Burlington. Annual rainfall was 5" below normal by the end of June, 9" by the end of July, and 13" by the end of August. By early July, Vermont was classified as having severe drought conditions.

In Northern Vermont, precipitation patterns changed in mid-summer. Much rain came in the form of severe thunderstorms, so the amount varied widely from one location to another. Many northern Vermont towns received 4 to 8 inches of rain in one storm in early August that caused widespread severe flooding. Flooding was particularly severe in the Lamoille River Valley from Wolcott to Morristown.

Southern Vermont did not get some of the August rains that occurred in the northern counties. Dry conditions led to scorch, leaf drop, and brown fields. Rivers were low and streams dried up. There were few important fungus disease problems, including very little leafblotch on horsechestnut.

Rainfall in late September and October was above average, helping to replenish the water table. October 1995 was the wettest recorded in Vermont. In southern Bennington County 10" of rain was recorded in one storm. The onset of fall foliage was normal, but the quality was brilliant, and retention good. Killing frosts did not occur in many areas until late October.

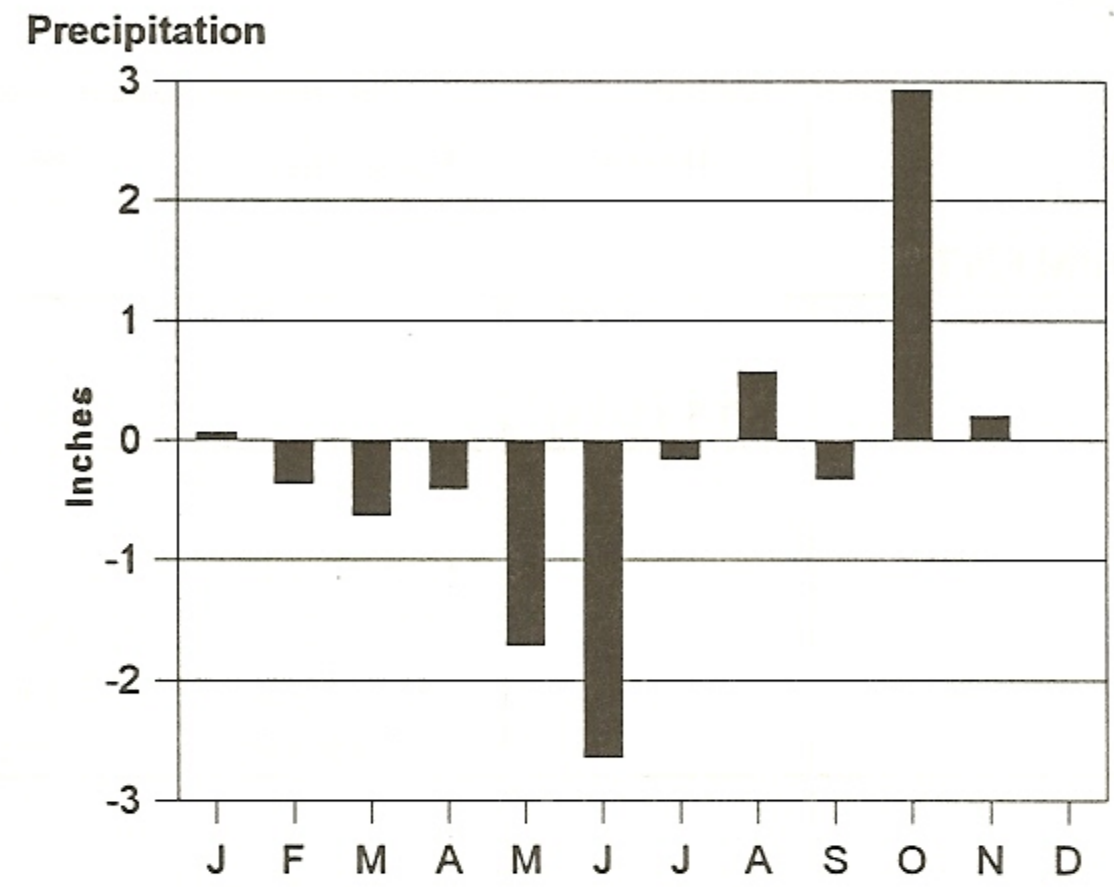
Heavy microburst windstorms on July 15 and 26, and August 12, led to areas of blowdown in scattered location in Southern Vermont. In the north, severe winds on the weekends of October 21 and November 11 blew down trees in many locations. The Elmore weather station recorded winds of 49 MPH on October 21.

Flowering on pine was heavy. In the fall, there was little mast produced by beech or oak. Sugar maple seeds were rare.

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

Table 1. 1995 Growing degree day accumulations and 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	30.5 (5/13)		21 (5/11)	47.5 (5/16)
Budbreak				
Balsam Fir		15.5 (5/14)	35 (5/13)	53.9 (5/19)
Hemlock		59 (5/22)	89 (5/23)	164.5 (6/1)
Sugar Maple		8.5 (5/3)	12 (5/4)	26.5 (5/9)
White Ash		15.5 (5/14)	35 (5/13)	53.9 (5/19)
Flowers				
Lilac		59 (5/22)	202.5 (6/1)	164.5 (6/1)
Red Maple		0 (4/18)		2.2 (4/25)
Shadbush		12 (5/5)	41.5 (5/14)	47.5 (5/16)
Sugar Maple		7.5 (5/1)	21 (5/9)	32.9 (5/12)
INSECT DEVELOPMENT				
Eastern Tent Caterpillar Nest	15.5 (5/9)	5.5 (4/27)	18.5 (5/7)	21.2 (5/5)
Maple Leafcutter Adult			243 (6/3)	



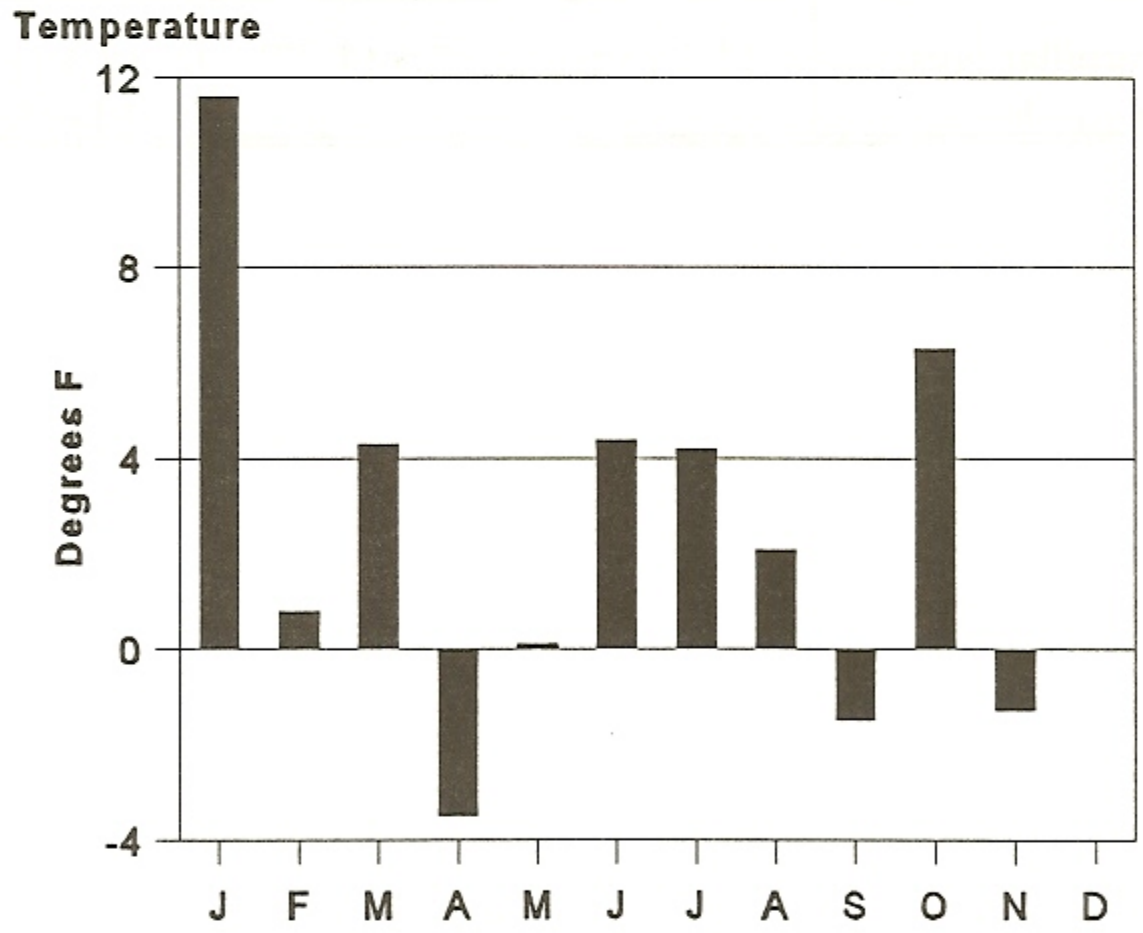
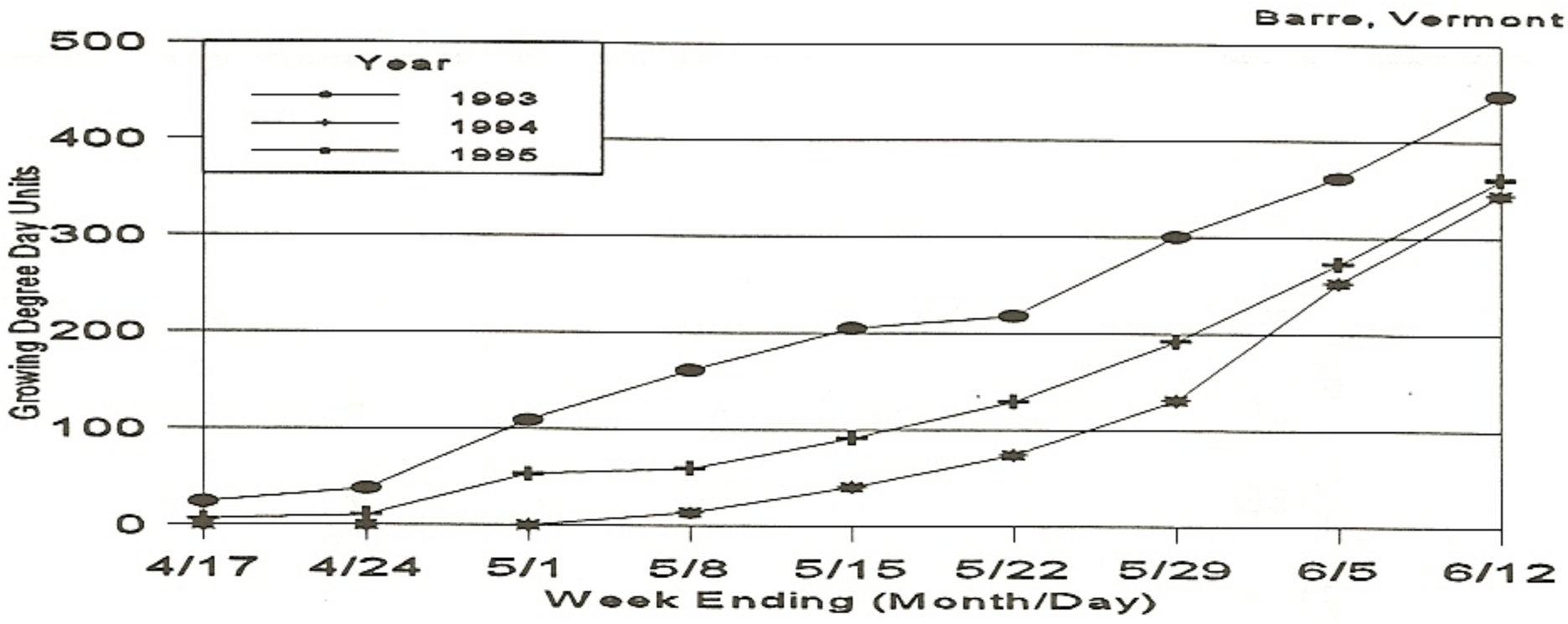
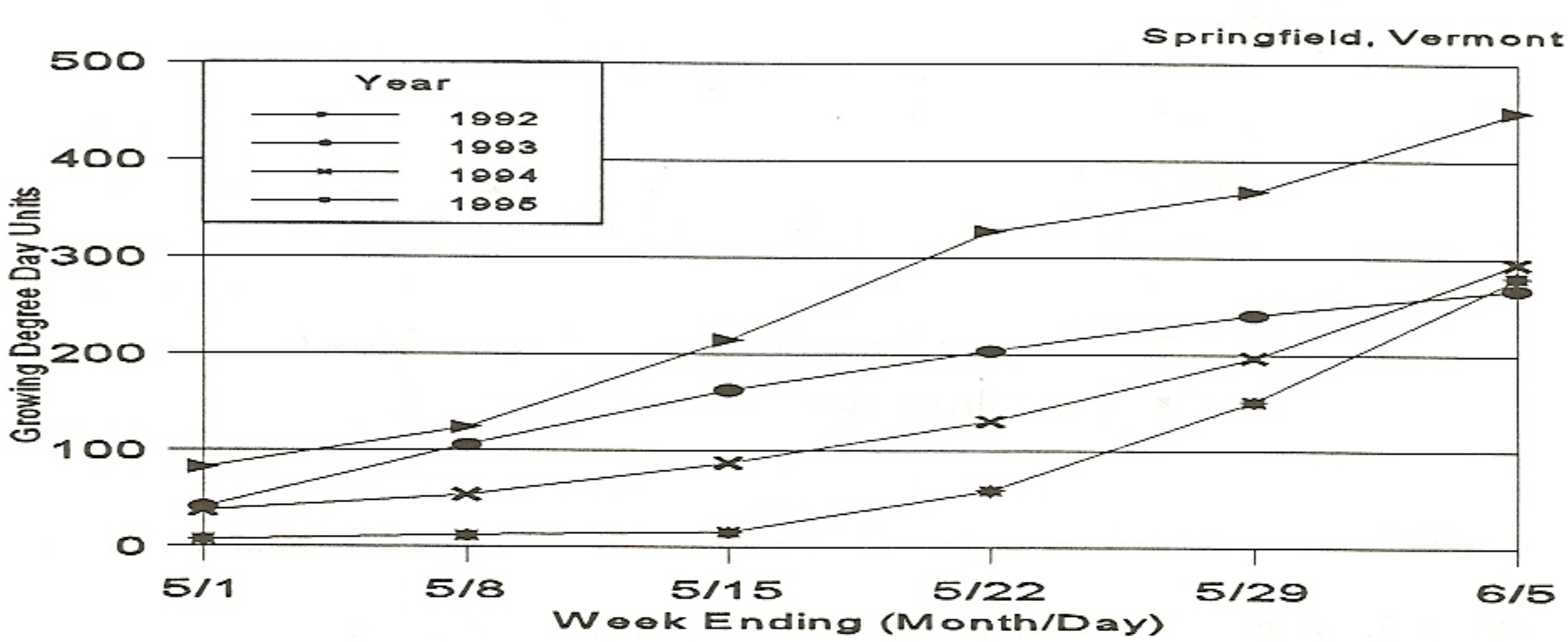


Figure 1. Departure from normal of 1995 precipitation and temperature at Burlington International Airport. Data from NOAA Local Climatological Data: Monthly Summary.





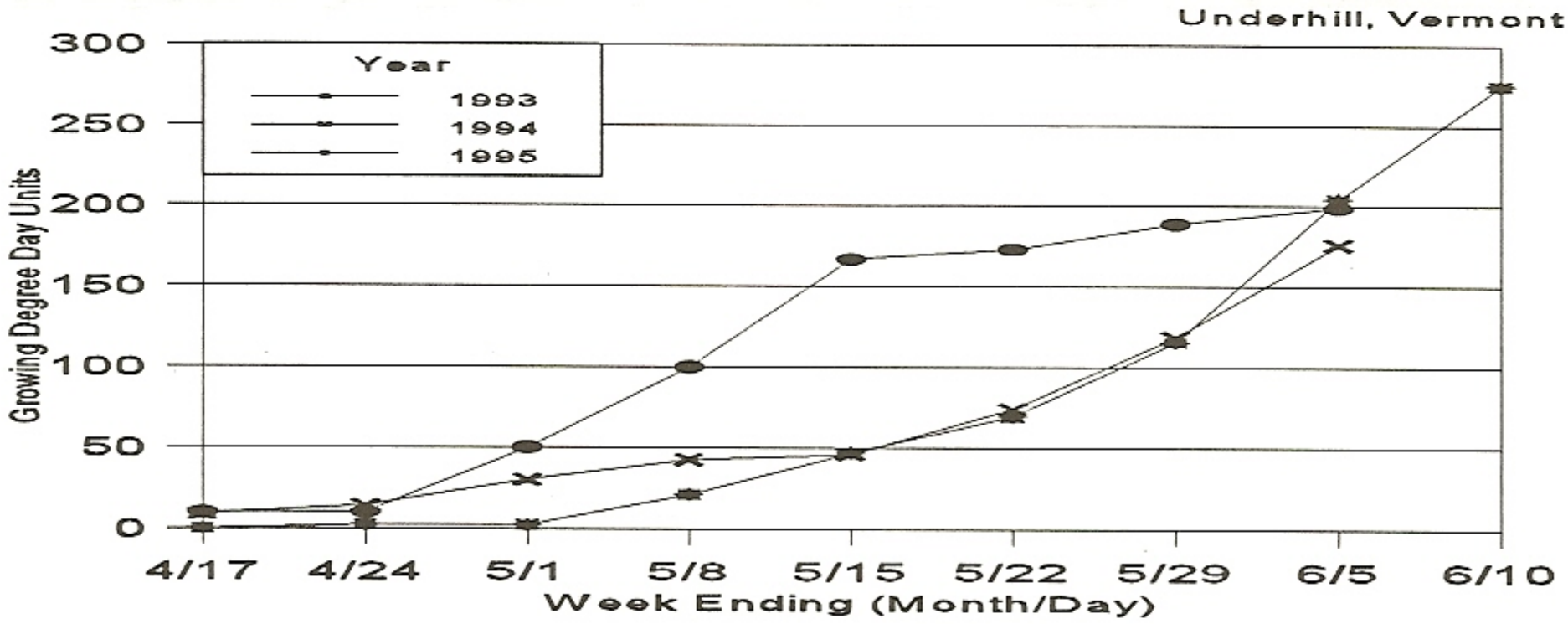


Figure 2. Weekly cumulative growing degree days at 4 locations by year through 1995. 50° F used as the threshold of development.

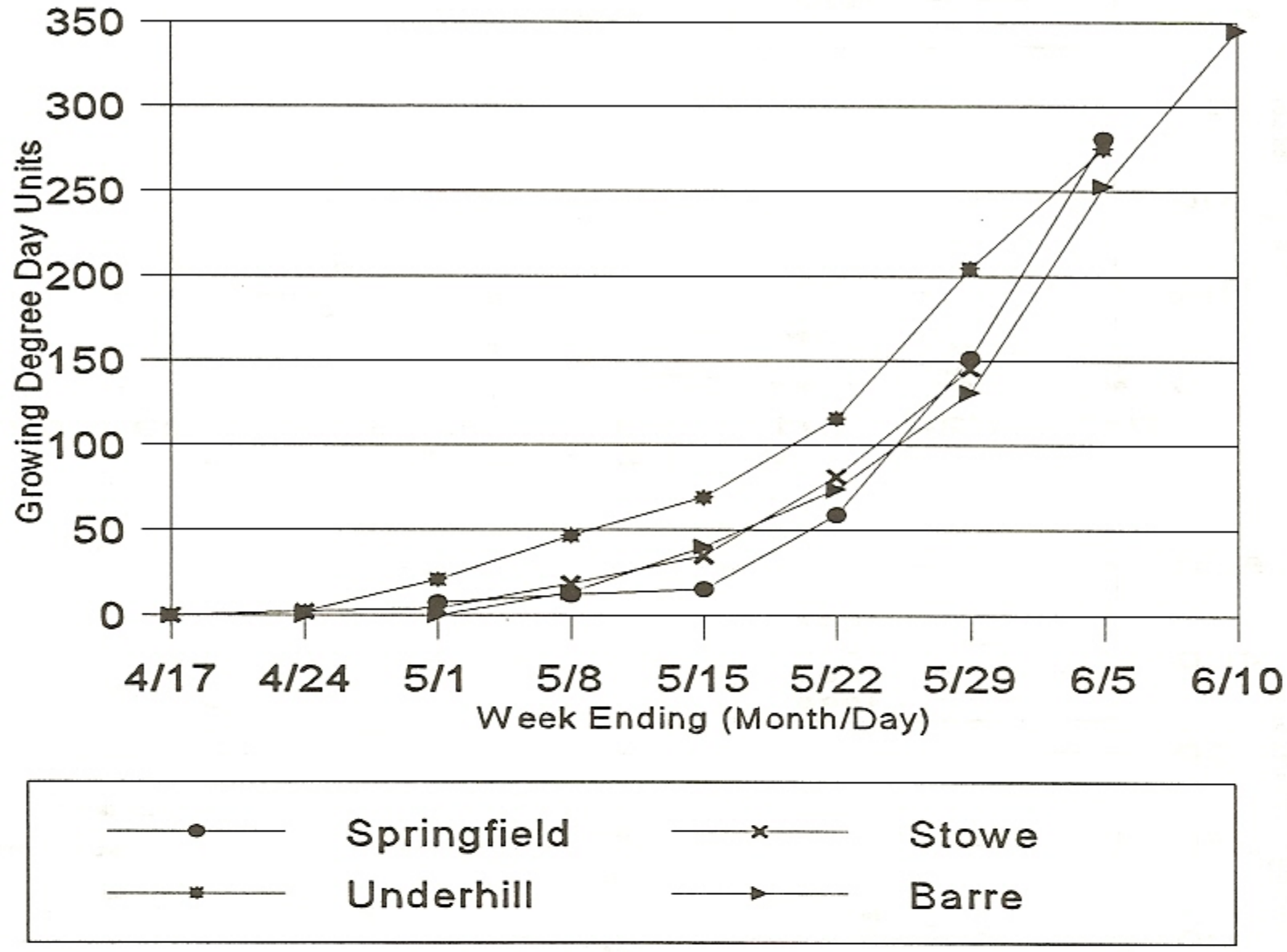


Figure 3. Weekly cumulative growing degree days at 4 locations in 1995. 50^0 F used as the threshold of development.

OZONE SUMMARY

The maximum ozone levels at both Vermont stations were lower in 1995 than in 1994. However, the northern Vermont monitoring station (Underhill) measured cumulative values of 0.060 ppm or greater with higher frequency than in 1994, while the southern Vermont station (Bennington) measured lower cumulative values (Table 2).

The ozone indices SUM06, SUM08, and W126 are used to relate ozone exposure over the season with injury to plants, especially species that are particularly sensitive to ozone. Black cherry, white ash, milkweed, blackberry, dogbane and big leaf aster are examples of ozone sensitive plants used as ozone bioindicator species. Plant injury can be caused by an accumulation of ozone in leaves. So these indices reflect a cumulative exposure to damaging levels of ozone.

Despite higher SUM06 values for northern Vermont this year, less injury to bioindicators was observed. This is attributed to the drought in early summer, which prevented plants from taking in ozone.

Table 2. 1995 Ozone levels at two Vermont monitoring stations.

Monitor Site	Total Number Hours With		Maximum Level		SUM 06 (ppm-hr)	SUM 08 (ppm-hr)	W126 (ppb-hr)
	≥ .060 ppm	≥ .080 ppm	ppm	Date			
Underhill	320	12	0.87	7/23	21.56	1.00	20.88
Bennington	282	33	0.99	6/6	19.49	2.82	18.54

*** Ozone data provided by the Vermont Air Pollution Control Division. ***

Ozone injury symptoms were observed on sensitive species (such as black cherry, white ash, milkweed, blackberry, dogbane and big leaf aster) in August at 4 of the 19 locations surveyed throughout the state (Figure 4). However, no ozone damage was detected on forest trees from aerial surveys. Fewer locations had ozone injury to plants this year than in 1994, probably due to drought conditions which reduced ozone uptake by plants this year.

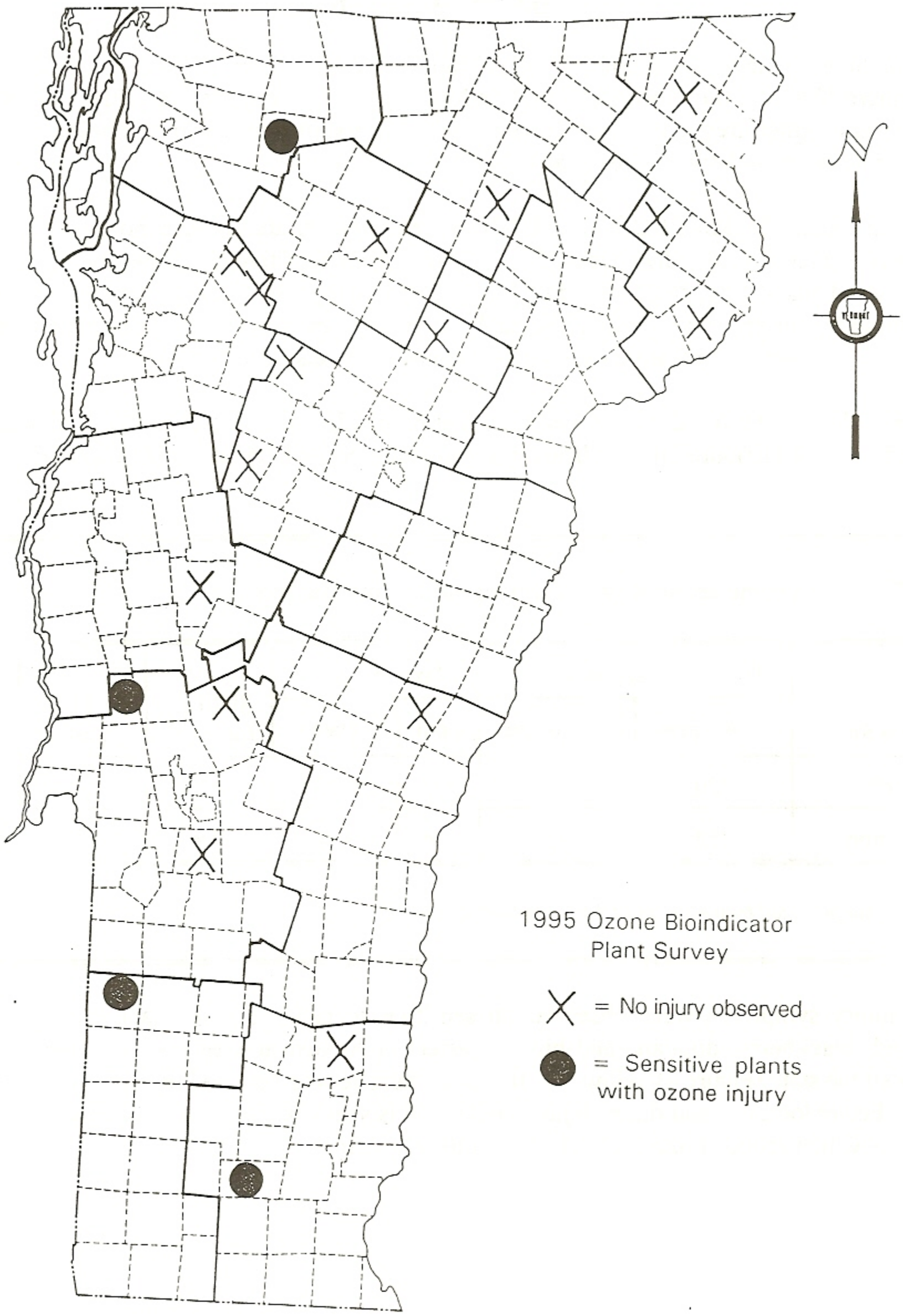


Figure 4. Approximate location of ozone bioindicator plant survey plots where presence or absence of ozone injury symptoms were recorded in 1995. Plots not to scale.

FOREST INSECTS

Hardwood Defoliators

Birch Defoliation, caused by **Birch Skeletonizer,** *Bucculatrix canadensisella*, **Birch Leaf Folders,** *Ancylis discigerana*, and **Birch Leaf Miners,** *Fenusa pusilla* and *Messa nana,* remained minimal in the north this year with mostly small acres of scattered defoliation detected during aerial survey. However in southern Vermont, it was more widespread. 70,850 acres were mapped compared to 6,650 in 1995 (Table 3, Figure 5).

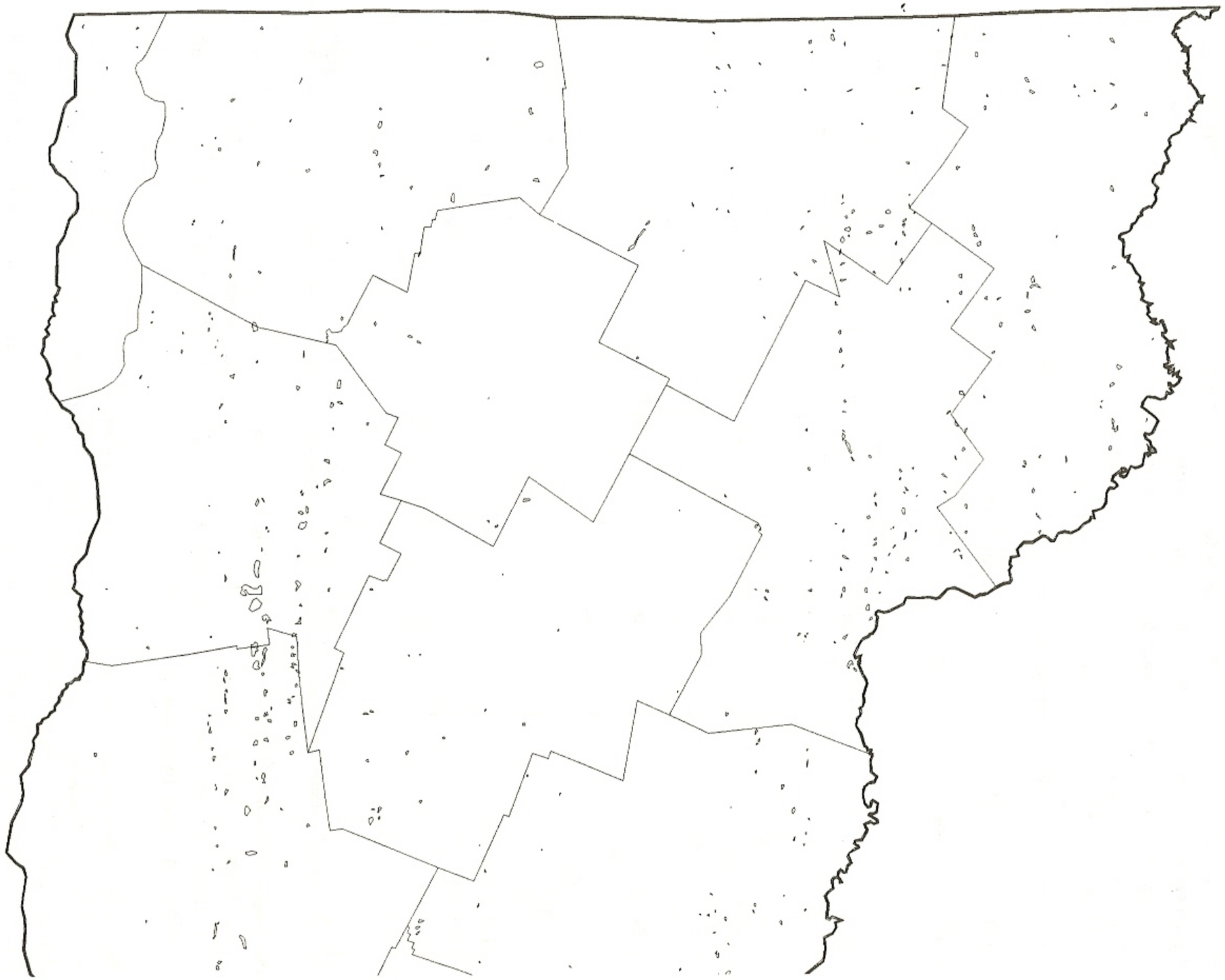
Table 3. Mapped acres of birch leaf miner and birch skeletonizer defoliation in 1995.

County	Defoliation Severity			
	Light	Moderate	Heavy	Total
Addison	33	2692	245	2970
Bennington	0	121	153	274
Caledonia	0	1853	272	2125
Chittenden	0	3037	198	3235
Essex	0	1619	136	1755
Franklin	0	1045	122	1167
Grand Isle	0	42	28	70
Lamoille	0	148	38	186
Orange	0	737	325	1062
Orleans	0	996	385	1381
Rutland	0	100	302	402
Washington	0	447	103	550
Windham	0	17404	1033	18437
Windsor	0	34257	2979	37236
Total	**33**	**64498**	**6319**	**70850**

Although widespread, the severity of late summer damage was generally less. Most damage was at lower elevations rather than the mountains. Symptoms appeared in some stands by late June due to dry conditions. Damage by birch skeletonizer was heaviest on yellow birch while the leaf miners were heaviest on paper birch and gray birch.

Bruce Spanworm, *Operophtera bruceata*, increased in areas of noticeable defoliation but decreased in intensity of defoliation. Only a few small areas of moderate to heavy defoliation were reported in Orleans and Caledonia counties, plus one heavy spot in Franklin County (Sheldon). None of these could be detected from the air. Most damage occurred to lower crown foliage and overtopped trees. Adult moths appeared to be less numerous this fall than during the past couple of years so perhaps damage may decrease in 1996.

BIRCH LEAF MINER



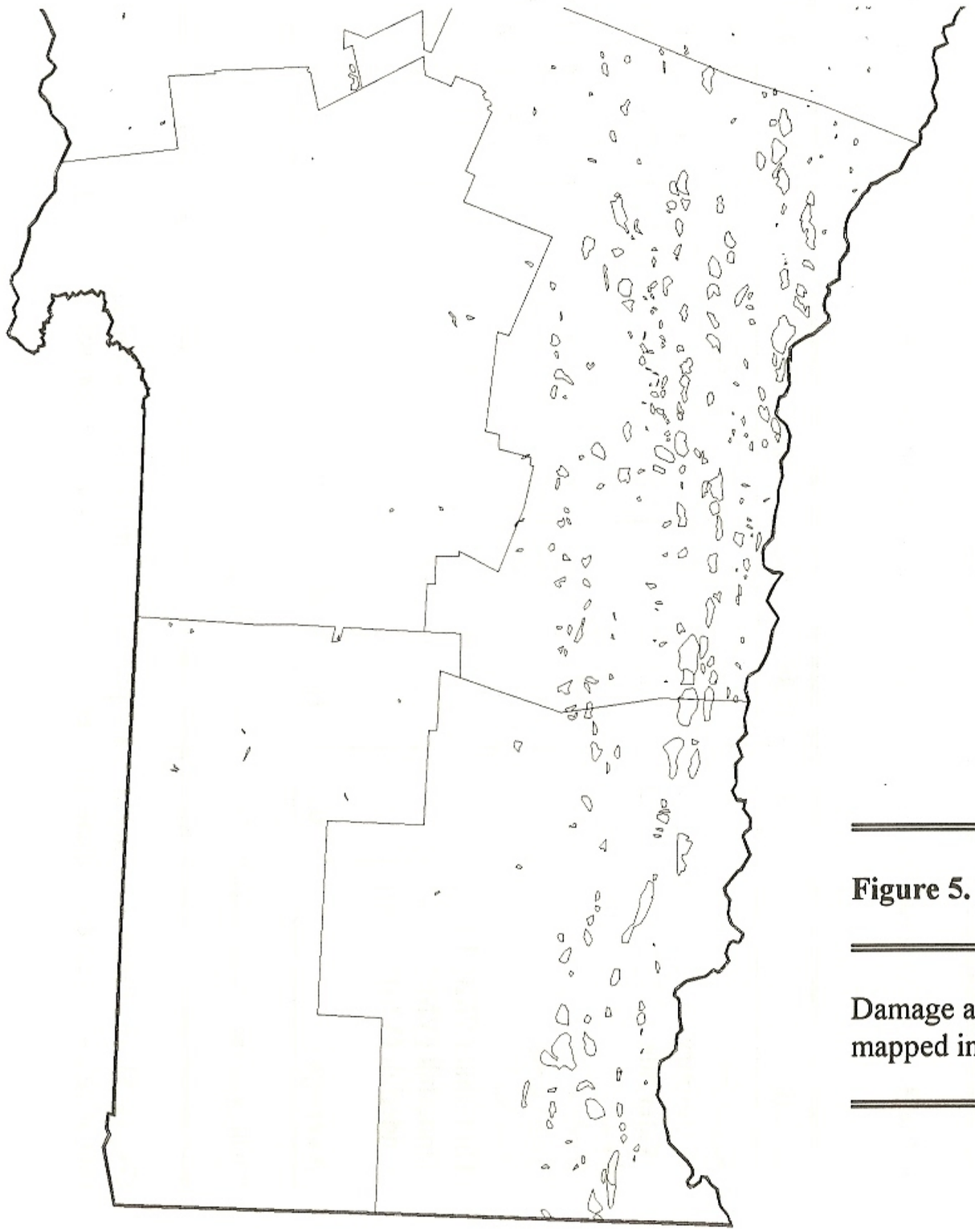


Figure 5. 1995 birch defoliation.

Damage area approximate location. Total damage mapped in 1995 = 70,850 acres.

Fall Webworm, *Hyphantria cunea*, damage was particularly heavy in the lower Connecticut River Valley, resulting in many inquiries. Populations were high enough on scattered trees to cause early defoliation and refoliation. Elsewhere, nests remained common, but damage was mostly light and scattered.

Forest Tent Caterpillar, *Malacosoma disstria*, populations continued to be very low this year statewide. More caterpillars were seen in urban areas than usual but only occasional larvae were reported in forest stands, and no forest defoliation was observed. No moths were caught in our pheromone traps this year. Only one moth (Rochester) was caught by the US Forest Service in the nine sites with traps on the Green Mountain National Forest. This continues the trend of low numbers in recent years

A comparison of Luminoc light traps with and without pheromone to pheromone trap alone showed that the pheromone has some attractiveness to the insect. A blue light plus pheromone for four hours per night caught 27 moths in Hyde Park while nearby traps with blue light alone or pheromone alone caught no moths.

Table 4. Average number of forest tent caterpillar moths caught in pheromone traps, 1988-1995.[1]

Location	1988	1989	1990	1991	1992	1993	1994	1995
Roxbury	0.0	0.6	0.2	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
Waterville	0.2	2.2	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
Bethel	-	0.4	0.2	0.4	0.0	0.0	0.2	0.0
Sherburne	-	2.6	0.0	0.0	0.0	0.0	0.0	0.0
Barnard	0.6	-	2.6	2.2	-	0.0	0.0	0.0
Underhill (VMC 1400)	-	-	-	0.0	0.0	0.0	0.0	0.0
Underhill (VMC 2200)	-	-	-	-	0.0	0.0	0.0	0.0
Underhill (VMC 3800)	-	-	-	-	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**

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

Gypsy Moth, *Lymantria dispar*, caterpillars were more numerous in northern urban areas than in recent years, but forest populations remain low and no defoliation was observed.

Numbers of male moths observed this summer appeared to be above normal. Egg mass counts in focal area monitoring plots (Table 5) remained very low, but populations may be building. Egg masses, along with larval and pupal skins, were found in more plots at generally higher numbers.

In one Rockingham location, egg masses covered the inside of several bird houses which had been on the site for several years. The nearby trees, mostly poplars, were not defoliated.

Table 5. Gypsy moth egg mass counts from focal area monitoring plots 1987-1995[1]

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

[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*, defoliation decreased, with only 330 acres of moderate to heavy defoliation mapped during aerial survey. Most of these were in Washington and Orange counties. Several areas in Lamoille County that had moderate understory damage in 1994 had no noticeable damage this year. Elsewhere, occasional light damage was observed on regeneration.

Saddled Prominent, *Heterocampa guttivata*, populations remained low, with larvae rarely observed. Trace feeding was observed in Orleans County. Some moths were caught in a light trap in Vershire but there was no visible defoliation.

OTHER HARDWOOD DEFOLIATORS

INSECT	HOSTS(S)	LOCALITY	REMARKS
Alder Leaf Beetle *Altica ambiens alni*	Speckled Alder	Throughout	Moderate-heavy defoliation of most alder in Northeast Kingdom.
American Dagger Moth *Acronicta americana*		VMC Survey Mt. Mansfield, Underhill	Common.
Beech Leaf Blotch Miner *Phyllonorycter sp.*	Beech	Shrewsbury	Regeneration.
Birch Leaf Folder *Ancylis discigerana*	Yellow Birch	Widely scattered	Mostly light. Some moderate defoliation of lower canopies in Holland and Norton.
Birch Leaf Miner *Fenusa pusilla*			See narrative.
Birch Skeletonizer *Bucculatrix canadensisella*			See narrative.
Bruce Spanworm *Operophtera bruceata*			See narrative.
Cherry Defoliation	Black Cherry	Brattleboro, Pittsfield, Pownal, Chester	Scattered leafdrop early in the season appeared to be caused by an unidentified petiole borer.
Cherry Scallop Shell Moth *Hydria prunivorata*	Black Cherry	Marlboro, Wilmington	Dieback and scattered mortality in forest stands caused by heavy defoliation in 1990-91.
Darkheaded Aspen Leafroller *Anacampsis inncuella*	Bigtooth Aspen	Rochester	
Early Birch Leaf Edgeminer *Messa nana*			See narrative.
Eastern Tent Caterpillar *Malacosoma americanum*	Cherry, Apple	Throughout	Generally lower populations than 1994. High numbers in Poultney.

OTHER HARDWOOD DEFOLIATORS

INSECT	HOSTS(S)	LOCALITY	REMARKS
Elm Leaf Beetle *Pyrrhalta luteola*	American Elm	Throughout	Scattered moderate defoliation in the Northeast Kingdom. Elsewhere, generally light damage.
Elm Leaf Miner *Fenusa ulmi*			Not observed.
Euonymous Caterpillar *Yponomeuta cagnagella*	Euonymous	Brattleboro	Heavy feeding.
European Snout Beetle *Phyllobious oblongus*	Sugar Maple	Hyde Park	Light defoliation.
Fall Cankerworm *Alsophila pometaria*	Hardwoods	Rutland County	Highest numbers in Pittsford-Brandon area.
Fall Webworm *Hyphantrea cunea*			See narrative.
Forest Tent Caterpillar *Malacosoma disstria*			See narrative.
Green Striped Mapleworm *Anisota rubicunda*	Sugar Maple	Widely scattered	Light defoliation on an ornamental in Morrisville. Occasional larvae seen in eastern counties.
Gypsy Moth *Lymantria dispar*			See narrative.
Half Winged Geometer *Phigalia titea*		Chittenden County	Common.
Imported Willow Leaf Beetle *Plagiodera versicolara*	Willows	Scattered throughout	Observed on ornamental, pasture and riparian willows. Mapped on 40 acres in Addison and Franklin Counties.
Japanese Beetle *Popillia japonica*	Many	Widespread	Heavier than usual in some locations, lighter in others.

OTHER HARDWOOD DEFOLIATORS

INSECT	HOSTS(S)	LOCALITY	REMARKS
Large Aspen Tortrix *Choristoneura conflictana*		VMC Survey Mt. Mansfield, Underhill	Uncommon.
Linden Looper *Erranis tilaria*		Grand Isle	Occasional.
Locust Leaf Miner *Odontata dorsalis*	Black Locust	Widely scattered	Heavy defoliation in isolated locations, including 90 acres mapped from the air in Chittenden and Windham Counties. Decreasing elsewhere.
Locust Looper *Semiothisa ocellinata*	Black Locust	Pomfret	Found in a stand defoliated primarily by the honeylocust plant bug.
Maple Basswood Leaf Roller *Sparganothis pettitana*		Throughout state	Occasional.
Maple Leaf Cutter *Paraclemensia acerifoliella*			See narrative.
Maple Leafblotch Miner *Cameraria aceriella*	Sugar Maple	Scattered	Light.
Maple Trumpet Skeletonizer *Epinotia aceriella*	Sugar Maple	Brandon Tinmouth Lamoille County	Several observed. Populations down from 1994.
Maple Webworm *Tetralopha asperatella*	Sugar Maple	Ryegate	Light.
Mountain Ash Sawfly *Pristiophora geniculata*	Mountain Ash	Bennington Waterbury	Ornamental.
Oak Leaf Tier *Croesia semipurpurana*		Bryant Mtn. Lake Dunmore	Common. Pheromone traps were discontinued in 1995.
Oak Skeletonizer *Bucculatrix ainsliella*	Oaks	Benson West Haven	Light damage.
Orange-humped Mapleworm *Symmerista leucitys*		VMC Survey Mt. Mansfield, Proctor	Occasional.

OTHER HARDWOOD DEFOLIATORS

INSECT	HOSTS(S)	LOCALITY	REMARKS
Pear Sawfly (Oak Slug) *Caliroa cerasi*	Red Oak	Morrisville	Moderate defoliation of large ornamental. Defoliation typical of this insect seen elsewhere.
Poplar Defoliation	Quaking Aspen	Rockingham, Springfield	Heavy damage by early June from sawfly feeding. Leaf beetles suspected to be the cause of late July defoliation.
Red-humped Oakworm *Symmerista canicosta*			Not observed.
Rose Chafer *Macrodactylus subspinosus*	Many	Widespread	Numerous, similar to 1994 levels.
Saddled Prominent *Heterocampa guttivata*			See narrative.
Satin Moth *Leucoma salicis*	Cottonwood	Royalton	Dieback from previous defoliation still visible on 60 acres of riparian woodland.
Say Blister Beetle *Lytta sayi*	Honeylocust	Stowe	Heavy on flowers.
Spiny Elm Caterpillar *Nymphalis antiopa*	Willow	Barnard	Ornamentals.
Spring Cankerworm *Paleacrita vernata*	Hardwoods	Brandon	Individual larvae.
Uglynest Caterpillar *Archips cerasivoramus*	Apple Cherry Milkweed	Scattered	Mostly light.
Variable Oak Leaf Caterpillar *Lochaeus manteo*	Red Oak	Morrisville	Light defoliation of an ornamental.
Willow Flea Beetle *Rhynchaenus rufipes*	Willow	Lamoille County	Light damage common.
White Marked Tussock Moth *Orgyia leucostigma*			Not observed.

SOFTWOOD DEFOLIATORS

Fall Hemlock Looper, *Lambdina fiscellaria*, caused only very light defoliation in widely scattered northern Vermont locations, although moths have been common statewide since 1991. Average moth catch was similar to 1994 levels but remained well below 1992 levels (Table 6). Moths were also caught by the US Forest Service in all but one (Landgrove) of the 15 trap sites on the Green Mountain National Forest, however, all of these sites averaged less than 10 moths per trap.

Table 6. Fall hemlock looper population counts in 1992-95.

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
Addison	Ferrisburg	5	0	17	38	86	-	310
Bennington	Dorset	0	0	-	15	126	71	32
Caledonia	Sutton	-	-	1	-	-	-	-
Caledonia	Barnet	2	3	7	-	118	11*	151
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
Chittenden	Underhill-VMC 2000	-	-	-	521	-	133	28
Chittenden	Underhill-s	-	-	-	41	27	25	8
Franklin	Swanton	4	0	2	-	55	92	30
Grand Isle	Alburg	0	0	0	-	-	-	47
Lamoille	Stowe-VMC3800	-	-	-	41	-	0	0
Lamoille	Morristown-W	3	1	3	342	129	280	254
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
Orleans	Derby	4	4	4	320	154	185	135
Rutland	Castleton	0	0	-	7	33	50	24
Rutland	Pittsford	0	0	-	10	67	103	21
Washington	Duxbury	-	-	-	666	250	173	212
Windham	Brattleboro	0	0	-	22	84	16*	30
Windsor	Sharon	0	0	-	94	71	268	291
Windsor	Stockbridge	0	0	-	201	175	41	37
Average		**1.1**	**0.6**	**1.6**	**264**	**118**	**144**	**115**

[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*, moth catches were low in pheromone traps, and no larvae were observed (Table 7). In hemlock looper impact plots, tree condition declined slightly in stands which had been only lightly or moderately defoliated in 1990-91. In plots which had been heavily defoliated, 83% of the hemlocks are now in good or fair condition, compared to 53% in 1993 (Figure 6).

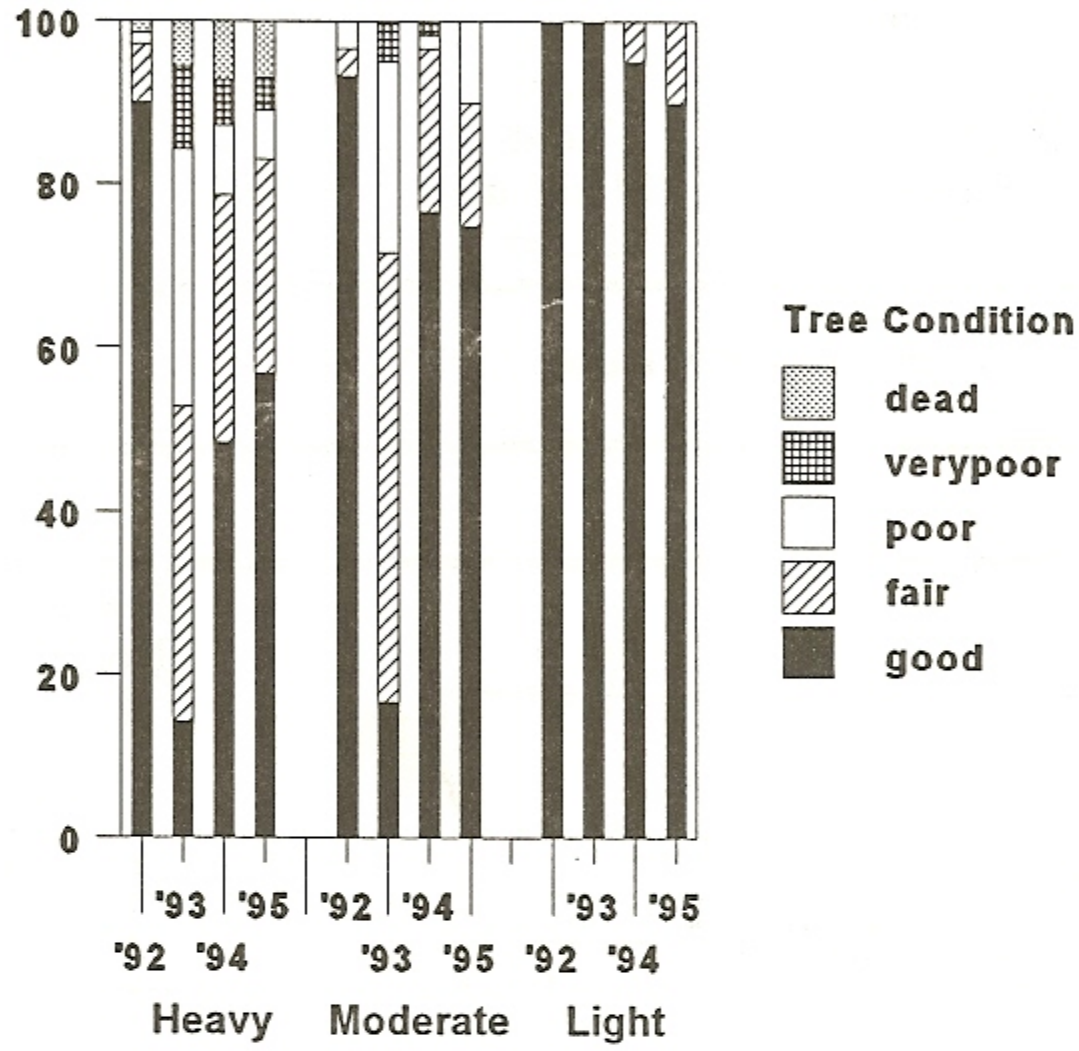


Figure 6. Percent of trees in spring hemlock looper impact plots in each of five condition classes when evaluated in spring of 1992-1995, by defoliation severity in 1991. Data are from ten trees in each of seven stands which had heavy defoliation, six which had moderate defoliation, and two which had no defoliation.

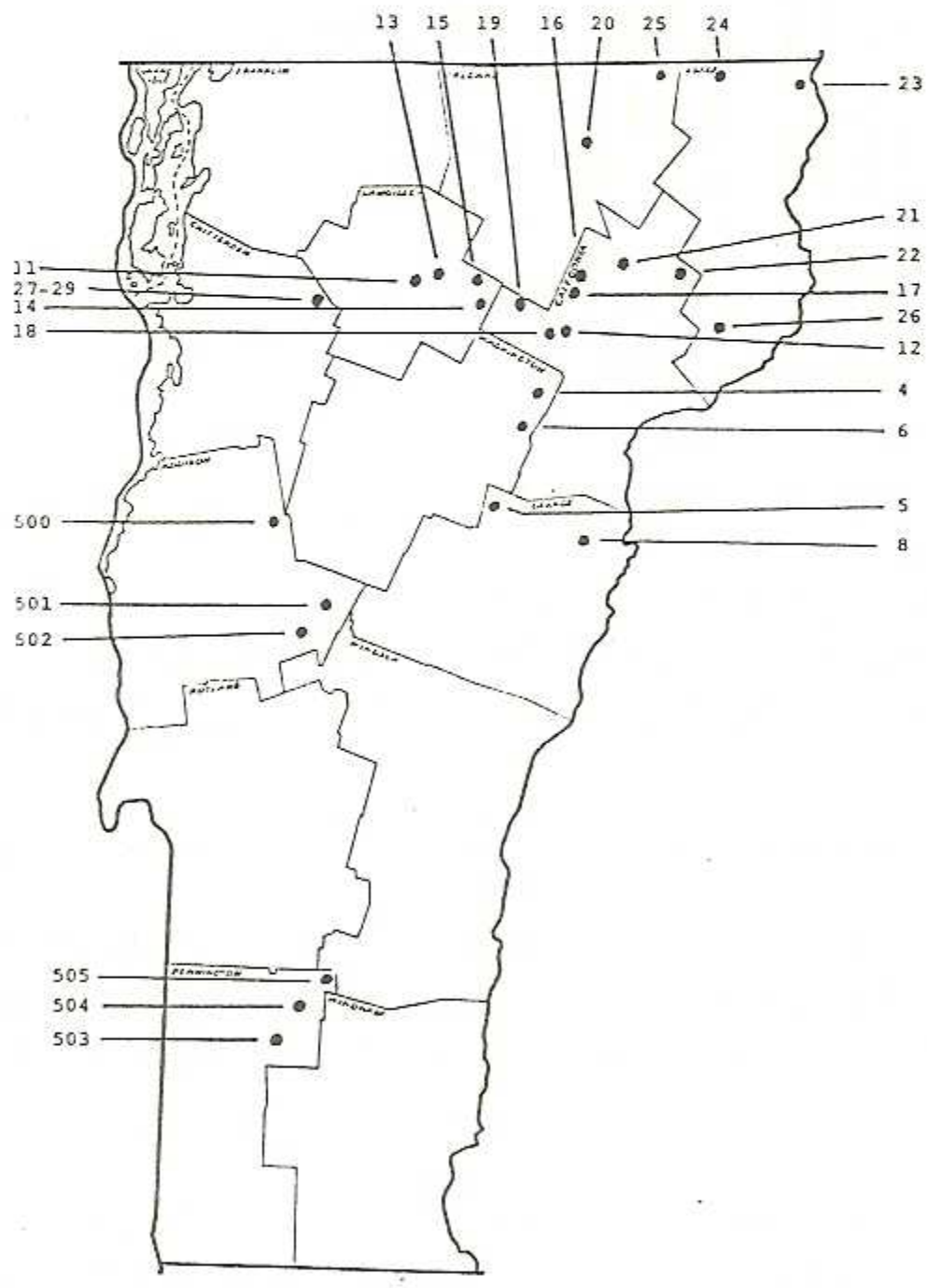
Dieback and mortality in southern Windham County areas defoliated in 1990-91 continues to be visible from the air. 330 acres were mapped in 1995, compared to 210 acres in 1994 and 690 acres in 1993. Fluctuations may be due to variability in mapping rather than important changes in damage area.

Spruce Budworm, *Choristoneura fumiferana*, continued at low levels, with no visible defoliation detected. The number of moths captured in pheromone traps in northern Vermont, which showed a sudden increase in 1991, continued at similar levels in 1992, and decreased slightly in 1994, decreased considerably this year (Figures 7-8). In the Green Mountain National Forest, moths were caught by the US Forest Service in all six trap sites. At these locations, populations had increased

Table 7. Number of spring hemlock looper moths caught in traps baited with fall hemlock looper pheromone (1992-1995)[1].

County	Town	1991 Defoliation	Moths/Trap			
			1992	1993	1994	1995
Chittenden	Underhill-1	None	-	0	0	0
Chittenden	Underhill-2	None	-	0	0	0
Lamoille	Stowe	None	-	0	0	0
Windham	Brattleboro	None	2	31	NA	6
Windham	Dummerston	Moderate	96	2	NA	13
Windham	Vernon	Heavy	116	11	NA	7

[1]Average of three multipher traps in 1992 and one in 1993-1995.



Location No.	Name	# of moths/trap
4.	Danville Hill	7.0
5.	Reservoir	3.7
6.	Marshfield Pd.	2.0
8.	Scotch Hollow	2.3
11.	Centerville	0.3
12.	Coles Pd.	0.7
13.	Diggins	2.0
14.	Wolcott F&G	0.7
15.	Bear Swamp	1.3
16.	Withers	1.0
17.	Mason	1.7
18.	Star School	3.0
19.	Beagle Club	1.0
20.	Brownington Pd.	5.0
21.	Calendar Brk.	5.0
22.	Chieppo	0.0
23.	Bunnel Brk.	0.0
24.	Norton Cem.	1.0
25.	Holland Pd.	0.0
26.	Victory Bog	0.3
27.	Underhill (VMC 1400)	11.7
28.	Underhill (VMC 2220)	5.0
29.	Underhill (VMC 3800)	25.7
	Average (excluding 28, 29)	**2.4**

Figure 7. Spruce budworm pheromone plot locations and average number of moths caught per trap in 1995.

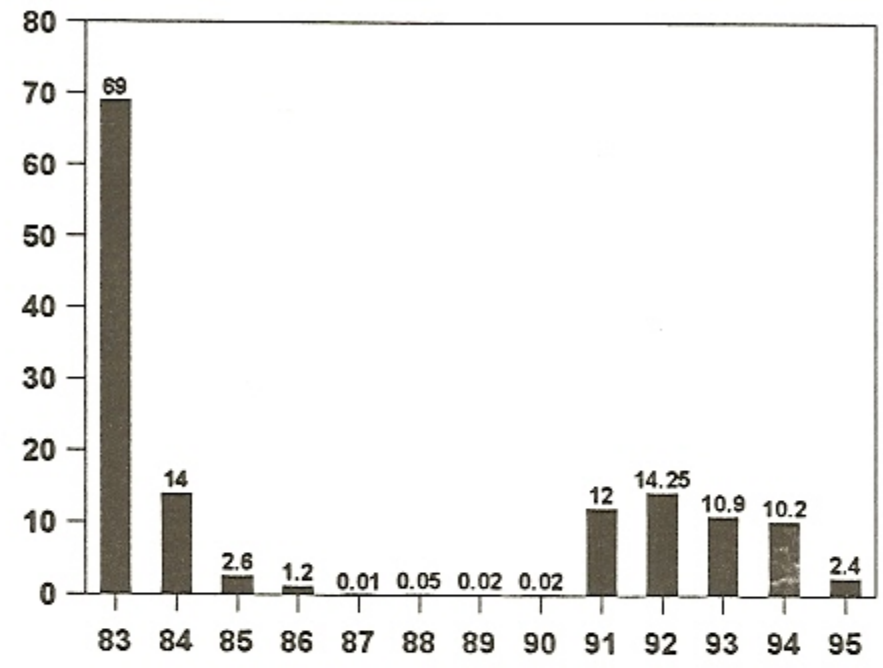


Figure 8. Average number of spruce budworm moths caught in pheromone traps, 1983-1995.

OTHER SOFTWOOD DEFOLIATORS

INSECT	HOST(S)	LOCALITY	REMARKS
Arborvitae Leaf Miner *Argyresthia thuiella*	Arborvitae	Western Rutland County	Very heavy damage in May including 550 acres mapped from the air. Light to moderate damage elsewhere in the state.
Balsam Fir Sawfly *Neodiprion abietis*			Not observed.
European Pine Sawfly *Neodiprion sertifer*	Scots Pine	West Windsor	Light damage.
European Spruce Needleminer *Taniva albolineana*	Blue Spruce	Ludlow	Christmas trees.
Fall Hemlock Looper *Lambdina fiscellaria*			See narrative.
Hemlock Needleminer Species unknown	Hemlock	Sunderland	Light damage.

OTHER SOFTWOOD DEFOLIATORS

INSECT	HOST(S)	LOCALITY	REMARKS
Introduced Pine Sawfly *Diprion similis*	White Pine Scots Pine	Widespread	Fewer than usual. Light damage to 98 acres of Christmas trees.
Jack Pine Budworm *Choristoneura pinus pinus*	White Pine	Brownington	One larva found.
Larch Casebearer *Coleophora laricella*		Widespread	Damage observed wherever native stands of larch occur. Occasionally heavy, including 340 acres mapped from the air in Bennington, Caledonia, and Orleans Counties. Heaviest damage to lower branches.
Larch Sawfly *Pristophora erichsonii*			Not observed.
Nursery Pine Sawfly *Diprion frutetorum*			Not observed.
Pale Juniper Webworm *Aethes rutilana*	Blue Chip Juniper	Springfield	Scattered damage.
Pine False Webworm *Acantholyda erythrocephala*			Not observed.
Pine Webworm *Tetralopha robustella*	White Pine	Craftsbury	Damage to two small Christmas trees.
Red-headed Pine Sawfly *Neodiprion lecontei*	Red Pine Scots Pine	Clarendon Bennington Co.	Isolated colony. Occasionally observed in Christmas trees.
Spring Hemlock Looper *Lambdina athasaria*			See narrative.
Spruce Bud Moth *Zeiraphera canadensis*	White Spruce	Widely scattered	54 acres of light damage and 14 acres of moderate damage to Christmas trees.
Spruce Budworm *Choristoneura fumiferana*			See narrative.

OTHER SOFTWOOD DEFOLIATORS

INSECT	HOST(S)	LOCALITY	REMARKS
Spruce Coneworm	Blue Spruce	Ludlow	Christmas trees.
Dioryctria reniculelloides			
White Pine Sawfly	White Pine	Stowe	Heavy defoliation of 2 ornamentals.
Neodiprion pinetum			
Yellow-headed Spruce Sawfly	White Spruce Blue Spruce	Barton Franklin	Heavy defoliation of ornamentals.
Pikonema alaskensis			

SAPSUCKING INSECTS, MIDGES, AND MITES

Balsam Gall Midge, *Paradiplosis tumifex*, populations increased this year and were found lightly infesting 102 acres in northern Vermont. Damage was especially noticeable in plantations where the midge can be found even in light years. A few individual trees in these plantations were heavily infested. Damage is likely to increase in 1996.

Balsam Twig Aphid, *Mindarus abietinus*, damage was detected on 379 acres of fir in northern Vermont compared to 237 acres in 1994. Another 129 acres out of 154 acres of balsam fir surveyed was observed in southern Vermont. Most of the damage was light, but 86 acres of moderate infestation and 35 acres of heavy infestation were recorded in the survey.

Very few stem mothers could be found in beating surveys early this spring just after egg hatch, yet noticeable damage resulted in these surveyed plantations. Perhaps the unusually dry weather this spring led to much better than normal survival and reproduction of additional aphids. Highest levels of damage occurred near native balsam fir. Good survival may lead to increased damage in 1996.

Researchers at the US Forest Service Experiment Station in Burlington recently documented that twig aphid injury caused a 22 percent reduction in needle area on injured shoots. This resulted in a 20 percent reduction in photosynthesis that persisted throughout the growing season. This could help explain reductions in balsam fir growth following aphid infestations that some growers have reported.

Eastern Spruce Gall Adelgid, *Adelges abietis*, damage was widespread. Damage to white spruce in the northern Vermont Christmas tree survey increased by 20 acres from 1994, for a total of 150 acres. Another 42 acres of light to moderate damage were detected in the southern Vermont survey.

Mortality of galled shoots occurred in some plantations probably due to the dry conditions experienced this summer in conjunction with the vascular disturbance caused by the galls themselves. Similar observations were made throughout New England. This is the first time in the survey that such injury to white spruce has been reported.

Hemlock Woolly Adelgid, *Adelges tsugae*, was not observed. Monitoring continued at the site in Stockbridge where the insect was introduced, and no adelgids were found. No adelgids have been found there since fall 1991, although 9 surveys have been done since then. One hemlock seedling was found during a survey in May, and another was found in October. These were apparently wildings. No signs of adelgid were observed on them or 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 in cooperation with the US Forest Service State & Private Forestry and other New England states.

Oystershell Scale, *Lepidosaphes ulmi*, populations increased this year. Damage was detected aerially on 30 acres in Addison County. They were more abundant in previously infested sites such as in Camel's Hump and Roxbury State Forests. Scale counts on current-year twigs of overstory trees in our study plot in Camel's Hump State Forest were the highest seen since the plot was established in 1984 (Table 8, Figure 9). This may signal a new episode of beech dieback within infested areas in the next year or so.

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	1990	1991	1992	1993	1994	1995
Suppressed	2.1	0.9	2.6	1.2	2.1	9.0	0.05	0.04	0.19	0.03	0.07	0.15
Intermediate	8.5	5.9	6.8	1.4	8.4	16.8	0.13	0.14	0.09	0.05	0.16	0.31
Codominant	7.4	0.7	4.8	4.8	3.4	11.3	0.11	0.32	0.33	0.11	0.08	0.71

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

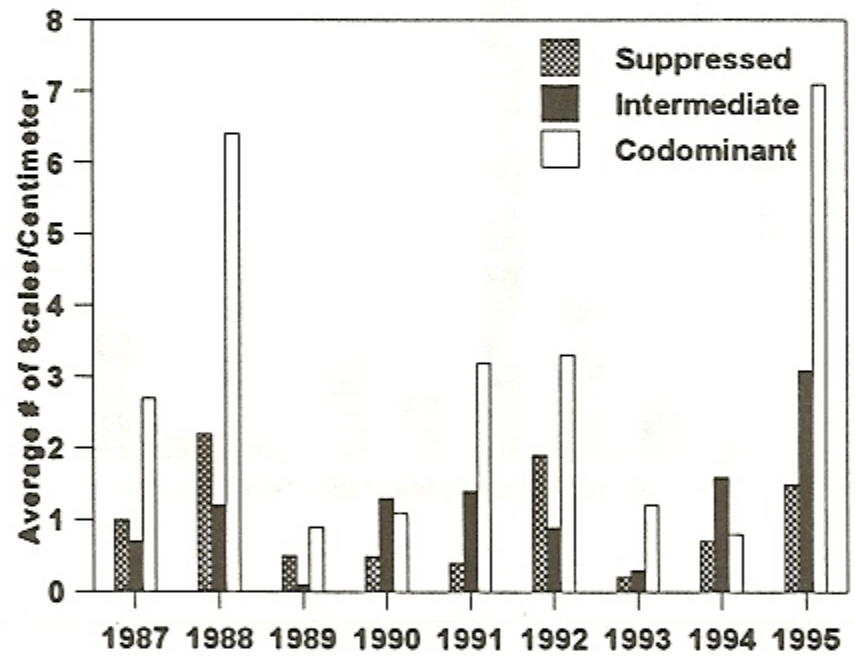


Figure 9. Number of viable oystershell scales per centimeter of current year twig in three tree canopy positions, Camel's Hump State Forest, 1987-1995. Average of 10 current year twigs/tree per crown class, collected in autumn.

Pear Thrips, *Taeniothrips inconsequens,* populations remained extremely low, after defoliating nearly 84,000 acres mapped in 1993. No damage was heavy enough to be aerially detected. Overwintering soil populations remained low going into 1995, but were slightly higher than the previous year. Spring bud counts remained very low (Figure 10). Some light damage to buds was observed in late April, and occasional light mottling on terminal leaves was observed in scattered locations.

Soil populations in late fall were slightly higher than 1994, but remained below levels expected to cause damage (Figure 11). Soil samples were taken in 73 sugarbushes throughout the state, and processed individually at the University of Vermont to force the thrips from the soil naturally at room temperature. Thrips populations were very low in most of the sites sampled this year. In 79% of the sites, the average number of thrips was less than 1.0 per bulb planter sample. Nine sites had an average of between 1-2 thrips per sample, and 6 sites had between 2-4 thrips per sample. The highest average number of thrips detected was 3.4. Despite relatively low populations, pear thrips were found in 92% of the sites, compared with 72% last year, and were detected in every county. Thrips populations increased from last year in 10 of the 14 counties and increased ind 69% of the individual sugarbushes. Despite the overall increase in thrips populations statewide for the past 2 years, it is unlikely that there will be serious damage in 1996.

Research is continuing at the University of Vermont on pear thrips biological control using locally-occurring insect-killing fungi. For the past 2 years, the number of live fungal spores on the forest floor was significantly increased by application of formulated fungal material. However, because thrips populations were low, it was difficult to detect the effect of the fungus in test plots.

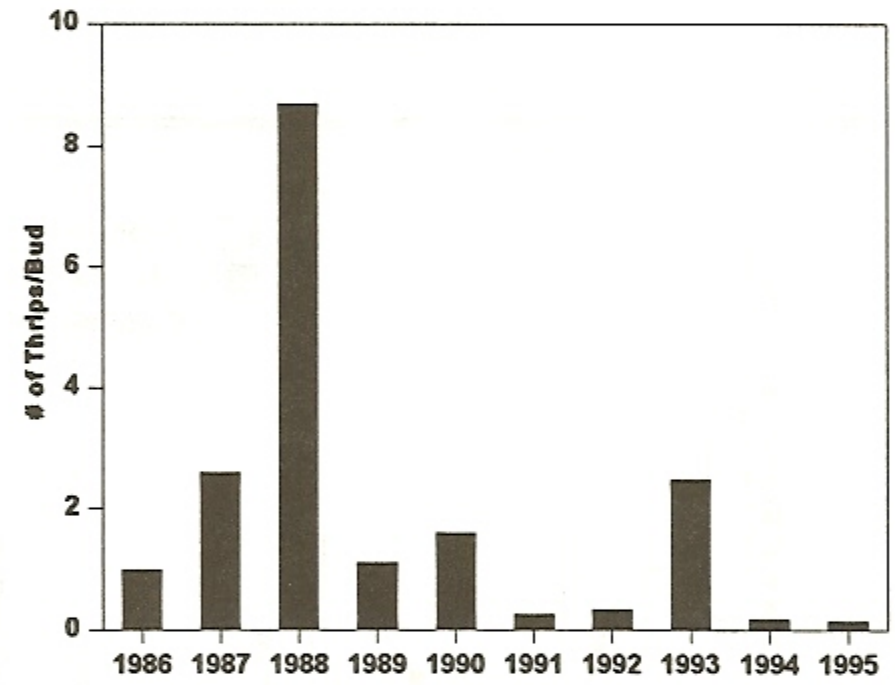


Figure 10. Average thrips counts in buds of sugar maple in southern Vermont 1986-1995. Average of 2 sugarbushes in 1986 and 6 sugarbushes in 1987-1995 (100 buds/sugarbush).

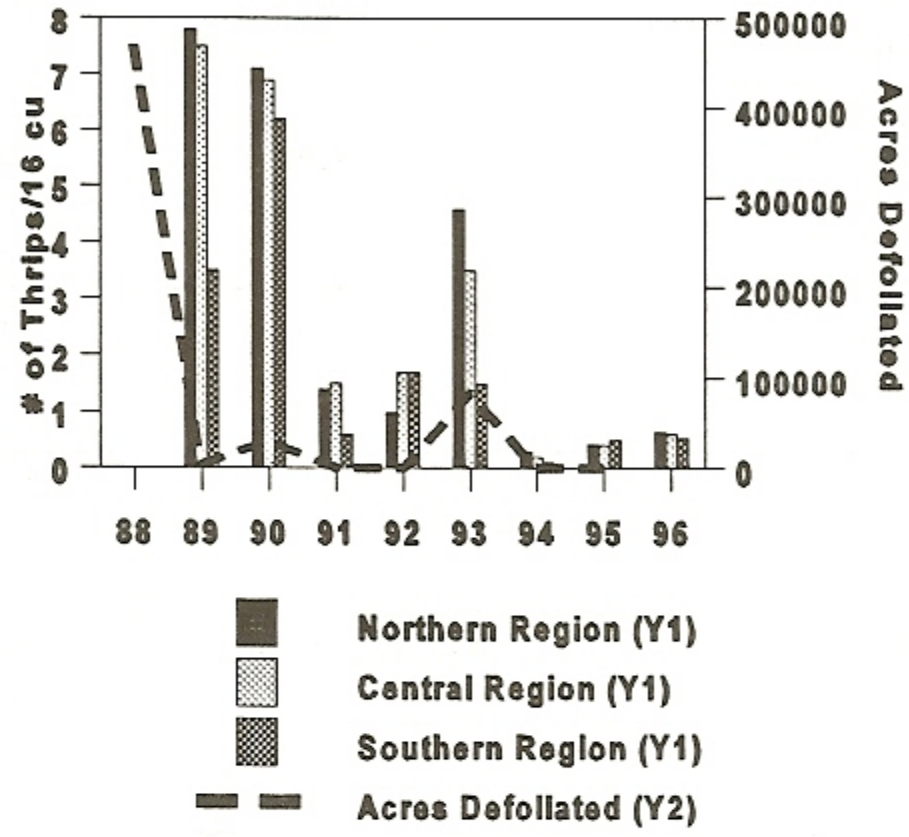


Figure 11. Average counts of overwintering pear thrips in soil samples (# of insects/16 in^3) by region of the state, compared to acres of thrips damage mapped statewide the following summer. Overwintering thrips numbers determined by extraction in 1989-93, and by forced emergence in 1994-96.

Pine Needle Midge, *Contarinea baeri*, populations increased to 170 acres in 1995, 155 acres of which were reported as light injury. One 15-acre plantation of Scots pine in Wolcott was reported with heavy infestations. At this site, at least 50 percent of the needles were stripped from current shoots of the upper crowns.

Spruce Spider Mite, *Oligonychus ununguis*, injury was more common this year in northern Vermont, but less severe although occasionally high in southern Vermont. 155 acres were reported with light injury and 10 acres were reported with moderate injury in the Christmas tree survey. An additional 8-acre balsam fir plantation in Starksboro that was not part of this survey was reported to have heavy damage as well as arborvitae, hemlock, and spruce ornamentals in widely-scattered locations. Fir as well as spruce trees are preferred by this pest. The hot, dry conditions encouraged population outbreaks, but intense rain storms such as were common this summer probably washed mites off feeding sites and helped to keep populations in check.

OTHER SAPSUCKING INSECTS, MIDGES, AND MITES

INSECT	HOSTS(S)	LOCALITY	REMARKS
Aphids *Cinara sp.*	White Pine Balsam Fir	Widespread in Northern Vermont	Light damage to 300 acres of Christmas trees.
Aphids *Periphyllus sp.*	Sugar Maple	Chittenden	Along roadside.
Balsam Gall Midge *Paradiplosis tumifex*			See narrative.
Balsam Twig Aphid *Mindarus abietinus*			See narrative.
Balsam Woolly Adelgid *Adelges piceae*	Balsam Fir	Mt. Holly	Heavy on scattered wild trees.
Beech Blight Aphid *Fagiphagus imbricator*	Beech	Rockingham	Heavy on scattered regeneration.
Beech Scale *Cryptococcus fagisuga*			See Beech Bark Disease.
Birch Catkin Bug *Kleidocerys resedae germinatus*	White Birch	Springfield	Ornamentals.
Black Locust Pod Gall Midge *Dasineura pseudaccaciae*	Black Locust	Tinmouth	Heavy defoliation of a black locust stand observed in the spring shortly after normal leaf out.
Cooley Spruce Gall Aphid *Adelges coolelyi*	White Spruce Blue Spruce Douglas Fir	Throughout	Light populations on spruce. Moderate damage to 40 acres of Douglas fir in Christmas tree survey compared to 73 acres light in 1994. In scattered Douglas fir plantations, damage was unusually light on current growth, although some damage to 1994 needles was visible.
Cottony Maple Scale *Pulvinaria innumerabilis*			See narrative.

OTHER SAPSUCKING INSECTS, MIDGES, AND MITES

INSECT	HOSTS(S)	LOCALITY	REMARKS
Eastern Spruce Gall Aphid			See narrative.
Adelges abietis			
Fletcher Scale			Not observed.
Lecanium fletcheri			
Hemlock Woolly Adelgid			See narrative.
Adelges tsugae			
Honeylocust Plant Bug	Black Locust Honey Locust	Woodstock, Pomfret	Occasional heavy damage, including one 20 acre black locust stand in Pomfret mapped from the air, and scattered ornamental honeylocust.
Diaphnocoris chlorionis			
Lacebugs	Elm	Chittenden Washington Lamoille Counties	Light-moderate on roadside trees.
Corythucha sp.			
Leafhoppers	Hardwoods	Throughout	Trace populations.
Cicadellidae			
Lecanium Scale	Pin Oak Black Cherry	Bennington Springfield	Heavy on occasional ornamentals.
Lecanium sp.			
Linden Wart Gall	Basswood	Weathersfield	Saplings.
Cecidomyia verrucicola			
Maple Spindle Gall Mites	Maples	Scattered throughout	Widely observed at light levels.
Vasates aceris-crumena			
Oystershell Scale			See narrative.
Lepidosaphes ulmi			
Pear Thrips			See narrative.
Taeniothrips inconsequens			

OTHER SAPSUCKING INSECTS, MIDGES, AND MITES

INSECT	HOSTS(S)	LOCALITY	REMARKS
Pine Bark Adelgid *Pineus strobi*	White Pine	Throughout	Generally heavier than usual. Heavy populations observed in pole and sawtimber sized stands in Jamaica, Pittsford, Rupert, and Shaftsbury. A monitoring plot was established in one stand to follow adelgid populations and impact. Levels normal on Christmas trees.
Pine Fascicle Mite *Trisetacus alborum*	White Pine	Widespread	Unusually common on Christmas trees. Noticeable shoot damage to understory trees in Rockingham
Pine Leaf Adelgid *Pineus pinifoliae*	White Pine	Scattered throughout	Mostly light damage on 62 acres of Christmas trees. About half the damage compared to 1994.
Pine Needle Midge *Contarinea baeri*	Scots Pine	Scattered throughout	Increasing. Mostly light injury to 170 acres of Christmas trees.
Pine Needle Scale *Chionapsis pinifoliae*	Scots Pine Mugo Pine	Shaftsbury	Moderate populations on occasional branches in one plantation. Elsewhere only light infestations.
Pine Spittlebug *Aphrophora parallela*	Pines	Throughout	Very heavy in one young Scots pine plantation in West Windsor. Populations high enough to cause scattered shoot dieback and sooty mold. Mostly light infestations on 200 acres of Christmas trees in northern Vermont survey.
Pine Thrips *Gnophothrips sp.*	Scots Pine	Scattered	Mostly light injury but increasing in some Christmas trees.
Pine Tortoise Scale *Toumeyella parvicornis*	Scots Pine	Barre	On Christmas trees for the second consecutive year.

OTHER SAPSUCKING INSECTS, MIDGES, AND MITES

INSECT	HOSTS(S)	LOCALITY	REMARKS
Poplar Petiolegall Aphid *Pemiphigus populitransversus*	Hybrid Poplar	Bennington	10% of leaves affected.
Potato Leafhopper *Empoasca fabae*	White Birch	Springfield	Causing foliage distortion, dieback and thin crowns on ornamental trees.
Ragged Spruce Gall Aphid *Pineus similis*	Red Spruce	Widely scattered	Light.
Root Aphid *Prociphilus americanus*			Not observed.
Spruce Gall Aphid *Adelges lariciatus*			Not observed.
Spruce Spider Mite *Oligonychus ununguis*			See narrative.
Woolly Alder Aphid	Alder	Rutland County	Observed in riparian areas.
Prociphilus tesselatus	Silver Maple	Widely scattered	Several reports on ornamentals.
Woolly Apple Aphid *Eriosoma lanigerum*	American Elm	Hyde Park	Heavy on ornamental.
Woolly Beech Leaf Aphid *Phyllaphis fagi*	American Beech	Shrewsbury	Moderate leaf curl on over-story and understory trees. Observed occasionally elsewhere.
Woolly Elm Aphid *Eriosoma americana*			Not observed.

BUD, SHOOT, AND STEM INSECTS

Balsam Shootboring Sawfly, *Pleroneura brunneicornis*, has been exhibiting even-year population peaks while steadily increasing overall. It was reported infesting 441 acres in northern Vermont compared to 655 acres in 1994 and 329 acres in 1993. This pest remains the most prevalent pest on fir Christmas trees throughout the native range of balsam fir in northern Vermont.

Unlike 1994, most of the damage this year was to balsam fir rather than fraser fir. Balsam fir had light damage to 229 acres and moderate damage to 94 acres while fraser fir had light damage to 80 acres and moderate damage to 36 acres. If some of the larvae overwinter a second year, as suspected, causing the even-year peaks, then the later maturing larvae from fraser fir are more likely to spend two years in the ground than the earlier maturing larvae from balsam. This would mean that most of the adults seen this spring originated from balsam fir and would explain the more abundant damage to that host this year.

Despite the overall trend of more damage to balsam this year, within moderately-infested plantations, shoot damage to fraser (17% of branches damaged) was similar to that on balsam (19% of branches damaged) and was higher than the 6% and 10% of balsam and fraser, respectively, recorded for the same plantations in 1994. Percent of branches with at least one bud killed ranged up to 37 for fraser and 36 for balsam, which is also higher than the 30% and 14% reported in 1994. When the insect had a choice between various sources of balsam and fraser within the same block, fraser fir was preferred. A second year of damage assessments to John Ahrens' seed-source planting in Woodbury revealed that fraser fir and fralsam (a fraser-balsam cross) had by far the most damage while Canaan (another fraser-balsam cross) had the least damage. All of the balsam in this block had less than half the damage of fraser and fralsam. The eggs or young larvae do not survive well on early-breaking balsam fir (personal observations), hence the selection pressure for late-breaking balsams or frasers. The apparent resistance of Canaan fir was a surprise and may relate to foliar chemistry of this particular cross.

Even though the spring of 1995 was cold, with slow bud development, adult sawflies began emerging the end of April, with moderate numbers on May 1 (at 0 growing degree days {GDD}) and abundant numbers on May 4th (3 GDD) and 9th (10 GDD) in Elmore, VT. Balsams here broke bud May 15, just after adult sawflies disappeared. This indicates that the sawflies are laying eggs through the unbroken bud sheath.

Three insecticides were tested on May 2 for control of this insect: Dimilin 25W (an insect growth regulator), Merit 75W (a new systemic) and Lorsban 4E. Material was applied to individual trees in Elmore that had heavy past damage, using a back-pack sprayer. Dimilin and Merit failed to provide any control while a single application of Lorsban gave a 30% reduction in shoot damage. Multiple applications of this material just after adult emergence will probably be necessary for decent control.

Given the current upward population trend of this insect, with higher damager in even years, ***growers should expect heavier damage in 1996, especially to fraser fir.***

Pine Shoot Beetle, *Tomicus piniperda*, was not found during a visual survey conducted in two southern Vermont counties of Rutland and Windsor, and the northwestern county of Grand Isle. This survey was a cooperative effort with the USDA Animal & Plant Health Inspection Service as part of the Cooperative Agricultural Pest Survey.

The visual tree-by-tree inspection was conducted in 33 pine (primarily Scots pine) Christmas tree plantations. The northwestern county of Grand Isle was found to contain 15 suitable pine plantations. In Rutland County, 12 sites were inspected. Only 6 suitable pine sites were found in Windsor County; these were also inspected.

A survey for *Tomicus* was also conducted during routine visual inspections within northern Vermont Christmas tree and red and Scots pine plantations. This survey consisted of 116 sites within 6 counties. 21 of these sites were surveyed last year and all of these sites were found free of *T. piniperda*.

White Pine Weevil, *Pissodes strobi*, damage increased in 1995. A total of 464 acres of pine and spruce Christmas trees in northern Vermont were reported with damage this year. This is an increase of almost 200 acres from last year, but was almost equal to the amount of damage reported in 1993. White pine continues to be the preferred host with 232 acres of reported damage. Scots pine had 69 acres of damage and blue spruce had 163 acres of damage. This weevil was also one of the more common problems on blue spruce Christmas trees in southern Vermont this year.

OTHER BUD, SHOOT & STEM INSECTS

INSECT	HOST(S)	LOCALITY	REMARKS
Allegheny Mound Ants *Formica exsectoides*	Many	Widely scattered	Mortality of scattered young trees, especially Christmas trees, remains common.
Ambrosia Beetle *Scolytidae*	White Birch	Rochester, Barnard	On trees at higher elevations.
Balsam Shootboring Sawfly *Pleroneura brunneicornis*			See narrative.
Eastern Pine Shoot Borer *Eucosma gloriola*	White Pine Scots Pine	Scattered	Shoot mortality on Christmas trees.
European Pine Shoot Moth *Rhyacionia buoliana*	White Pine Scots Pine	Scattered	Shoot mortality on Christmas trees.
Fir Coneworm *Dioryctria abietivorella*	Scots Pine White Pine	Scattered	Occasional shoot mortality common on Christmas trees this year.
Locust Borer *Megacyllene robiniae*	Black Locust	Derby	Adult seen.

OTHER BUD, SHOOT & STEM INSECTS

INSECT	HOST(S)	LOCALITY	REMARKS
Maple Petiole Borer	Sugar Maple	Windham County	Very light damage.
Caulocampus acericaulis			
Northeastern Sawyer			See Sawyer.
Monochamus notatus			
Northern Pine Weevil			Not observed.
Pissodes approximatus			
Pales Weevil	White Pine Scots Pine	Widespread in northern Vermont	Increased. Observed on 77 acres of Christmas trees.
Hylobius pales			
Pine Gall Weevil	Red Pine	Ferrisburg	Unusually heavy damage, including top kill, to off-site poletimber.
Podapion gallicola			
Pine Root Collar Weevil			Not observed.
Hylobius radicis			
Pitch Nodule Maker			Not observed, for the first time in several years.
Petrova albicapitana			
Pitted Ambrosia Beetle	Sugar Maple	Glover	Killing scattered seedlings in sugarbush.
Corthylus punctatissimus			
Pseudanthonomus validus			Not observed.
Rounded-headed Apple Tree Borer	Apple Mountain Ash	Cabot Danville Sheffield	Ornamentals.
Saperda candida			
Sawyer	White Pine	Townshend	Associated with bark beetles in dying sawtimber trees.
Monochamus sp.	Balsam Fir	Widely scattered	Light twig mortality in Christmas tree plantations.
Sugar Maple Borer *Glycobius speciosus*	Sugar Maple	Throughout	Remains common, especially on slow-growing trees. Dissection of 10 wounded trees in Duxbury showed that attacks dated back to 1981 but most had occurred in 1990.

OTHER BUD, SHOOT & STEM INSECTS

INSECT	HOST(S)	LOCALITY	REMARKS
Twig Pruner *Elaphidionoides villosus*	Red Oak	Addison Chittenden Franklin Counties	Decreasing. Very little damage seen.
White Pine Weevil *Pissodes strobi*			See narrative.
Willow Shoot Sawfly *Janus abbreviatus*	Purple Willow	Morrisville	Causing shoot mortality to 5-7% of shoots in SCS nursery bed.
Zimmerman Pine Moth *Dioryctria zimmermanni*	White Pine	Shaftsbury Bennington Bristol	Light, on previously infested Christmas trees.

ROOT INSECTS

INSECT	HOST(S)	LOCALITY	REMARKS
Conifer Swift Moth *Korsheltellus gracilis*		VMC Survey Mt. Mansfield, Underhill	Uncommon (alternate flight year).
June Beetle *Phyllophaga spp.*	Lawns	Widely scattered	General complaints. Common at lights.

BARK INSECTS

Exotic Bark Beetles were not detected in a survey of Christmas tree plantations. Lindgren funnel traps were placed in four sites on April 21. All traps were baited with exotic Ips lures and were placed in plantations of mixed spruce, fir, and pine. Some stumps and brush were present at all of the sites. Trapping locations were: Franklin County (Bakersfield), Grand Isle County (Grand Isle), Chittenden County (Williston), and Addison County (Bristol).

Traps were inspected and contents collected every two weeks until July 17. All traps were negative for exotic beetles. This survey was a cooperative effort with the USDA Animal Plant Health Inspection Service as part of the Cooperative Agricultural Pest Survey.

OTHER BARK INSECTS

INSECT	HOST(S)	LOCALITY	REMARKS
Bronze Birch Borer *Agrilus anxius*	Paper Birch	Winhall, Sherburne Groton	Ornamentals and forest trees. In one location, associated with mortality of birch girdled by sapsucker and chemical treatment.
Eastern Larch Beetle *Dendroctonus simplex*	Eastern Larch	Groton	Increasing mortality in some locations.
Elm Bark Beetles *Hylurgopinus rufipes* *Scolytus multistriatus*			See Dutch Elm Disease
Hemlock Borer *Melanophila fulvoguttata*	Hemlock	Woodstock, Dummerston, Pownal	Associated with scattered dying and recently dead trees. See Hemlock Decline.
Pine Engraver *Ips pini*	White Pine	Jamaica, Townshend, Clarendon	In Windham County, infesting trees snapped by windstorm within two weeks of the storm event. Uprooted trees were not infested at that time.
	Red Pine	Ferrisburg	Associated with mortality of off-site, drought-stressed poletimber.
Red Turpentine Beetle *Dendroctonus valens*	Red Pine	Brandon	On dying trees stressed by drought.
	White Pine	Townshend	See Teeny Weeny White Pine Beetle.
	Red Pine	Rutland	On dying trees on wet site.
Teeny Weeny White Pine Beetle *Pityogenes hopkinsi*	White Pine	Townshend	Associated with *Monochamus* and red turpentine beetles in small patch of mortality in a a sawtimber stand. Cause of the original stress is unknown. About 20 trees currently infested or dead.

MISCELLANEOUS INSECTS

Bark Lice, *Psocidae*, were unusually common throughout.

> Oh, the bark lice. Oh, the bark lice.
> On the bark of pine and oak.
> Pray, provide us with detritus
> And we'll live at Ocracoke.
>
> NC Gypsy Moth Focal Area Survey Crew, 1975

Non-Target Moths caught in Pheromone Traps with lures for forest tent caterpillar (Table 9), spring hemlock looper (Table 10), spruce budworm (Table 11), and fall hemlock looper (Table 12) were tallied in 1995. The numbers in the tables are from 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.

Table 9. Non-target moths caught in traps baited with forest tent caterpillar pheromone 1995.

3593	**Pandemis lamprosana** (Rob., 1869). (willow-aspen leafroller) Tortricidae (Tortricinae)
6237	**Pseudothyatiracymatophoroides** (tufted thyatirid, birch and alder caterpillar) Thyatiridae (Thyatirinae)
6330	**Semiothisa ulsterata** (Pears., 1913). Geometridae (Ennominae)
6640	**Biston betularia** (L., 1758). (pepper-and-salt moth, cleftheaded spanworm, peppered moth or geometer) Geometridae (Ennominae)
6796	**Campaea perlata** (Gn., 1857). (fringed looper, pale beauty) Geometridae (Ennominae)
6811	**Homochlodes lactispargaria** (Wlk., 1861). Geometridae (Ennominae)
6813	**Homochlodes disconventa** (Wlk., 1860). Geometridae (Ennominae)
6863	**Caripeta divisata** Wlk., 1863. (gray spruce looper) Geometridae (Ennominae)
6884	**Besma endropiaria** (G. & R., 1867). (straw besma) Geometridae (Ennominae)
6888	**Lambdina fiscellaria** (Gn., 1857). (hemlock looper) Geometridae (Ennominae)
7139	**Cyclophora pendulinaria** (Gn., 1857). (sweetfern geometer) Geometridae (Sterrhinae)
8090	**Hypoprepia fucosa** Hbn., 1827-1831. (painted lichen moth) Arctiidae (Lithosiinae)
8318	**Lymantria dispar** (L., 1758). (gypsy moth) Lymantriidae (Orgyiinae)
8345	**Zanclognatha laevigata** (Grt., 1872). (variable zanclognatha) Noctuidae (Herminiinae)
8442	**Bomolocha baltimoralis** (Gn., 1854). (Baltimore bomolocha) Noctuidae (Hypeninae)
8942	**Syngrapha rectangula** (W. Kby., 1873). (salt-and-pepper moth, looper moth, angulated cutworm) Noctuidae (Plusiinae)
9547	**Phlogophora periculosa** Gn., 1852. (brown angle shades) (Enominae)
9549	**Enargia decolor** (Wlk., 1858). (aspen twoleaftier) (Amphipyrinae)
9551	**Enargia mephisto** Franc., 1939. Noctuidae (Amphipyrinae)
10275	**Polia nimbosa** Gn., 1852. (stormy arches) Noctuidae (Hadeninae)

Table 10. Non-target moths caught in traps baited with spring hemlock looper pheromone 1995.

6668 **Lomographa glomeraria** (Grt., 1881). (grey spring moth) Geometridae (Oenechrominae)
6813 **Homochlodes disconventa** (Wlk., 1860). Geometridae (Ennominae)
6837 **Probole alienaria** H.-S., 1855. (alien probole) Geometridae (Ennominae)
6966 **Eutrapela clemataria** (J.E., Smith. 1917). (curve-toothed looper) Geometridae (Ennominae)
8203 **Halysidota tessellaris** (J.E. Smith, 1797). (banded tussock moth) Arctiidae (Arctiinae)
8326 **Idia rotundalis** (Wlk., 1866). (rotund idia) Noctuidae (Herminiinae)
8442 **Bomolocha baltimoralis** (Gn., 1854). (Baltimore bomolocha) Noctuidae (Hypeninae)
10521 **Morrisonia confusa** (Hbn., 1827-1831). (confused woodgrain) Noctuidae (Hadeninae)

Table 11. Non-target moths caught in traps baited with spruce budworm pheromone 1995.

1864 **Pseudochelaria walsinghami** Dietz, 1900. Gelechidae (Gelechiinae)
3539 **Acleris chalybeana** (Fern., 1882). (lesser maple leafroller) Tortricidae (Tortricinae)
3682 **Clepsis persicana** (Fitch, 1856). (white triangle tortrix) Tortricidae (Tortricinae)
6347 **Semiothisa pinistrobata** Fgn., 1972. (white pine angle) Geometridae (Ennominae)
6348 **Semiothisa fissinotata** (Wlk., 1863). (hemlock angle) Geometridae (Ennominae)
6677 **Cabera erythemaria** Gn., 1857. (yellow-dusted cream moth) Geometridae (Ennominae)
6796 **Campaea perlata** (Gn., 1857). (fringed looper, pale beauty) Geometridae (Ennominae)
6811 **Homochlodes lactispargaria** (Wlk., 1861). Geometridae (Ennominae)
6813 **Homochlodes disconventa** (Wlk., 1860). Geometridae (Ennominae)
6888 **Lambdina fiscellaria** (Gn., 1857). (hemlock looper) Geometridae (Ennominae)
7187 **Dystroma truncata** (Hufn., 1767). (marbled carpet) Geometridae (Larentiinae)
7371 **Xanthorhoe iduata** (Gn., 1857). Geometridae (Larentiinae)
7394 **Epirrhoe alternata** (Müller, 1764). (white-banded toothed carpet) Geometridae (Larentiinae)
8203 **Halysidota tessellaris** (J.E. Smith, 1797). (banded tussock moth, pale tussock moth) Arctiidae (Arctiinae)
8318 **Lymantria dispar** (L., 1758). (gypsy moth) Lymantriidae (Orgyiinae)
8349 **Zanclognatha protumnusalis** (Wlk., 1859). Noctuidae (Herminiinae)
8397 **Palthis angulalis** (Hbn., 1796). (dark-spotted palthis, spruce harlequin) Noctuidae (Herminiinae)
8442 **Bomolocha baltimoralis** (Gn., 1854). (Baltimore bomolocha) Noctuidae (Hypeninae)
8942 **Syngrapha rectangula** (W. Kby., 1873). (salt-and-pepper moth, looper moth, angulated cutworm) Noctuidae (Plusiinae)
9189 **Charadra deridens** (Gn., 1852). (the laugher) Noctuidae (Pantheinae)
9549 **Enargia decolor** (Wlk., 1858).(aspen twoleaf tier) Noctuidae (Amphipyrinae)
9550 **Enargia infumata** (Grt., 1874) (birch-aspen noctuid) Noctuidae (Amphipyrinae)
9640 **Amphipyra glabella** (Morr., 1874) Noctuidae (Amphipyrinae)
9678 **Elaphria versicolor** (Grt., 1875). variegated midget, fir harlequin caterpillar) Noctuidae (Amphipyrinae)
9961 **Anathix ralla** (G. & R., 1868). (dotted sallow) Noctuidae (Cuculliinae)

Table 12. Non-target moths caught in traps baited with fall hemlock looper pheromone 1995.

1864 **Pseudochelaria walsinghami** Dietz, 1900. Gelechidae (Gelechiinae)
6273 **Itame pustularia** (Gn., 1857). (lesser maple spanworm) Geometridae (Ennominae)
6796 **Campaea perlata** (Gn., 1857). (fringed looper, pale beauty) Geometridae (Ennominae)
6906 **Nepytia canosaria** (Wlk., 1863). (false hemlock looper, evergreen cleora) Geometridae (Ennominae)
6982 **Prochoerodes transversata** (Drury, 1770). (large maple spanworm) Geometridae (Ennominae)
7139 **Cyclophora pendulinaria** (Gn., 1857). (swiftfern geometer) Geometridae (Sterrhinae)
7182 **Dysstroma citrata** (L., 1761). (dark marbled carpet) Geometridae (Larentiinae)
7399a **Euphyia unangulata intermediata** (Gn., 1857). (sharp-angled carpet) Geometridae (Larentiinae)
7640 **Lobophora nivigerata** Wlk., 1862. (powdered bigwing, twolined aspen looper) Geometridae (Larentiinae)
7673 **Tolype laricis** (Fitch, 1856). (larch tolype, larch lappet moth) Lasiocampidae (Macromphaliinae)
8129 **Pyrrharctia isabella** (J. E. Smith, 1797). (banded woollybear, Isabella tiger moth) Arctiidae (Arctiinae)
8318 **Lymantria dispar** (L., 1758). (gypsy moth) Lymantriidae (Orgyiinae)
8322 **Idia americalis** (Gn., 1854). (American idia) Noctuidae (Herminiinae)
8442 **Bomolocha baltimoralis** (Gn., 1854) (Baltimore bomolocha) Noctuidae (Hypeninae)
9053 **Lithocodia carneola** (Gn., 1852). (pink-lined or pink barred lithocodia) Noctuidae (Acontiinae)
9420 **Oligia illocata** (Wlk., 1857). (wandering brocade) Noctuidae (Amphipyrinae)
9545 **Euplexia benesimilis** McD., 1922. (American angle shades) Noctuidae (Amphipyrinae)
9547 **Phlogophora periculosa** Gn., 1852. (brown angle shades) Noctuidae (Ennominae)
9550 **Enargia infumata** (Grt., 1874) (birch-aspen noctuid) Noctuidae (Amphipyrinae)
9578 **Hyppa xylinoides** (Gn., 1852). (common hyppa, cranberry cutworm) Noctuidae (Amphipyrinae)
10438 **Pseudaletia unipuncta** Haw., 1809. (armyworm, whitespeck or American wainscot moth) Noctuidae (Hadeninae)
10944 **Xestia smithii** (Snell., 1896). (Smith's dart) Noctuidae (Noctuninae)
10950 **Xestia bicarnea** (Gn., 1852). (pink-spotted dart) Noctuidae (Noctuinae)

Lepidotera caught in Light Traps at Merck Forest in Rupert are listed in Table 13. Light traps were run every week or two weeks between June and August, 1995.

Table 13. Lepidoptera species caught in light traps, Merck Forest, Rupert June-August 1995.

Arctiidae
Cisseps fulvicollis (Hbn., 1818)
Ctenucha virginica (Esp., 1794)
Cycnia oregonensis (Stretch, 1873)
Grammia virgo (L., 1758)
Hyphantria cunea (Drury, 1773)

Geometridae
Cabera erythemaria Gn., 1857
Campaea perlata (Gn., 1857)
Caripeta divisata Wlk., 1863
Ectropis crepuscularia (D. & S., 1775)
Epirrhoe alternata (Muller, 1764)
Euchlaena johnsonaria (Fitch, 1869)
Euchlaena muzaria (Wlk., 1860)
Euchlaena serrata (Drury, 1770)
Eulithis explanata (Wlk., 1862)
Eusarca confusaria Hbn., 1813
Hydrelia inornata (Hulst, 1896)
Itame anataria (Swett, 1913)
Itame loricaria (Evers, 1837)[1]
Lambdina fiscellaria (Gn., 1857)
Semiothisa signaria (Hbn., 1800-09)
Semiothisa ulsterata (Pears., 1913)
Stamnodes gibbicostata (Wlk., 1862)
Xanthotype urticaria Swett, 1918

Lasiocampidae
Malacosoma americanum (F., 1783)
Malacosoma disstria Hbn., 1820

Lymantriidae
Lymantria dispar (L., 1758)

Noctuidae
Acronicta americana (Harr., 1841)
Acronicta hasta Gn., 1852
Acronicta impressa Wlk., 1856
Acronicta increta Morr., 1974
Acronicta innotata Gn., 1852
Anathix ralla (G. & R., 1868)

Bomolocha baltimoralis (Gn., 1854)
Caenurgina erechtea (Cram., 1780)
Ctenucha virginica (Esp., 1794)
Enargia decolor (Wlk., 1858)
Enargia infumata (Grt., 1874)
Epiglaea apiata (Grt., 1874)[2]
Eueretagrotis perattenta (Grt., 1876)
Eulithis explanata (Wlk., 1862)
Eupsilia tristigmata (Grt., 1877)
Eurois astricta Morr., 1874
Feltia jaculifera (Gn., 1852)
Homorthodes furfurata (Grt., 1875)
Ipimorpha pleonectusa Grt., 1873
Lacinipolia lorea (Gn., 1852)
Lacinipolia olivacea (Morr., 1874)
Lacinipolia renigera (Steph., 1829)
Leucania pseudargyria Gn., 1852
Lithacodia muscosula (Gn., 1852)
Ochropleura plecta (L., 1761)
Oligia modica (Gn., 1852)
Oligocentria semirufescens (Wlk., 1865)
Orthodes cynica Gn., 1852
Papaipema cataphracta (Grt., 1864)[3]
Phlogophora periculosa Gn., 1852
Polia nimbosa (Gn., 1852)
Polia purpurissata (Grt., 1884)
Proxenus miranda (Grt., 1873)
Pseudaletia unipuncta (Haw., 1809)
Pseudeustrotia carneola (Gn., 1852)
Pyreferra pettiti (Grt., 1874)
Syngrapha epigaea (Grt., 1874)[4]
Sunira bicolorago (Gn., 1852)
Xestia bicarnea (Gn., 1852)
Xestia dolosa Franc., 1980
Xestia normaniana (Grt., 1874)
Xestia smithii (Snell., 1896)
Xestia tenuicula (Morr., 1874)

Notodontidae
Nadata gibbosa (J.E. Smith, 1797)
Peridea basitriens (Wlk., 1855)
Peridea ferruginea (Pack., 1864)
Schizura leptinoides (Grt., 1864)
Schizura unicornis (J.E. Smith, 1797)

Pyralidae
Donacaula tripunctella (Rob., 1870)
Ortholepis pasadamia (Dyar, 1917)
Phlyctaenia coronata tertialis (Gn., 1854)

Tortricidae
Apotomis capreana (Hbn., 1814-17)
Archips cerasivorana (Fitch, 1856)
Clepsis persicana (Fitch, 1856)
Epinotia solandriana (L., 1758).
Gypsonoma haimbachiana (Kft., 1907)
Olethreutes nigrana (Heinr., 1923).
Olethreutes permundana (Clem., 1860).
Orthotaenia undulana (D. & S., 1775)

[1] Previous Vermont records include only Camp Johnson.
[2] An obligate bog species.
[3] Represents the third specimen in State collection, though it is not necessarily rare.
[4] Represents the fourth specimen in State collection; feeds on blueberries.

FOREST DISEASES

Stem Diseases

Beech Bark Disease, caused by *Cryptococcus fagisuga* and *Nectria coccinea var. faginata*. Symptoms were more noticeable with 9,250 acres mapped from the air statewide, compared to 770 acres in 1994 (Table 13, Figure 12). The disease also increased in monitoring plots, where Nectria fruiting and scale wax cover increased and tree condition worsened in most plots (Figure 13). Heavy Nectria fruiting was observed in scattered locations, especially where beech grows in association with hemlock.

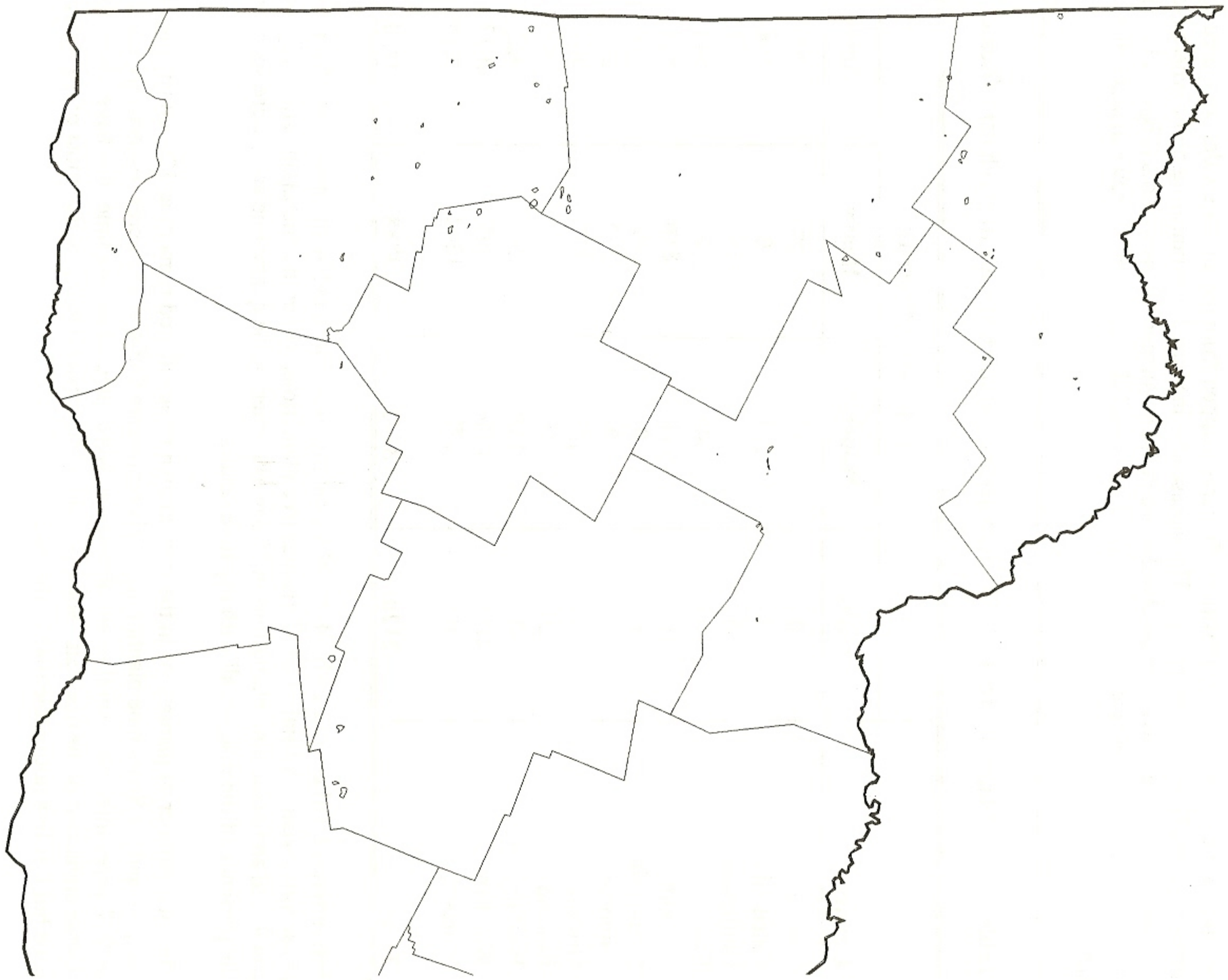
Table 13. Mapped acres of 1995 beech decline and mortality due to beech bark disease.

County	Defoliation Severity			
	Light	Moderate	Heavy	Acres
Addison	0	0	27	27
Caledonia	0	268	0	268
Chittenden	0	0	167	167
Essex	0	544	0	544
Franklin	0	11	816	827
Grand Isle	0	0	40	40
Lamoille	0	0	279	279
Orleans	0	145	257	402
Rutland	20	0	0	20
Washington	0	156	267	423
Windham	2100	1246	691	4037
Windsor	0	972	1244	2216
Total	**2120**	**3342**	**3788**	**9250**

Scleroderris Canker, caused by *Ascocalyx abietina*, was not found in any new towns for the ninth consecutive year. A total of 21 Christmas tree plantations within the quarantine zone (Figure 14), and 95 red and Scots pine plantations in 18 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 it is less noticeable than in the past.

BEECH BARK DISEASE



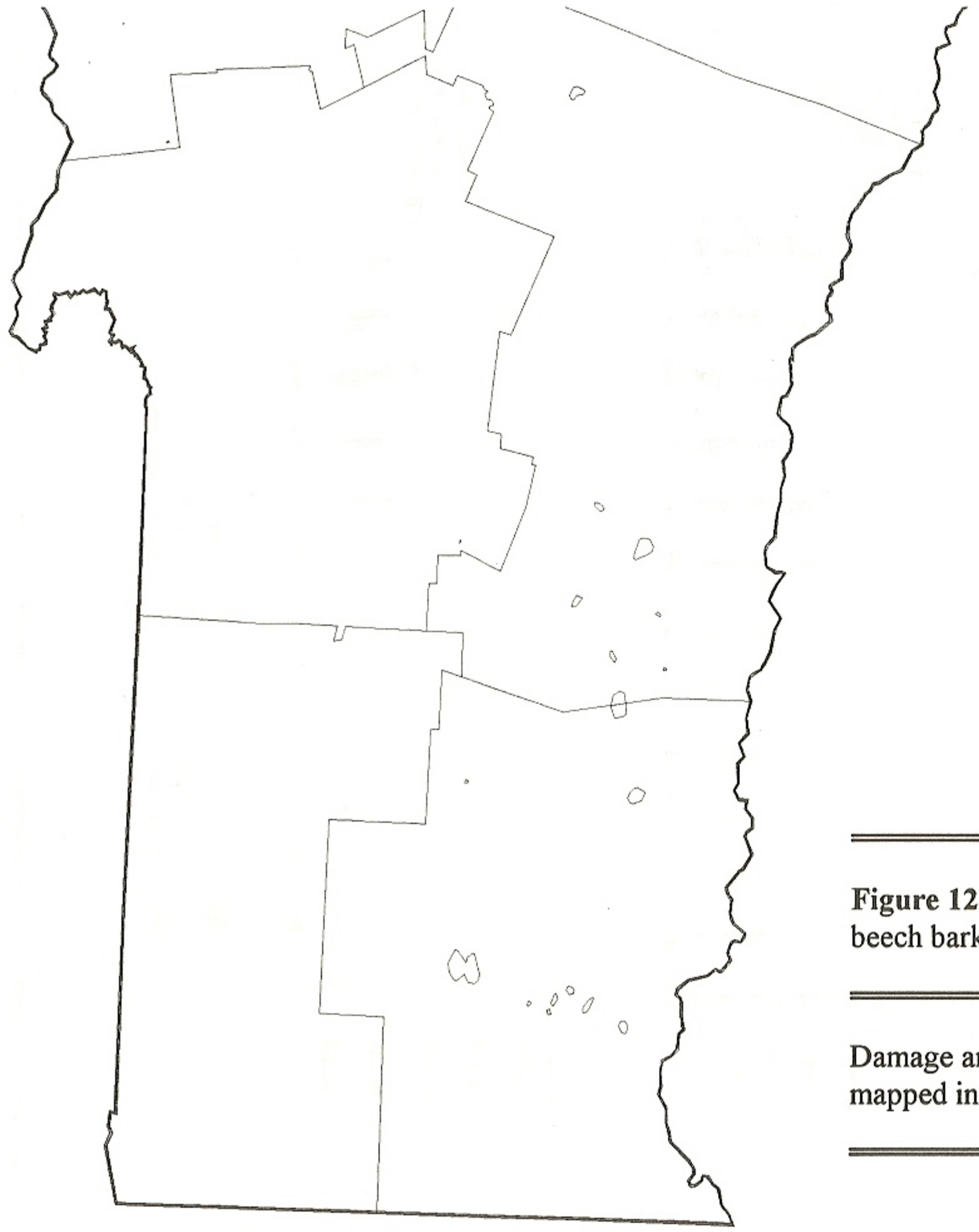


Figure 12. 1995 beech bark decline and mortality from beech bark disease.

Damage area approximate location. Total damage mapped in 1995 = 9,250 acres.

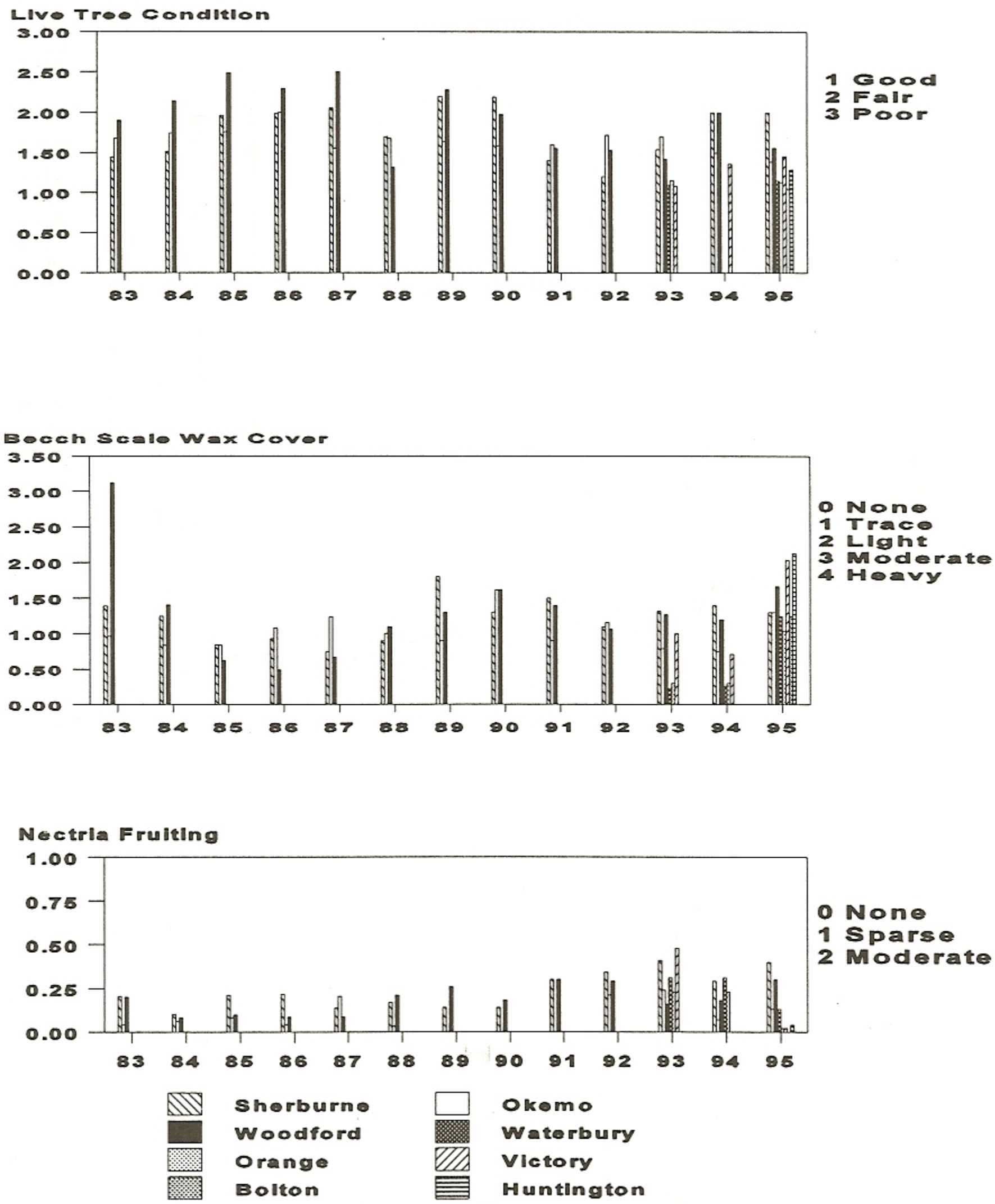


Figure 13. Average live tree condition, beech scale wax cover, and Nectria fruiting ratings in six locations, 1982-1995. No crown ratings available for Waterbury and Groton in 1994.

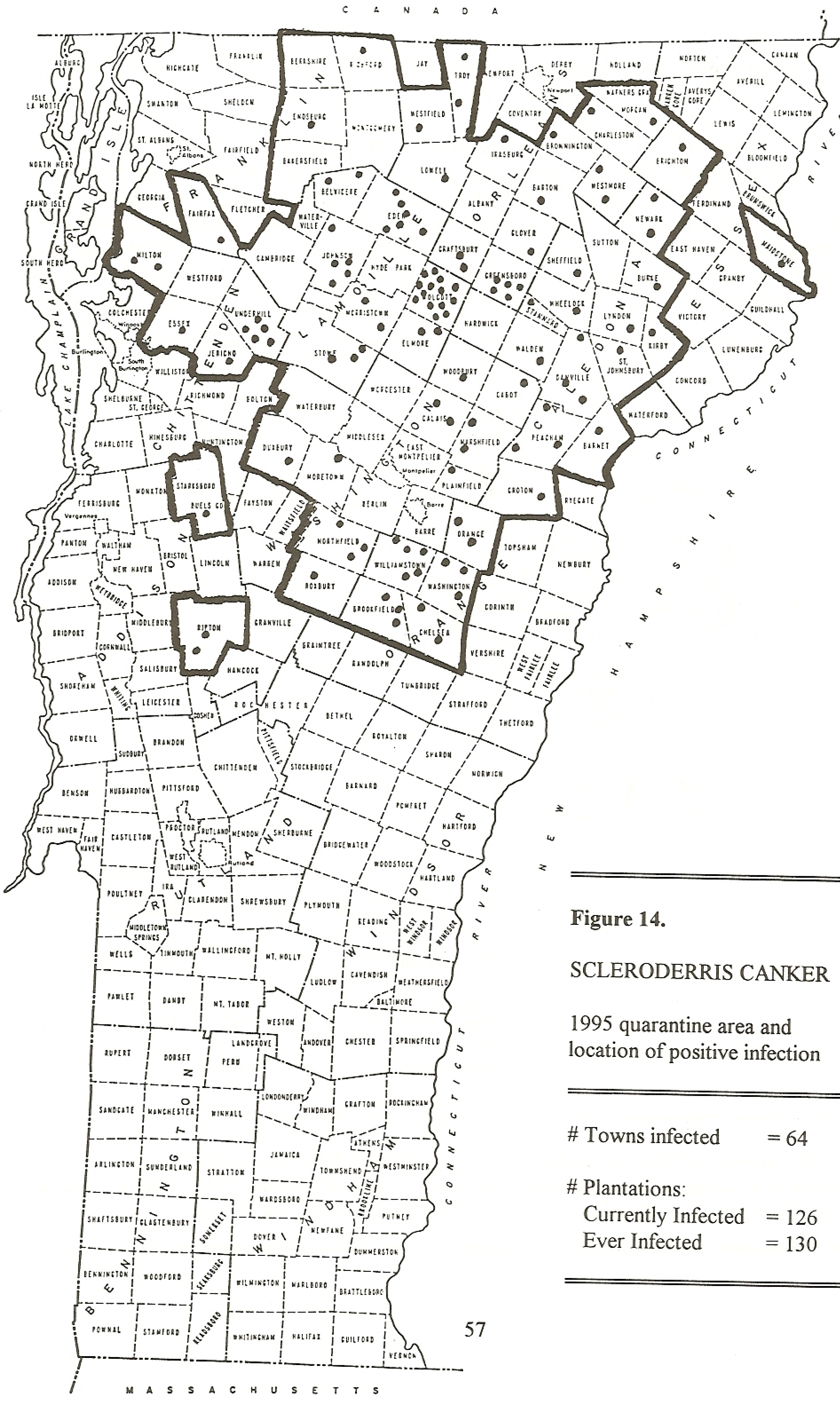


Figure 14.

SCLERODERRIS CANKER

1995 quarantine area and location of positive infection

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

White Pine Blister Rust, *Cronartium ribicola*, was observed throughout. Damage was mostly light on 229 acres of Christmas trees in northern Vermont, although in one southern Vermont plantation, ten percent of the white pine had cankers.

A survey was done in Rutland County to document the presence of Ribes species in and around young white pine stands. One stand from each of eleven towns were surveyed. Surveyed stands would have been eligible for treatment when the Ribes eradication program was active: stands at least 2 acres in size, with at least 50% white pine less than 30 years old. Ribes plants were found in each of the stands, with prickly gooseberry being the most common species. White pine blister rust also occurred in all eleven stands. Lower Ribes populations were associated with lower levels of blister rust (Figure 15).

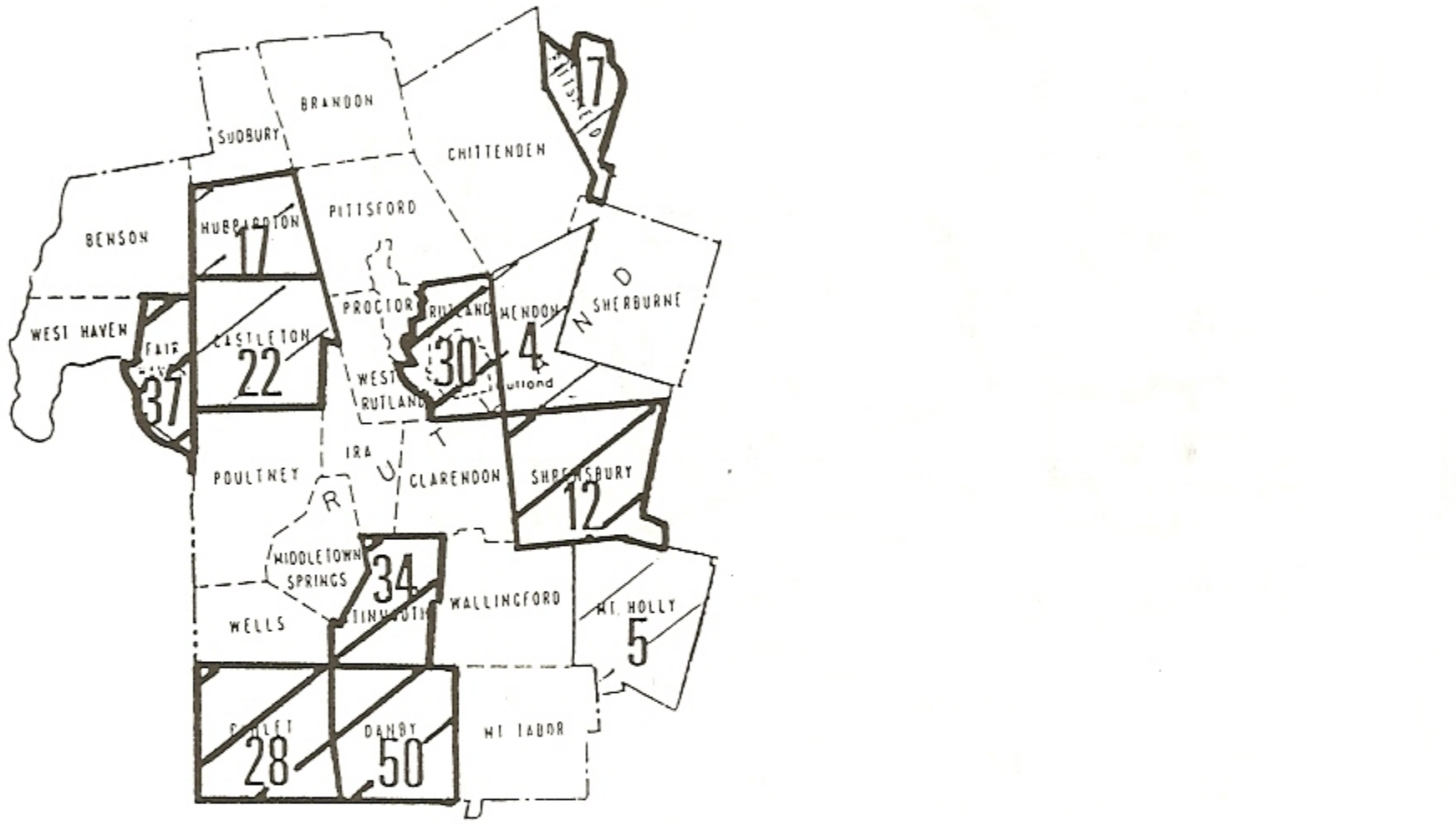


Figure 15. Number of Ribes per 10 chains surveyed, and General occurrence of Ribes and white pine blister rust in a survey of eleven sites (one per town) in Rutland County, 1995. Numbers indicate number of Ribes plants encountered along a 10 chain transect in the survey site.

OTHER STEM DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Annual Canker *Fusarium sp.*	Sugar Maple	Duxbury	Common on slow-growing trees.
Ash Yellows *Mycoplasma-like organism*	White Ash	Throughout	New report in Cambridge of 20 acres with ash decline. A broom was found on one 12" ash.
Beech Bark Disease *Cryptococcus fagisuga* and *Nectria coccinea var. faginata*			See narrative.
Black Knot *Dibotryon morbosom*	Cherries	Throughout	Common on cherry seedlings in old fields.
Brown Rot *Monilinia fructicola*	Sour Cherry	Weathersfield	Ornamental.
Butternut Canker *Sirococcus clavigignenta-juglandacearum*	Butternut	Throughout	Widespread, and in some cases almost complete mortality of butternut throughout the state. Individuals without cankers, while extremely rare, are occasionally observed.
Caliciopsis Canker *Caliciopsis pinea*	White Pine	Throughout	Common but fewer symptoms seen than in earlier years. Cankers on trees in high use recreation area in Barnard.
Chestnut Blight *Cryphonectria parasitica*	American Chestnut	Southern Counties Woodbury	Stable. Young planted trees.
Cytospora Canker *Leucostoma kunzei*	Blue Spruce White Spruce	Throughout	Remains common on ornamentals. Mostly older infections.

OTHER STEM DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Diplodia Shoot Blight	Red Pine Austrian Pine	Ferrisburg	Associated with off-site, drought-stressed poletimber.
Diplodia pinea *(Sphaeropsis pinea)*	Mugo Pine	Stowe	Heavy shoot mortality on ornamentals.
	Scots Pine	Brownsville	Probable cause of shoot mortality associated with spittlebug.
	Balsam Fir Fraser Fir Scots Pine	Widespread	Scattered shoot mortality, mostly to fir, on 200 acres of Christmas trees.
Dutch Elm Disease *Ceratocystis ulmi*	American Elm	Throughout	Levels appeared normal in spite of dry conditions.
Eastern Dwarf Mistletoe *Arceuthobium pusillum*			Not observed.
Fireblight *Erwinia amylovora*	Cherries, Apples	Windsor & Caledonia Counties	Very severe in one ornamental planting, including some infection on pear.
Fusarium Wilt *Fusarium oxysporum callistephi* Race 3	Staghorn Sumac	Brattleboro	Identified at UVM forest pathology lab.
Hypoxylon Canker *Hypoxylon pruinatum*	Aspen	Throughout	Remains common. A lot of breakage at cankers during windstorms. Often heavy in open, riparian areas and cause of tree hazard in state parks.
Kabatina Blight *Kabatina juniperi*	Juniperus procumbens	Stowe	Thought to be the cause of heavy mortality of young plants at the base of a landscaped slope.
Maple Canker *Steganosporium ovatum*	Sugar Maple	Widespread	Commonly associated with branch dieback on drought-stressed trees. First year noticeable since 1989. Light.
Oak Canker probably *Botryosphaeria spp.*	Red Oak	St. Johnsbury	Causing dieback of lower branches.

OTHER STEM DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Oak Wilt *Ceratocystis fagacearum*			Not detected during annual aerial survey.
Phomopsis Twig Blight *Phomopsis sp.*	Ground Juniper	Springfield Stowe	Heavy damage to a "Blue Chip" juniper planting. Light shoot mortality on ornamental.
Red Ring Rot *Fomes pini*	Conifers	Throughout	In blowdown areas, both sound trees and trees with red ring rot had stem breakage. Heavy infection throughout mature, white pine stand in Lyndon.
Sapstreak *Ceratocystis coerulescens*	Sugar Maple	Middletown Springs	Suspected, but not confirmed, as cause of sugar maple mortality.
Scleroderris Canker *Asocalyx abietina*			See narrative.
Sirococcus Shoot Blight *Sirococcus strobilinus*	Red Pine	Peacham	Infection remains light in Groton State Forest. Light infection on 30 acres of Christmas trees.
Verticillium Wilt *Verticillium albo-atrum* or *V. dahliae*	Sugar Maple	Chittenden Danville	Mortality to ornamentals.
White Pine Blister Rust *Cronartium ribicola*			See narrative.
Woodgate Gall Rust *Endocronartium harknessii*	Scots Pine	Throughout	Heavy on individual Christmas trees. In northern Vermont survey, similar to 1994 with 172 acres affected.
Yellow Witches Broom Rust *Melampsorella caryophyllacearum*	Balsam Fir	Throughout	Scattered on 190 acres of Christmas trees in northern Vermont compared to 116 acres in 1994. Less noticeable than 1994 in southern Vermont.

FOLIAGE DISEASES

Balsam Fir Needlecast, caused by *Lirula nervata*, was observed causing browning and premature needlecast in a small patch of balsam fir Christmas trees in Weston. The fungus was identified by the forest pathology lab at Penn State. Other fungi identified on affected needles were from the genera *Lophodermium*, *Phaeocryptopus*, and *Sclerophoma*.

Fir-Fern Rust, caused by *Uredinopsis mirabilis*, increased throughout on Christmas trees. In the northern Vermont survey, the acreage doubled from 1994, with 364 acres of fir plantations reported with infection. Most of the needle loss was to balsam fir, but where balsam had moderate to heavy damage, light to moderate damage was common on fraser fir at the same location. Ninety-four acres had moderate infection and one plantation (14 acres) in Albany had heavy infection. At this site, current year needle loss was approaching 50 percent. Infection of this magnitude is uncommon but there were reports from growers not included in the survey with similar problems. Despite the dry summer, cool wet conditions prevailed early in the growing season, during shoot elongation, when initial infection occurred.

OTHER FOLIAGE DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Anthracnose	Red Oak	Ludlow	Ornamental.
Apiognomonia spp. *Gloeosporium spp.*	Sugar Maple	Westmore Waterford	Light leaf damage.
Apple Scab			Not observed.
Venturia inequalis			
Balsam Fir Needlecast			Not observed.
Lirula nervata			
Brown Spot Needle Blight	Bristlecone Pine Mugo Pine	Huntington	Confirmed by UVM.
Scirrhia aciola			
Cedar-Apple Rust	Red Cedar	Addison & Washington Counties	Ornamental and roadside trees.
Gymnosporangium juniperi-virginianae			
Coccomyces Leaf Spot			Not observed.
Blumeriella jaapii			
Cyclaneusma Needlecast (formerly Naemacylcus)	Scots Pine	Throughout	Remains common on Christmas trees. Reported for 276 acres compared to 176 acres in 1994. Usually little impact on merchantability.
Cyclaneusma minus			

OTHER FOLIAGE DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Delphinella Tip Blight of Fir *Delphinella balsamae*	Balsam Fir Fraser Fir	Widely scattered in northern Vermont	Increasing on Christmas trees but mostly light on 185 acres. Moderate damage in Wolcott and East Montpelier. Suspected as the cause of heavy shoot mortality to subalpine fir in Wolcott.
Dolthistroma Needlecast *Dolthistroma pini*			No new findings.
Fir-Fern Rust *Uredinopsis mirabilis*			See narrative.
Fir Fireweed Rust	Concolor Fir	Shaftsbury	Christmas trees.
Lophodermium Needlecast *Lophodermium seditiosum*	Scots Pine	Throughout	Increased in northern VT Christmas trees. 221 acres of mostly light damage compared to 102 acres in 1994.
Pestalotiopsis Blight *Pestalotiopsis funerea*	Arborvitae	Barnard	Associated with a browned patch of current and older foliage heavily damaged by mites. Identified by the UVM forest pathology lab.
Phyllosticta Leafspot *Phyllosticta minima*	Sugar Maple	Springfield, Woodstock, Westminster	Spotting early in the season.
Powdery Mildew *Eryiphaceae*	Lilac Perennial flowers	Widespread	Common but lighter than 1994.
Rhabdocline Needlecast *Rhabdocline pseudotsugae*	Douglas Fir	Bennington Co.	Occasional heavy damage in Bennington County. Elsewhere, damage down from previous years. Reported on 50 acres of Christmas trees in northern Vermont.
Rhizosphaera Needlecast *Rhizosphaera kalkhoffi*	Blue Spruce White Spruce	Throughout	Remains common on ornamentals especially to larger trees. Mostly light damage on 175 acres of Christmas trees in northern Vermont similar to 1994.

OTHER FOLIAGE DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Septoria Leaf Spot *Septoria musiva*	Balsam Poplar	Shrewsbury Mt. Holly	Heavy defoliation in riparian areas.
Septoria Leaf Spot *Septoria sp.*	White Birch	Bennington Co.	Associated with widespread late season browning at upper elevations.
Sooty Mold *Perisporiacae*	Many	Throughout	Increasing due to higher than normal levels of sucking insects.
Swiss Needlecast *Phaeocryptopus gaumanni*	Douglas Fir	Widespread	Occasional heavy damage to Christmas trees. Stable in northern Vermont survey with 50 acres affected.
Tar Spot *Rhytisma acerinum*	Sugar Maple	Widely scattered	Only occasional light damage seen.
Tiger Striped Rust	Scots Pine	Shaftsbury	Christmas trees.
Venturia Leaf Blight *Venturia acerina*	Red Maple	Chester	Ornamentals.
Walnut Anthracnose *Gnomonia leptostyla*	Butternut	Richmond	Forest tree confirmed by UVM.
White Pine Needle Blight probably *Pseudovirgella spp.*	White Pine	Northern Vermont	Common on Christmas trees (233 ac.). Increase over 1994 levels.

ROOT DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Annosus Root Rot *Heterobasidion annosum*			No new reports.
Shoestring Root Rot *Armillaria spp.*	Many	Throughout	Remains common on stressed trees and occasional Christmas trees.

ANIMAL DAMAGE

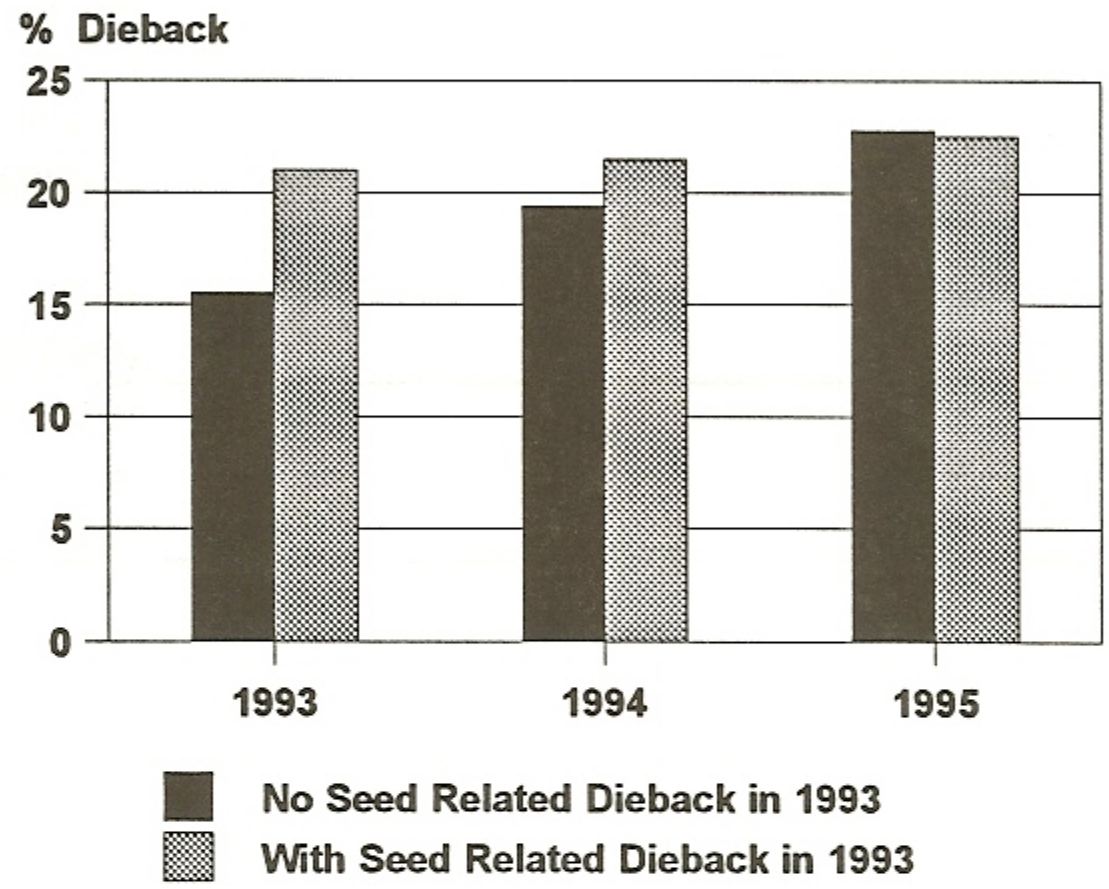
ANIMAL	SPECIES DAMAGED	LOCALITY	REMARKS
Beaver			Many inundated areas observed during the aerial surveys, especially in the Green Mountain range. Reduced trapping pressure contributing to population increase.
Deer	Balsam Fir Fraser Fir	Throughout	Increasing levels of damage to Christmas trees.
	Apple	Orleans Caledonia Essex Counties	Numerous calls on damage to young trees. Elsewhere, only occasional damage to a variety of species.
Moose			Bark stripping and breakage from feeding at high elevations and other areas where moose winter.
Mouse (Meadow Vole)	Scots pine	Dummerston	Damage from winter 93-94 caused scattered discoloration and mortality. Girdling sometimes below the soil line. Delayed symptoms probably due to abundant food reserves in affected trees, allowing roots to survive. Drought may have caused the additional stress leading to symptoms in 1995.
	Apple	Caledonia County	Two calls.
Porcupine			Heavy hemlock feeding near a camp in Troy. Elsewhere, scattered reports of light damage.

ANIMAL DAMAGE

ANIMAL	SPECIES DAMAGED	LOCALITY	REMARKS
Sapsucker			Damage increasing throughout, especially southern Vermont and the Northeast Kingdom. Sapsucker damage to ornamentals, particularly white birch, is causing occasional mortality and economic loss. One attempt to control sapsuckers by applying repellant to the bark of young trees led to tree mortality from the chemical treatment.
Squirrel			Increasing damage to tubing in some areas linked to higher squirrel populations.

DIEBACKS, DECLINES, AND ENVIRONMENTAL DISEASES

Ash Dieback from ash yellows continues, particularly in Southern Vermont and the Champlain Valley. Thin ash was mapped on 50 acres in Grand Isle. In the Woodstock monitoring plot established to follow the health of trees impacted by a heavy seed crop in 1993, crown density remained stable. Trees which had dieback related to seed production continued to have thinner crowns than those which did not have dieback related to the heavy seed crop (Figure 16). However, dieback increased on the trees which did not have dieback related to the heavy seed crop in 1993. This is probably from the impact of ash yellows.



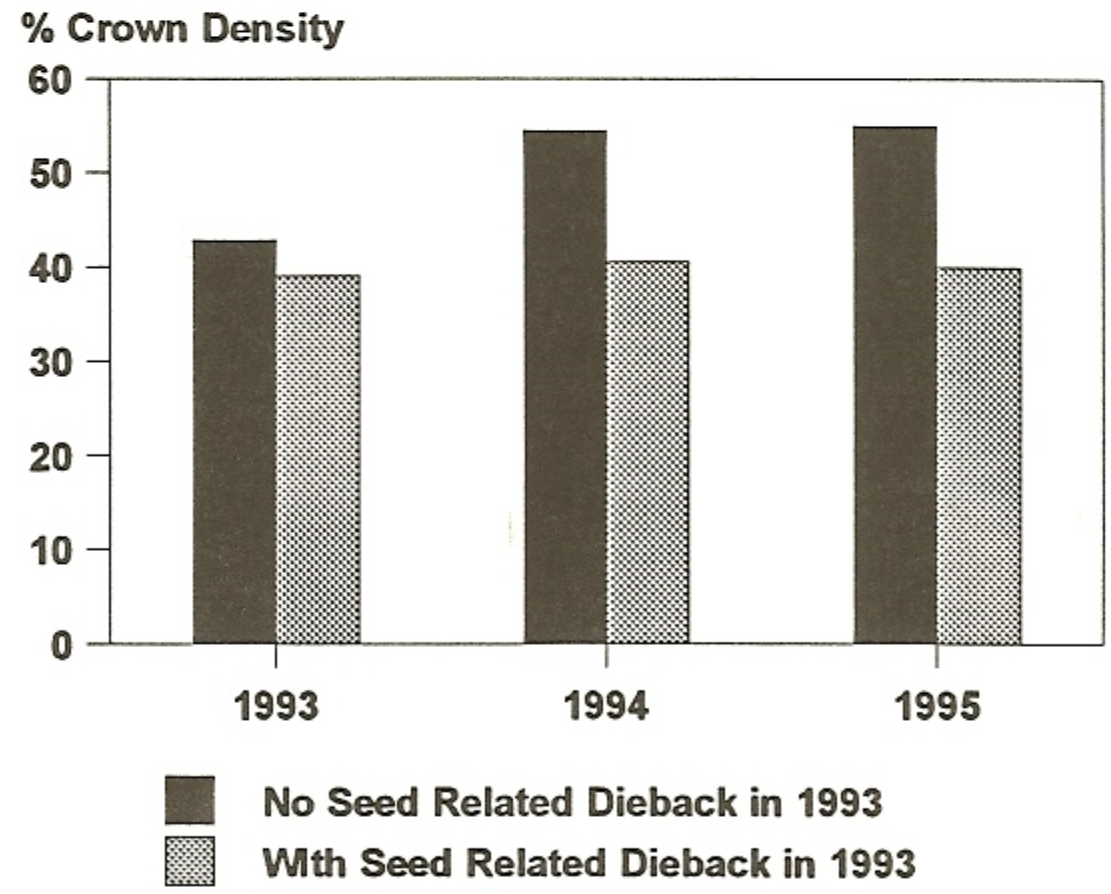


Figure 16. Average percent dieback and crown density 1993-1995 of 10 white ash that had and 9 that did not have dieback related to seed production in 1993.

Birch Decline was mapped on 650 acres. Although defoliation has been widespread, damage severity has been limited. Some paper birch decline was in or near logged areas and elsewhere birch looked thin when mixed with other hardwoods. Paper birch condition improved in some monitoring plots and stayed the same in others, while yellow birch was slightly less healthy (by 2%) than in 1993. In seven of the nine plots, at least 80% of the birch have less than 10% crown dieback (Figure 17).

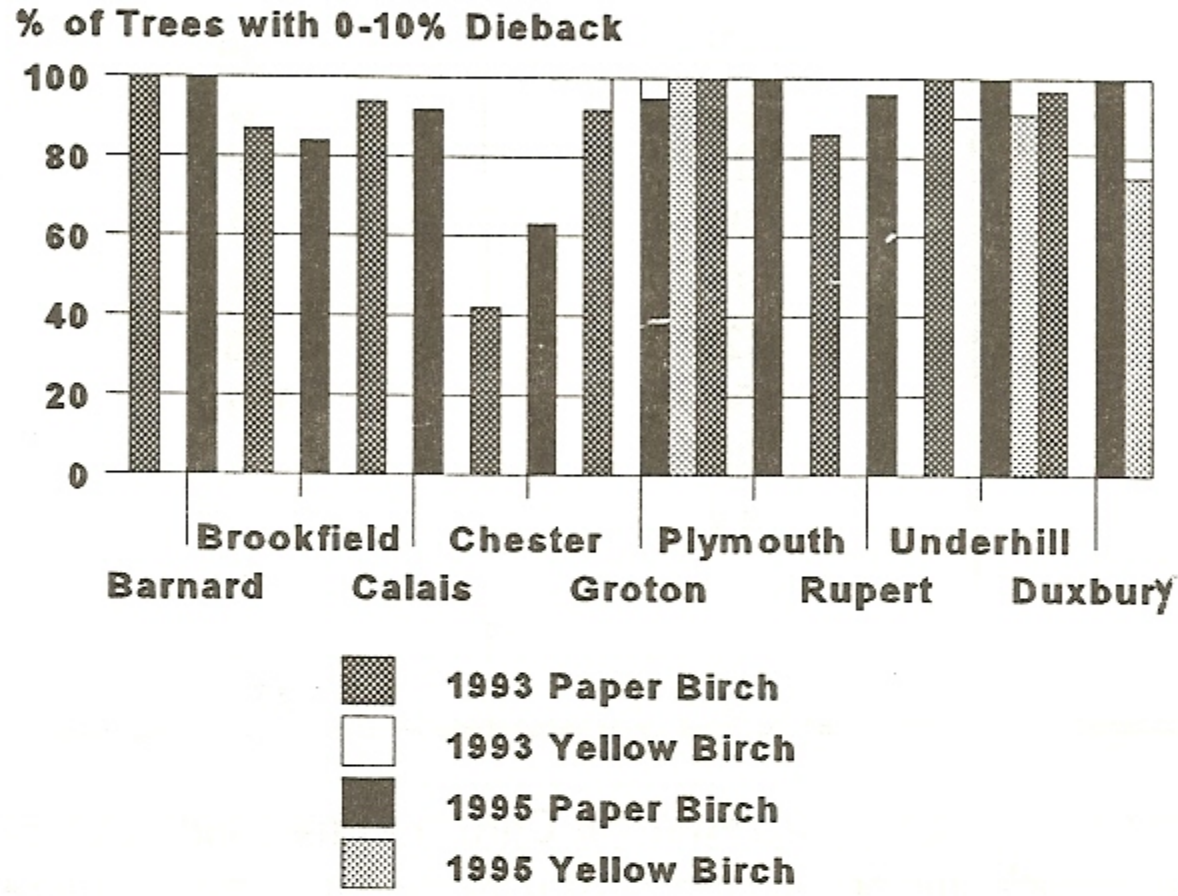


Figure 17. Percent of live birch trees (≥ 5" DBH) with ≤ 10% dieback in birch monitoring plots by location 1993-1995.

Drought conditions during the growing season led to scattered mortality on rocky high elevation sites and of recently planted trees. Some oak-hickory stands on ledgey sites, mostly on west-facing slopes in the Taconic range, were brown by late July, but refoliated in August. Others, including the Champlain valley, remained brown in late August. 7060 acres of drought damage were mapped during aerial survey (Table 15, Figure 18). Similar damage was not observed in the Green Mountains. A thin hemlock stand on a steep ravine mapped from the air with premature needle drop and a bark beetle infestation of a pole-sized red pine stand in Brandon were attributed to drought. Leaf drop occurred on stressed apple trees and other species. Elsewhere, scorch, cupping, and wilting were observed. Dry conditions are thought to be responsible for the early leaf miner symptoms on birch and the rapid browning of birch leaves infected with *Septoria*.

Table 15. Mapped acres of browning and defoliation due to drought in 1995.

County	Moderate	Heavy	Total
Addison	360	468	828
Bennington	4	72	76
Caledonia	500	0	500
Chittenden	405	59	464
Essex	2268	0	2268
Franklin	24	117	141
Lamoille	97	0	97
Orange	0	6	6
Orleans	426	33	459
Rutland	56	1816	1872
Washington	80	4	84
Windham	14	0	14
Windsor	0	251	251
Total	**4234**	**2826**	**7060**

Drought damage was observed statewide in Christmas tree and other recent conifer plantations. Mortality and tip dieback similar to heavy frost damage was common on recently-planted trees. On dry sites visited as part of the northern Vermont Christmas tree survey, trees planted as long as four years ago received some injury. Drought conditions led to mortality of about one-fourth of the 2-3' white spruce in a plantation in Rutland planted in a heavy clay soil. Drought damage to some 14-year-old crosses between fraser fir and balsam fir at the US Forest Service Experiment Station in Burlington revealed some differences based on sex of the parent. The balsam (♀) - fraser (♂) crosses resisted drought much better than the fraser (♀) - balsam (♂) crosses. Some of the fraser firs on this dry site were killed by the drought.

Following the severe drought conditions that were present into early July, most of northern Vermont received above-average rainfall for the rest of the growing season, resulting in healthy-appearing forest trees in most locations. Elsewhere, decline, mortality, and secondary pest problems are expected to increase in the future due to the 1995 drought.

Hardwood Decline and Mortality increased with 41,160 acres mapped from the air, compared to 20,430 in 1994 (Table 16, Figure 19), probably due to dry weather. Hardwood defoliators have been at low levels for a number of years. Although growing season weather has been favorable in recent years, decline may continue to increase due to dry 1995 conditions.

Table 16. Mapped acres of hardwood dieback, mortality, thin crowns, chlorosis, and scorch in 1995.

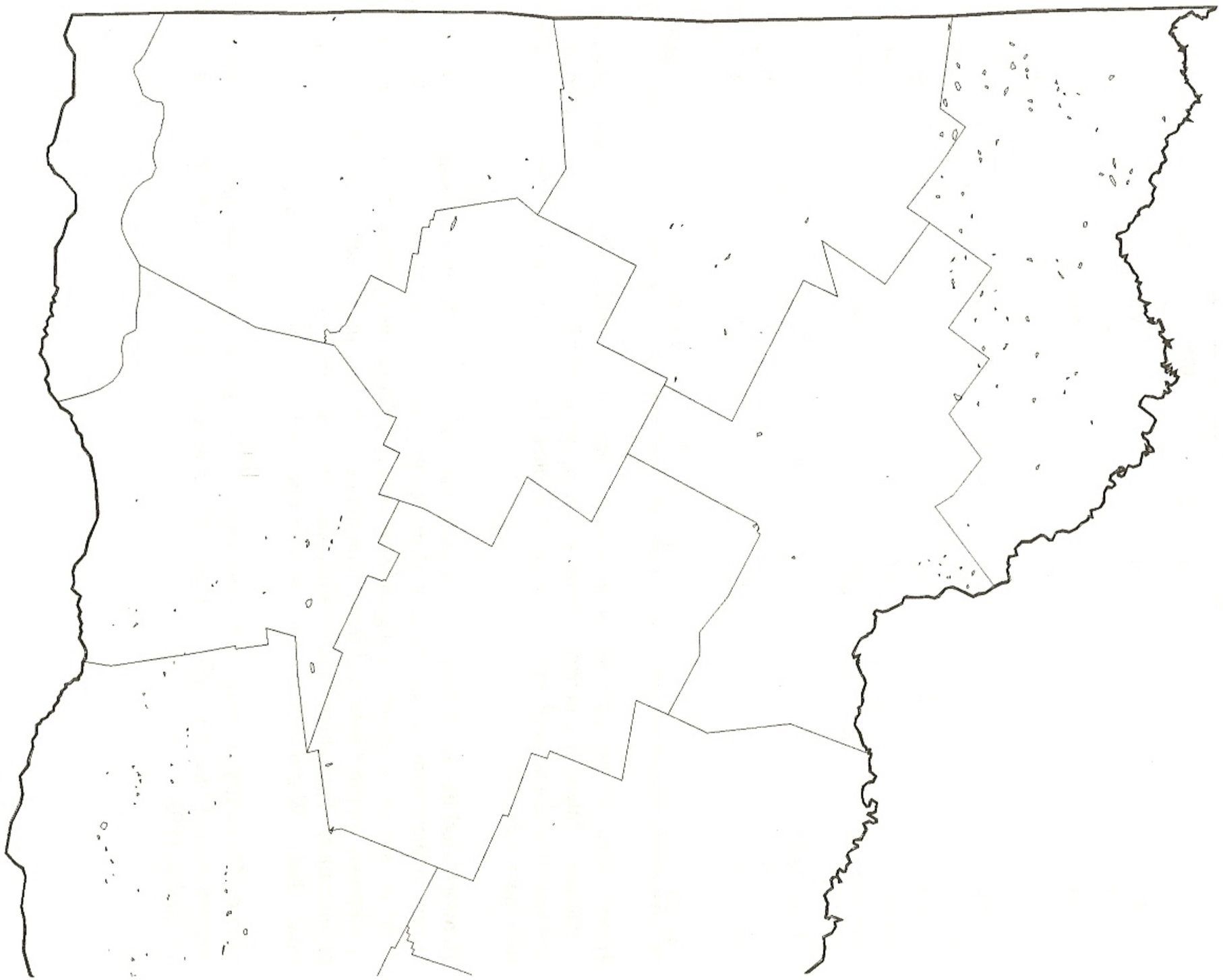
County	Damage Pattern		Total Acres
	<30% of Trees	>30% of Trees	
Addison	1360	300	1660
Bennington	4920	560	5480
Caledonia	280	390	670
Chittenden	460	1180	1640
Essex	200	360	560
Franklin	220	450	670
Grand Isle	130	0	130
Lamoille	7510	1310	8820
Orange	340	640	980
Orleans	610	9200	9810
Rutland	1690	440	2130
Washington	1520	1820	3340
Windham	680	740	1420
Windsor	2770	1080	3850
Total	**22690**	**18470**	**41160**

Heavy Seed did not produce symptoms in 1995. Most seed production was light due to dry conditions. Only spruce in north central Vermont, spruce and hardwoods in the Northeast Kingdom, and yellow birch and hophornbeam in the Champlain Valley and southern Vermont were reported to have heavy seed.

Hemlock Decline, thin crowns, and occasional mortality were observed in isolated, widely scattered stands in the towns of Sunderland, Dummerston, Woodstock, Windsor, Guilford, and Pownal. Although some had recent cutting and scattered Armillaria, the cause for the premature needledrop is unknown. In the Sunderland stand, thinning in the crowns due to needle drop was most severe on regeneration. Elsewhere, regeneration was healthier than overstory trees. A monitoring plot was established in Woodstock to follow changes in crown dieback and density.

Spruce Mortality, primarily of upper elevation red spruce combined with some balsam fir, was mapped on 1710 acres (Table 17, Figure 20), similar to the 2,650 acres mapped in 1994 and 2,050 mapped in 1993.

DROUGHT



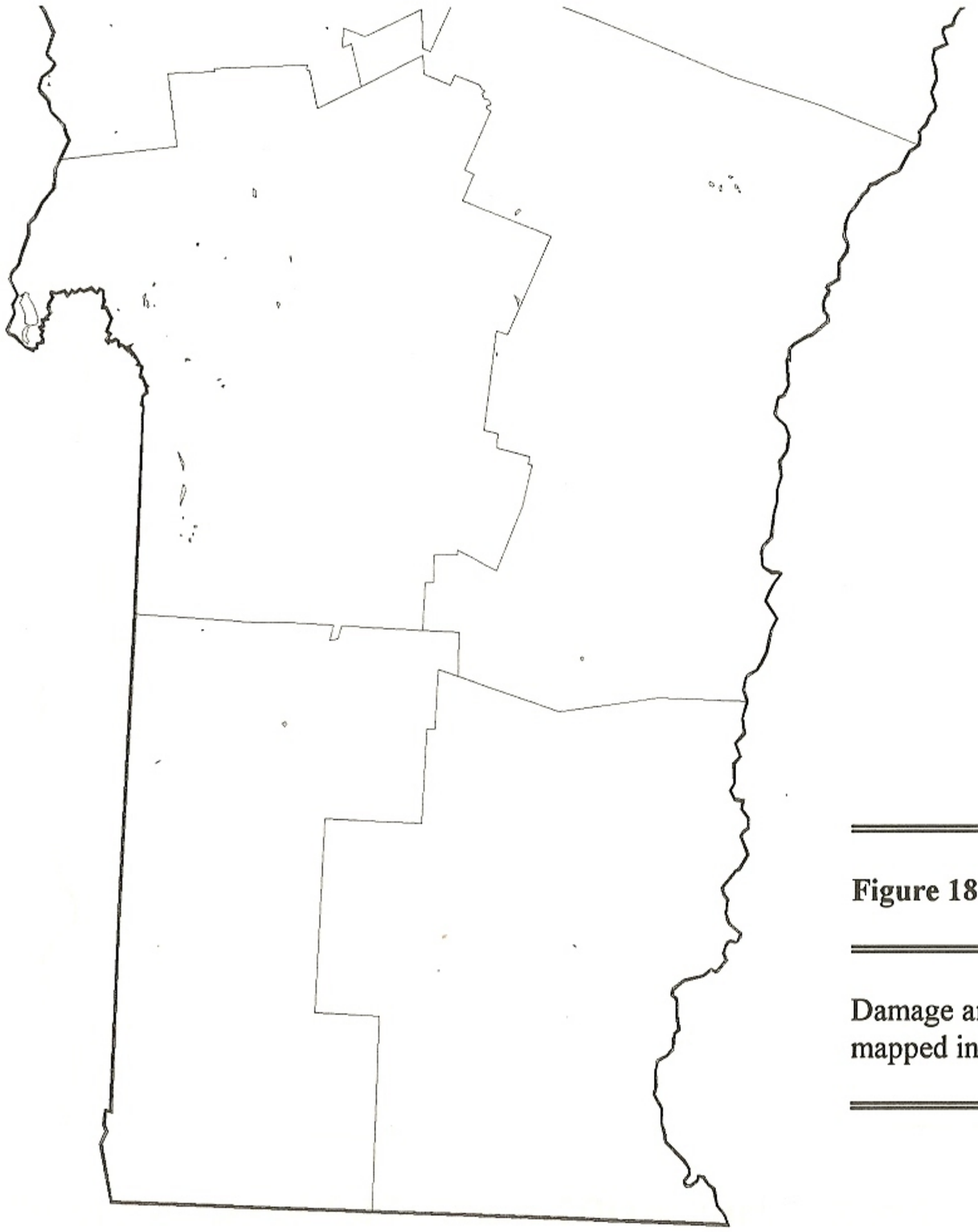
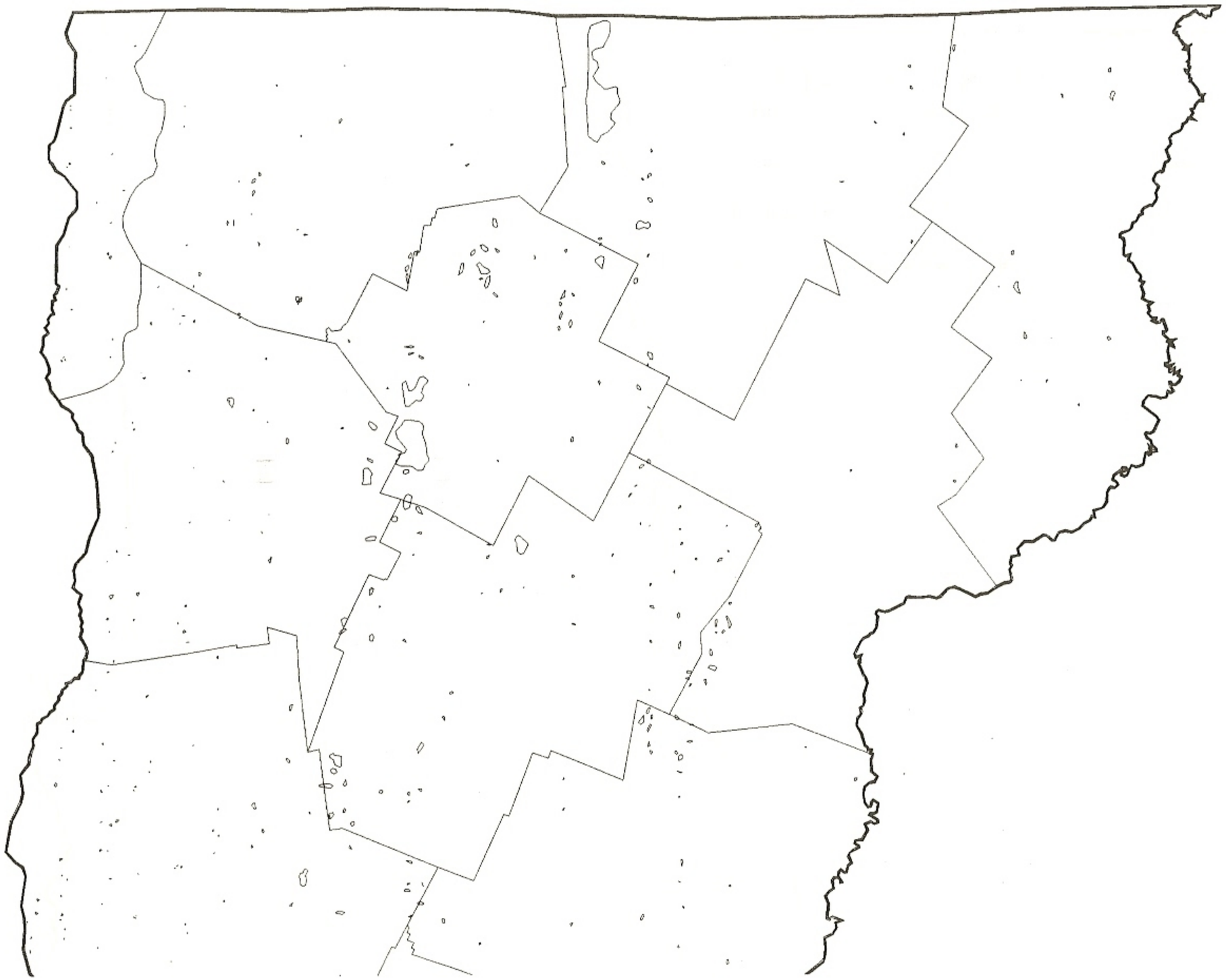


Figure 18. 1995 drought symptoms.

Damage area approximate location. Total damage mapped in 1995 = 7,060 acres.

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



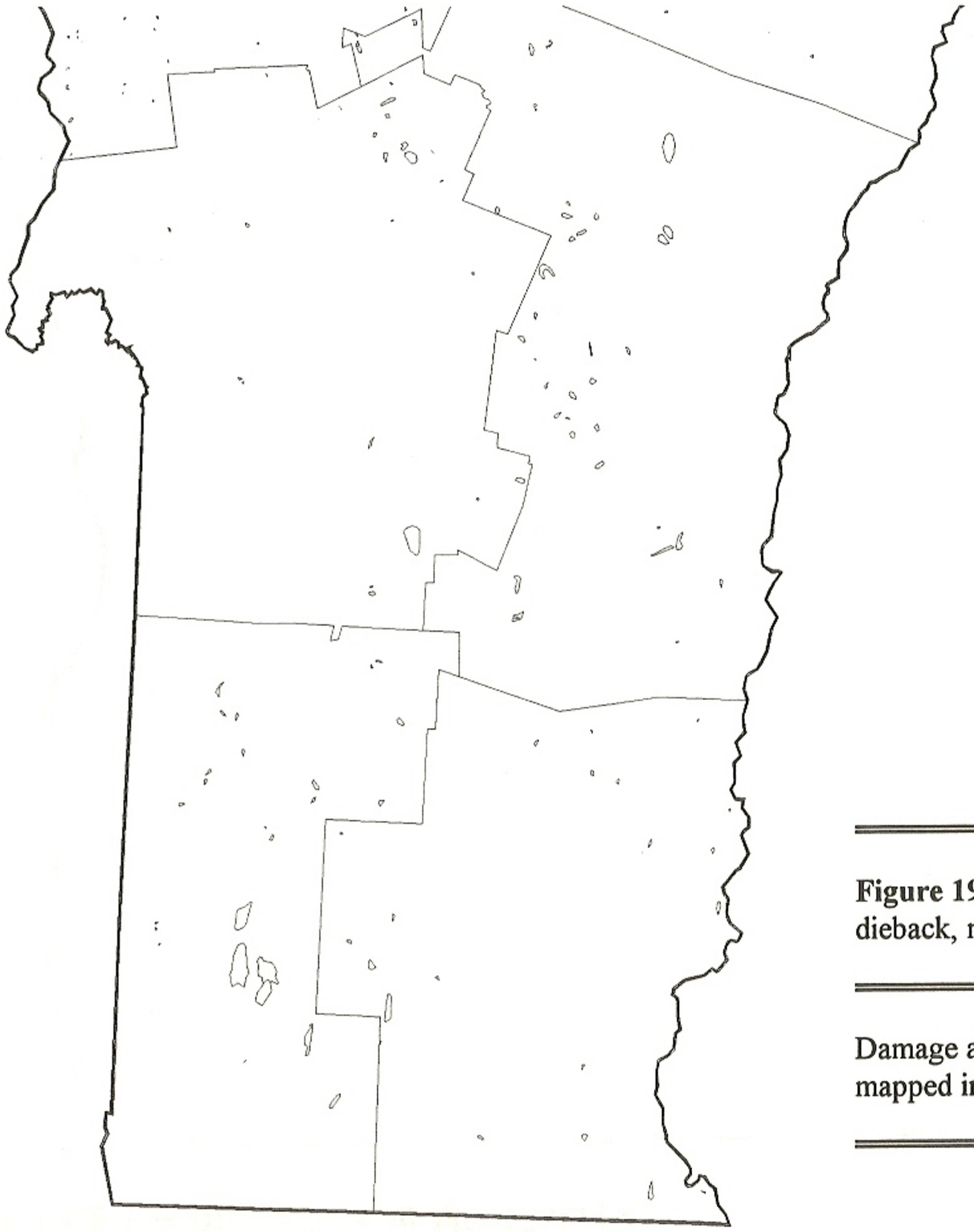
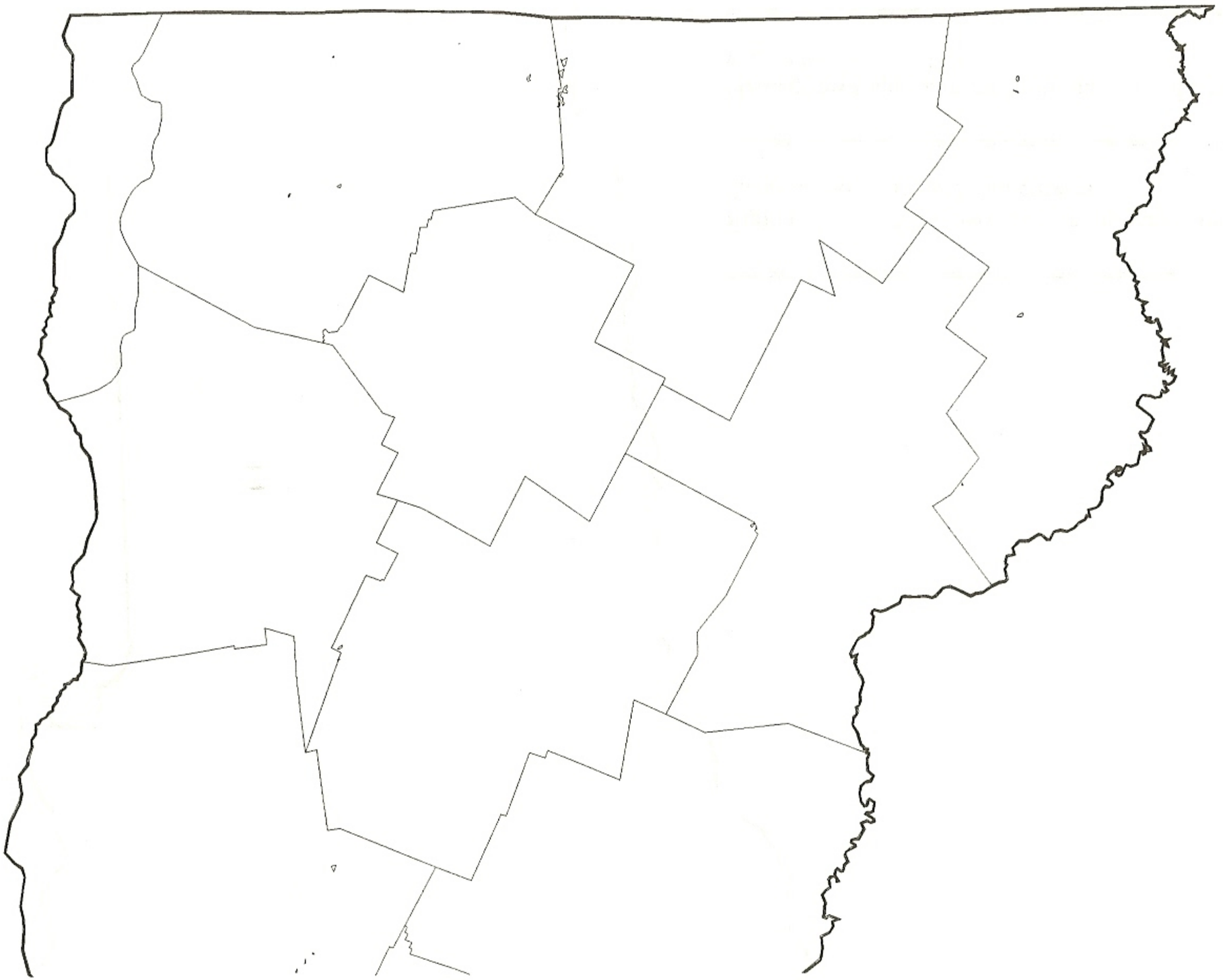


Figure 19. 1995 hardwood chlorosis, early color, dieback, mortality, and thin crowns.

Damage area approximate location. Total damage mapped in 1995 = 41,160 acres.

SPRUCE/FIR DIEBACK and MORTALITY



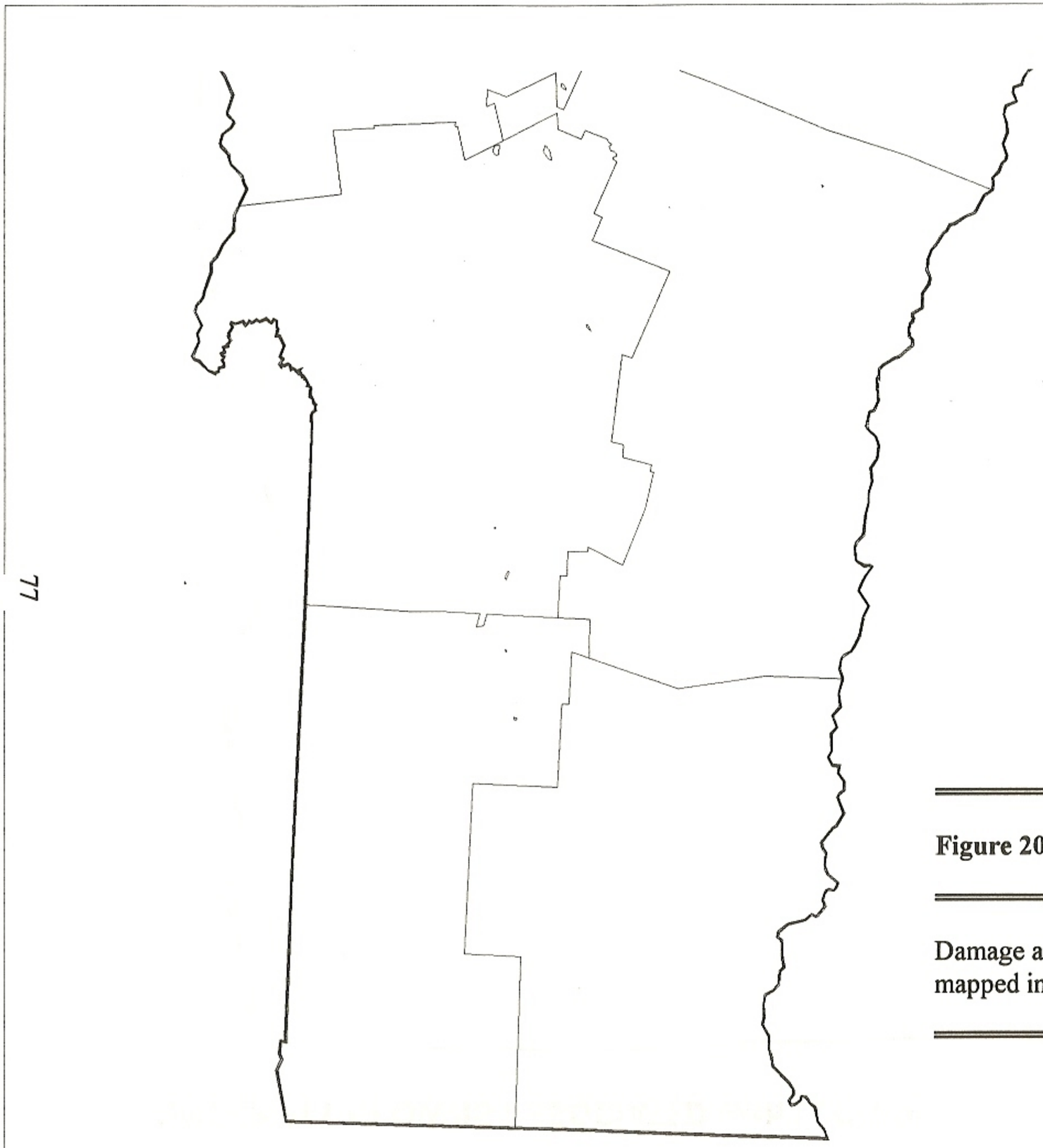
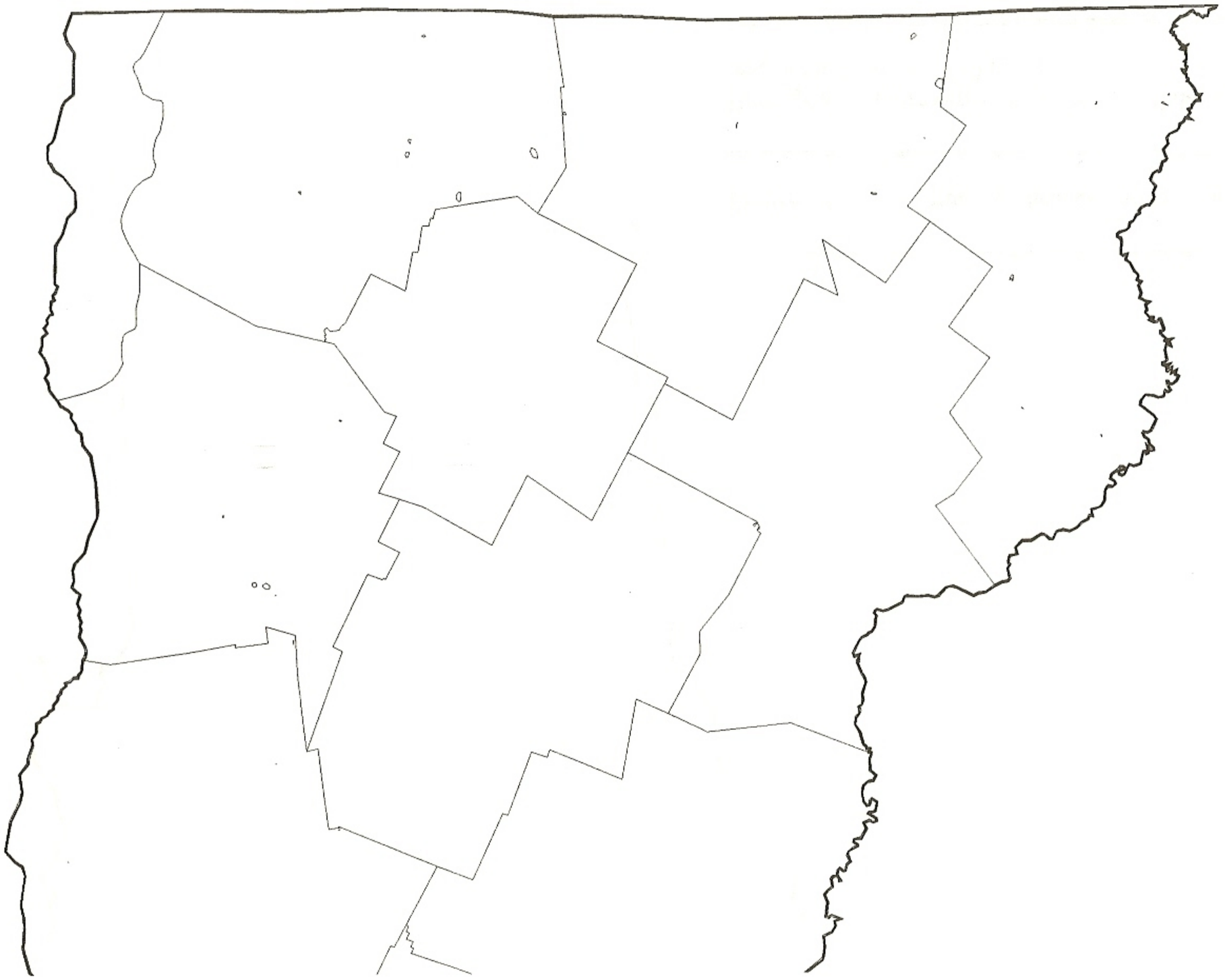


Figure 20. 1995 spruce/fir dieback and mortality.

Damage area approximate location. Total damage mapped in 1995 = 1,710 acres.

UNTHRIFTY CROWNS ASSOCIATED with LOGGING



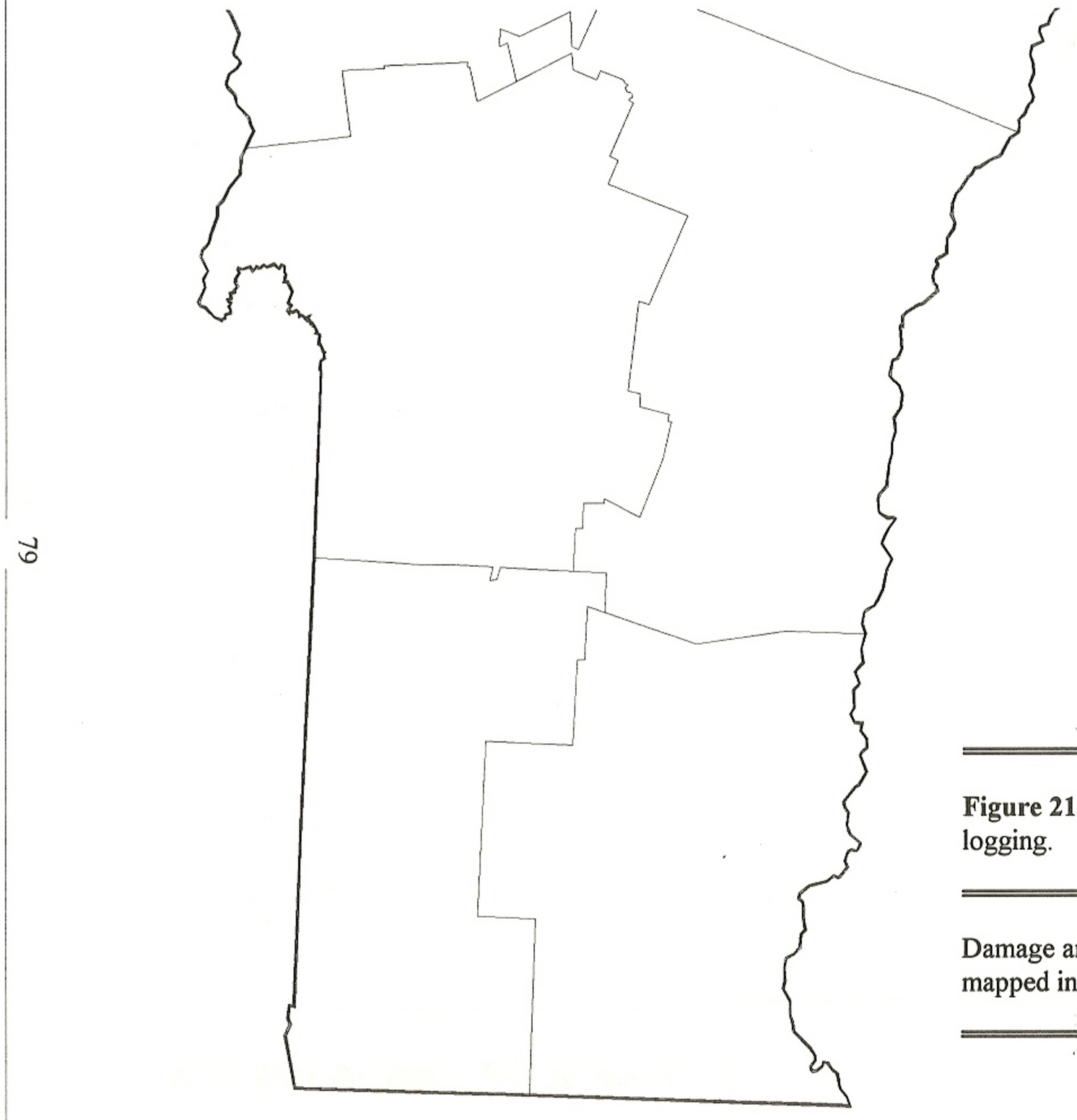
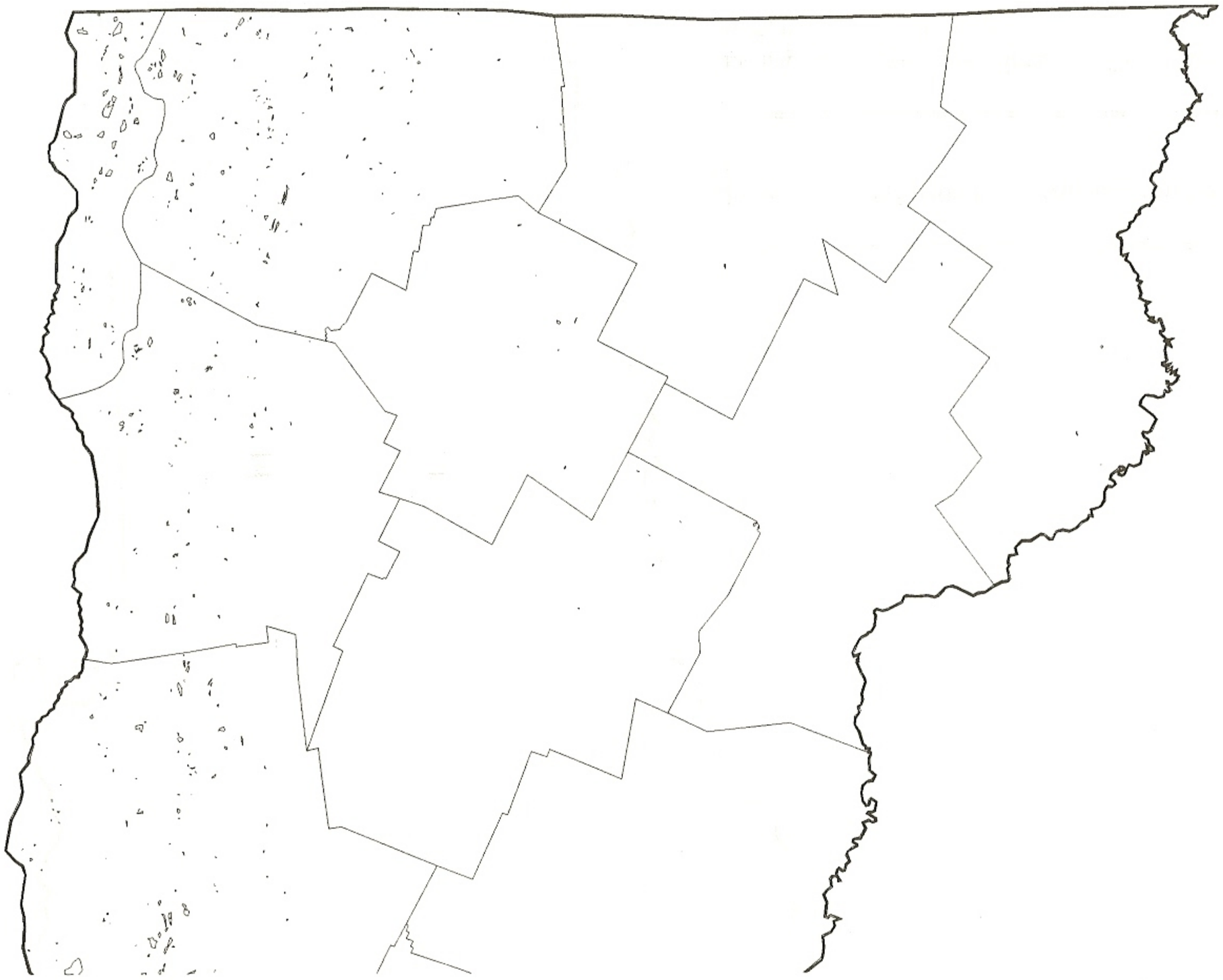


Figure 21. 1995 unthrifty crowns associated with logging.

Damage area approximate location. Total damage mapped in 1995 = 1,440 acres.

WET SITE DIEBACK and MORTALITY



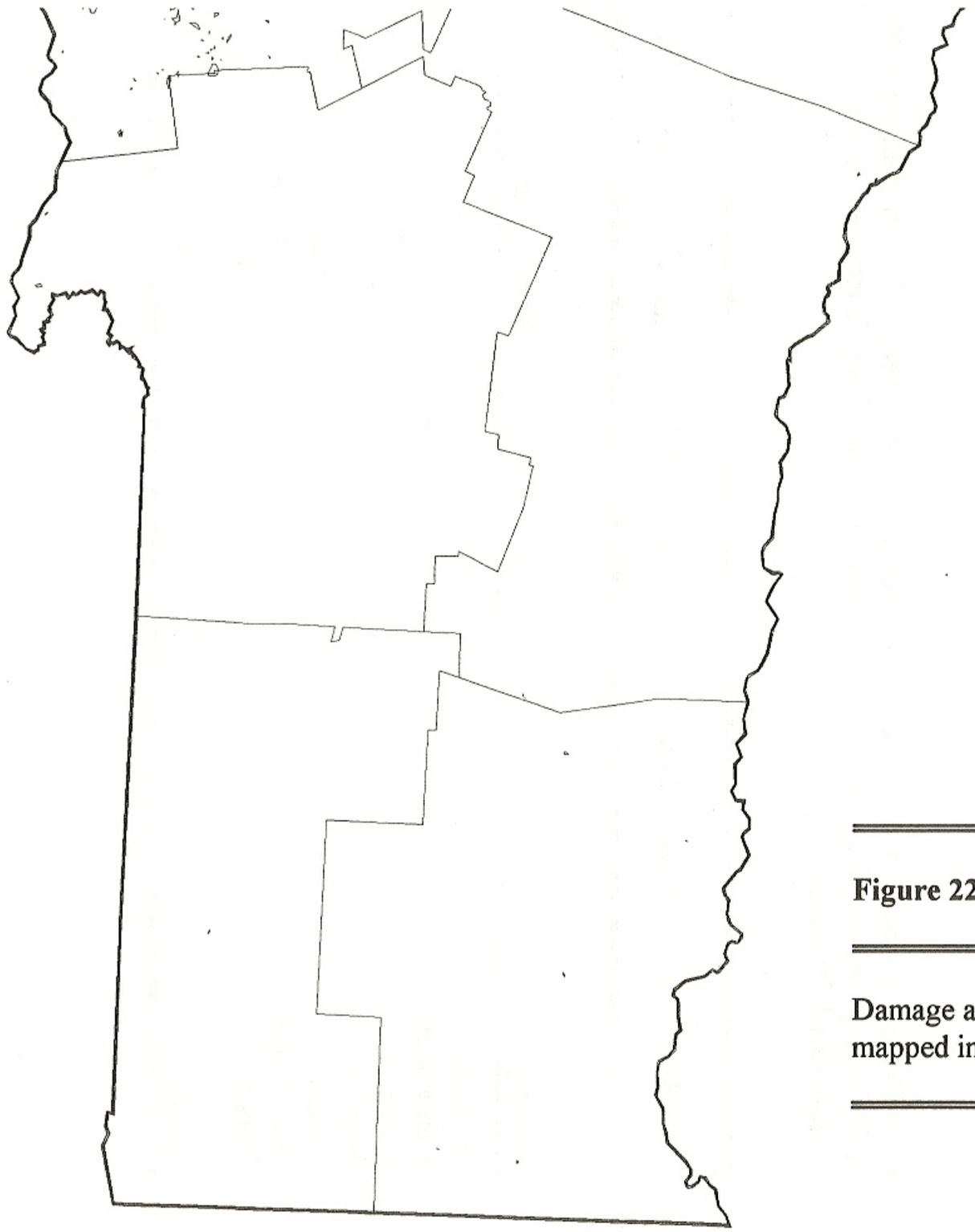


Figure 22. 1995 dieback and mortality due to wet site.

Damage area approximate location. Total damage mapped in 1995 = 10,170 acres.

Table 17. Mapped acres of spruce mortality in 1995.

County	Total Acres
Addison	155
Bennington	44
Chittenden	6
Essex	176
Franklin	184
Orleans	506
Rutland	555
Washington	63
Windsor	21
Total	**1710**

Unthrifty Hardwood Crowns associated with logging activities were aerially mapped on 1440 acres (Table 18, Figure 21), compared to 860 acres in 1994. The difference may be from dry conditions, or from variability in mapping.

Table 18. Mapped acres of unthrifty crowns associated with logging activities in 1995.

County	Total Acres
Addison	30
Chittenden	230
Essex	150
Franklin	570
Orleans	440
Washington	10
Windham	10
Total	**1440**

Wet Site dieback and mortality from wet site conditions were mapped on 10170 acres compared to 9670 acres in 1994 (Table 19, Figure, 22). Additional mortality is expected in 1996 because shallow rooted trees on wet sites were stressed by 1995 drought conditions.

Table 13. Mapped acres of dieback and mortality due to wet site in 1995.

County	Damage Pattern		Total Acres
	<30% of Trees	>30% of Trees	
Addison	2110	1670	3780
Bennington	0	10	10
Caledonia	0	10	10
Chittenden	320	900	1220
Essex	0	40	40
Franklin	510	1680	2190
Grand Isle	650	1760	2410
Lamoille	0	100	100
Orleans	0	30	30
Rutland	100	100	200
Washington	0	50	50
Windham	30	50	80
Windsor	0	40	40
Total	**3730**	**6440**	**10170**

Wind Damage from heavy microburst windstorms on July 15 and 26, and August 12 led to areas of blowdown in Bennington, Rutland, and Windham Counties. Although only 90 acres were mapped during aerial survey, the damage area is known to be larger. Blowdown areas were difficult to detect from the air. In Jamaica, Wardsboro, Newfane, Dummerston, Townshend, and Stratton, damage was mostly to white pine from the July 15 storm. Snapped trees were invaded by pine engravers and bluestain within two weeks. In Manchester and Sunderland, damage from the July 15 storm occurred to a variety of ornamental and woodlot species in the Batten Kill valley, particularly willows, and large, old trees. Larger areas of hardwood blowdown occurred on the west slope of the Lye Brook wilderness area. Further north, most of the damage was to hardwoods including damage from the July 26 storm in Stockbridge and Royalton, and from the August 12 storm in Chittenden. Salvage sales were initiated in some of the blowdown areas.

Heavy winds in October and November (up to 81 MPH in Cambridge according to WCAX) blew down trees over a widespread area of northern Vermont. There were only a few small areas of known heavy damage, mostly white pine and spruce in Lamoille County. This consisted of 30 acres of white pine and Norway spruce in the Stowe Village Forest, many of which were broken or uprooted. A 10-acre forest in Cambridge that contained large white pine, red spruce, and some hardwoods, was similarly damaged. Another 5 acres of recently thinned white pine in Cambridge was flattened by the heavy winds.

Winter Injury to Red Spruce caused only occasional light damage. Dieback remains low in plots established to monitor the impact of widespread winter injury in 1993 (Figure 23).

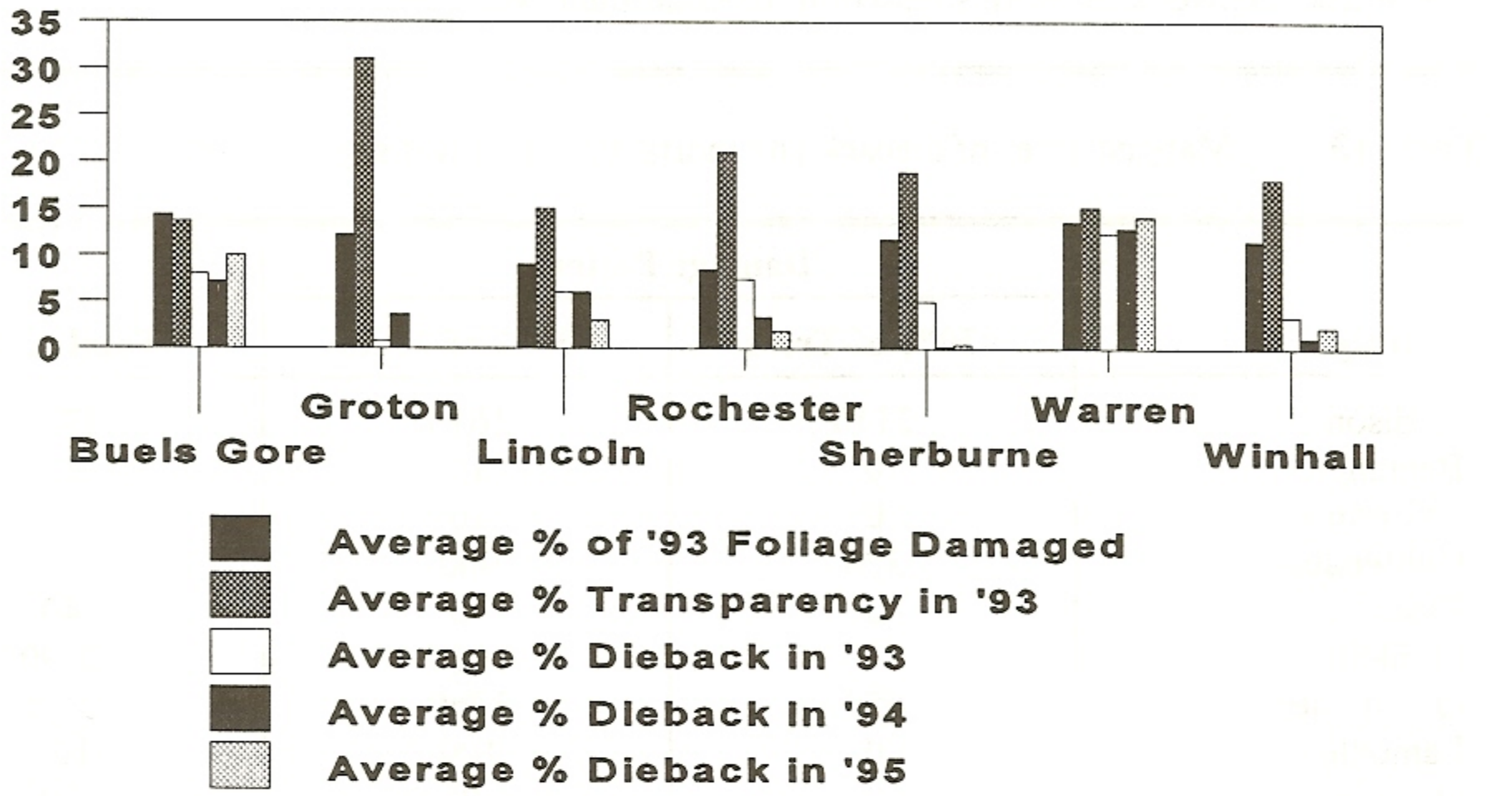


Figure 23. Average percent of foliage damaged by winter injury and foliage transparency in 1993 and percent dieback in 1993 through 1995 on live red spruce from seven plots established to assess the winter injury impact.

Wound size was related to the amount of discoloration and decay 15 years after wounding according to a study of logging wounds on sugar maple, completed in 1995. Eighty percent of the trees with at least 20% of the circumference of the stem wounded had decay. None of the trees with only 10% of the circumference wounded were decayed.

OTHER DIEBACKS, DECLINES, AND ENVIRONMENTAL DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Ash Dieback			See narrative.
Birch Decline			See narrative.
Drought			See narrative.
Fertilizer Injury	Balsam Fir	Dorset	Causing lower branch browning on ornamental.
Fire		Addison, Windham & Windsor Counties	Mapped on 80 acres.

OTHER DIEBACKS, DECLINES, AND ENVIRONMENTAL DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Frost Damage	Balsam Fir	Rutland County	Very occasional light damage from 5/4 frost. Elsewhere, not seen for the first time since 1989.
Hardwood Decline and Mortality			See narrative.
Heavy Seed			See narrative.
Hemlock Decline			See narrative.
Improper Planting	Arborvitae	Clarendon	3/4 of trees in windbreak dying from improper planting depth, and leaving wrappings on the root ball.
	Many	Throughout	Planting too deep remains the most common problem. Girdling roots also widely observed.
Larch Decline	Tamarack	Northeast Kingdom	Remains common in the Northeast Kingdom, but rare elsewhere. However, larch decline is expected to increase following heavy defoliation by larch casebearer. Larch is particularly vulnerable to dry conditions because of its shallow rooting.
Lightening	Sugar Maple	Shrewsbury	A dark, narrow ring in the outer sapwood of a sugar maple stem, which extended throughout the stem, is thought to have been a lightening ring.
Maple Decline			See Hardwood Decline and Mortality.
Mechanical Injury			Frequent damage to ornamentals, often leading to dieback and decline. Use of mulch would prevent some of the damage by lawnmowers and weedwhackers.

OTHER DIEBACKS, DECLINES, AND ENVIRONMENTAL DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Nutrient Deficiency	White Spruce	Dummerston	Dry conditions may have contributed to unusually severe chlorosis of current foliage on young Christmas trees.
Ozone Injury			Not observed.
Salt Damage			Less salt damage than normal because of the mild, snow-free winter of 1994-95.
Snow Breakage			Not observed.
Spruce Mortality			See narrative.
Wet Site			See narrative.
White Pine Needle Blight			Chlorosis and needlecast of previous years' needles occurred on scattered trees early in the season. The cause was undetermined.
Wind Damage			See narrative.
Winter Injury	Black Walnut	Springfield	Winter injury from the winter of 93-94 responsible for tree mortality in 1995.
	Conifers	Throughout	Only occasional light damage in 1995. See Winter Injury to Red Spruce.
Wounds			See narrative.

TREND IN FOREST CONDITION

This information about forest condition is from North American Maple Project plots.

Sugar Maple

The percent of overstory sugar maple trees on NAMP plots in a healthy condition has remained constant over the past seven years, with 90% of trees on all Vermont plots considered healthy in 1995 (Figure 24).

Sugar maple tree foliage was less dense (more transparent) this year than in 1994 (Figure 25). Thirty-eight percent of the plots had light to moderate defoliation by mid-season. Six of the forty plots (15%) had light to moderate defoliation by Bruce spanworm. Drought symptoms were observed on some of the plots. And 10% of the plots had light to moderate seed crops.

New mortality has remained low over the past 7 years, with only 0.5% new mortality on overstory trees in 1995. A few plots had wind damage that broke tree boles, accounting for some of the newly dead trees. An additional 0.3% of trees on plots were cut by owners.

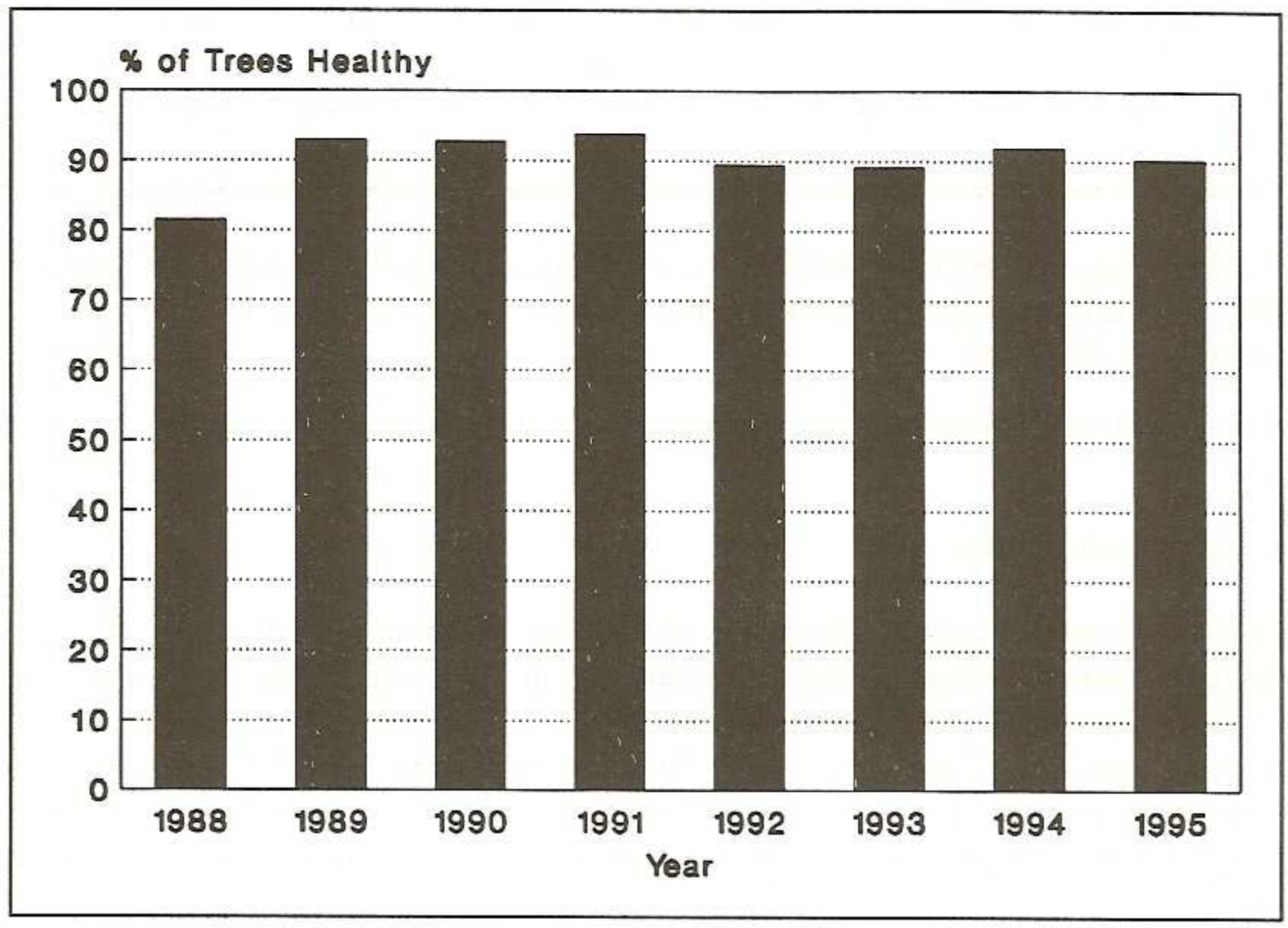


Figure 24. Percent of overstory sugar maple trees in North American Maple Project plots with ≤15% dieback (considered healthy), 1988-1995.

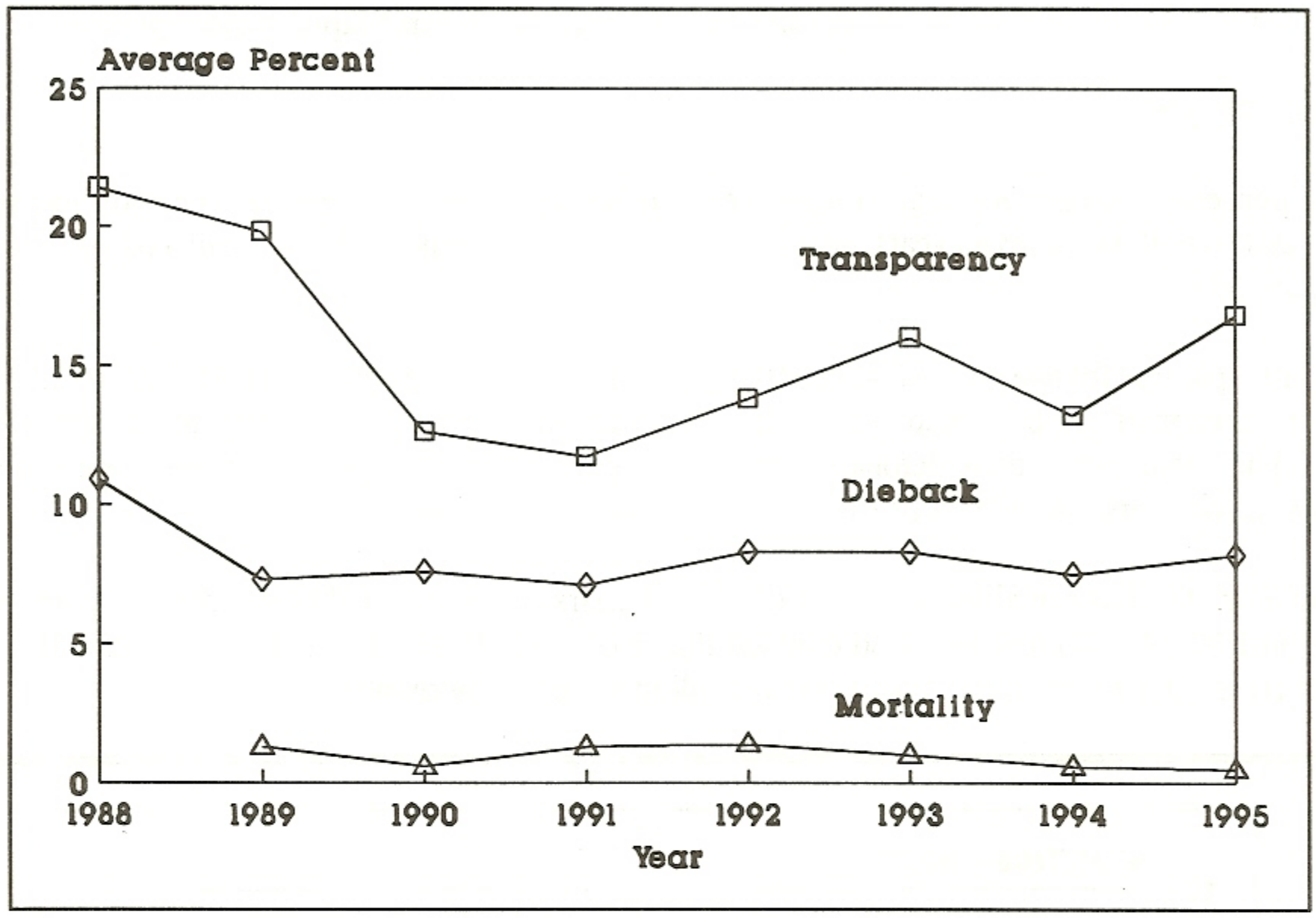


Figure 25. Average percent transparency (amount of light coming through foliage), dieback and new mortality of overstory sugar maple trees on the North American Maple Project plots, 1988-1995. Data are from 1,964 trees.

Other Hardwood Species

Other hardwood species are also monitored annually on Vermont NAMP plots. Ash, yellow birch, red maple and beech trees all improved in condition in 1995 (Figure 26). Over 90% of overstory trees of each species were in a healthy condition (≤ 15% dieback). Average dieback was less than 8% for each species, with no seriously declining trees observed (>55% dieback). Transparency ratings ranged from 20% (red maple) to 25% (beech). These transparency ratings are higher than sugar maple (16.8%). In general, sugar maple tends to have more dense foliage than other hardwood species.

New mortality was low this year, with no new dead red maple, yellow birch or ash overstory trees, and 0.6% new dead beech trees. An additional 0.9% of yellow birch was cut.

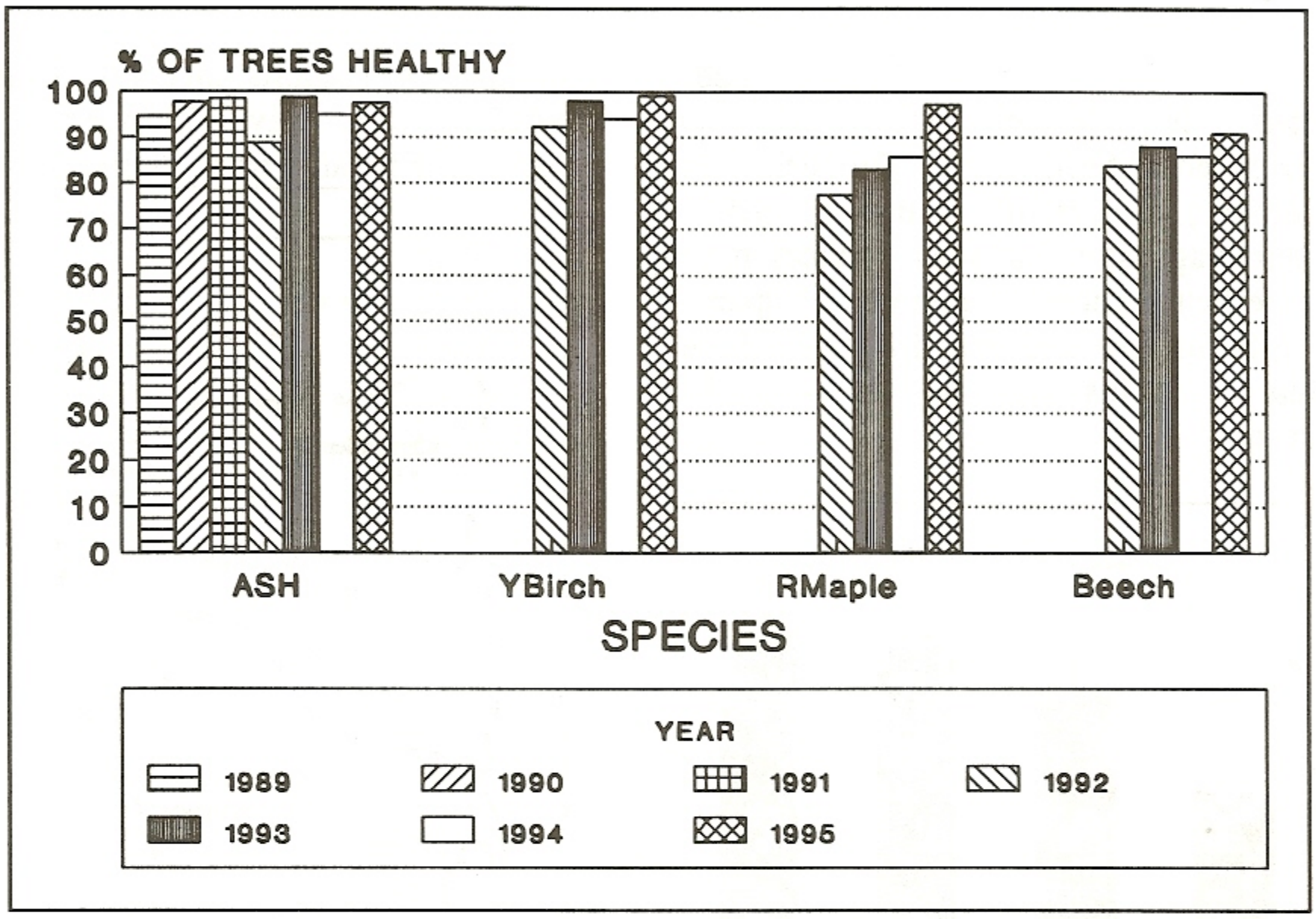
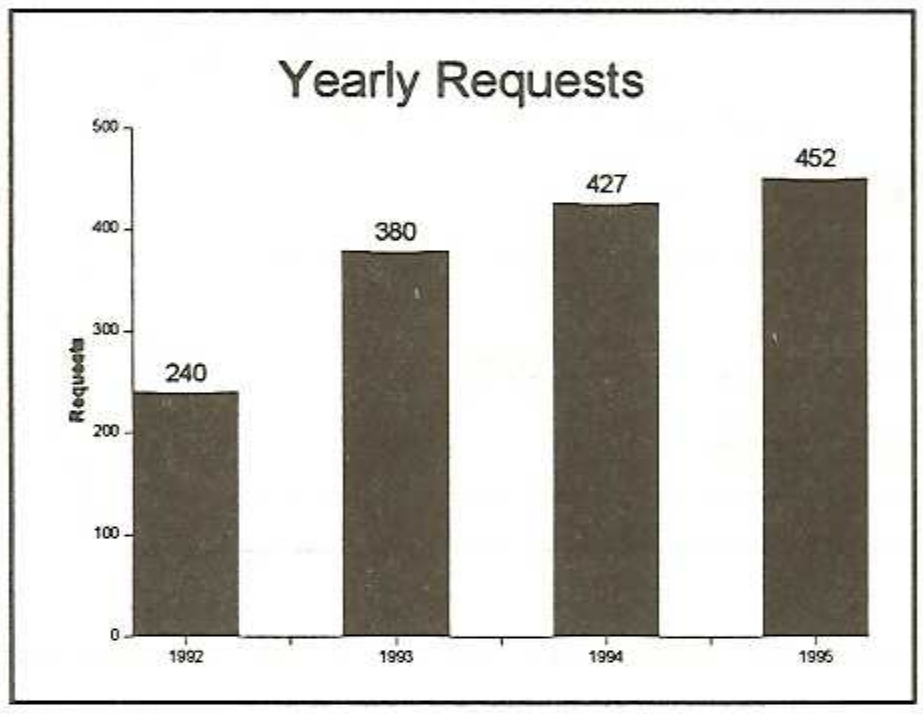


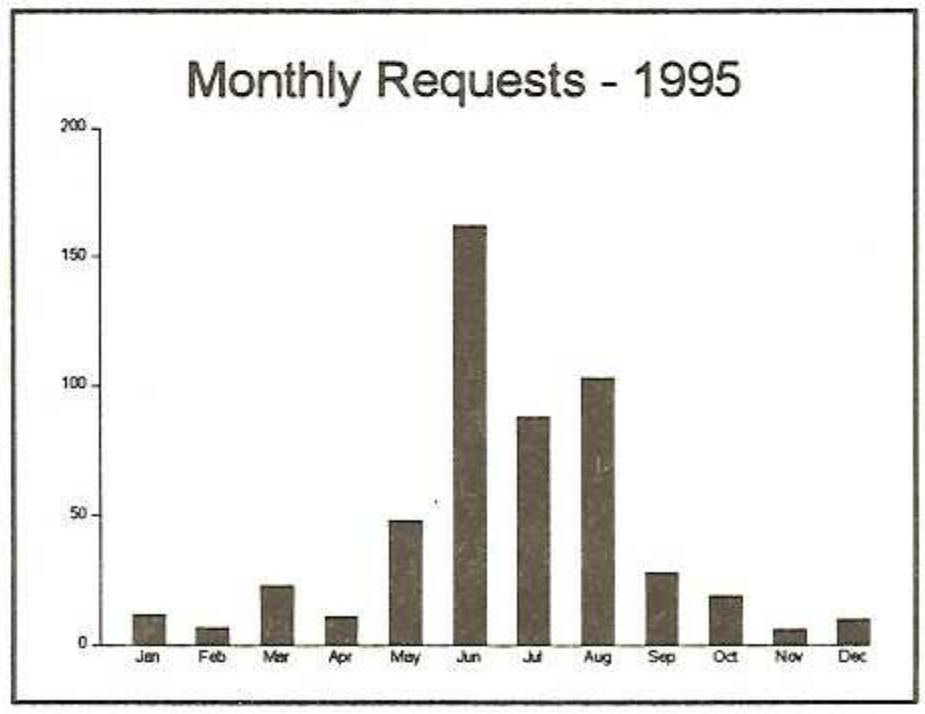
Figure 26. Percent of overstory white ash, yellow birch, red maple and beech trees in the North American Maple Project plots with ≤ 15% dieback (considered healthy), 1989-1995.

FOREST BIOLOGY LABORATORY - 1995

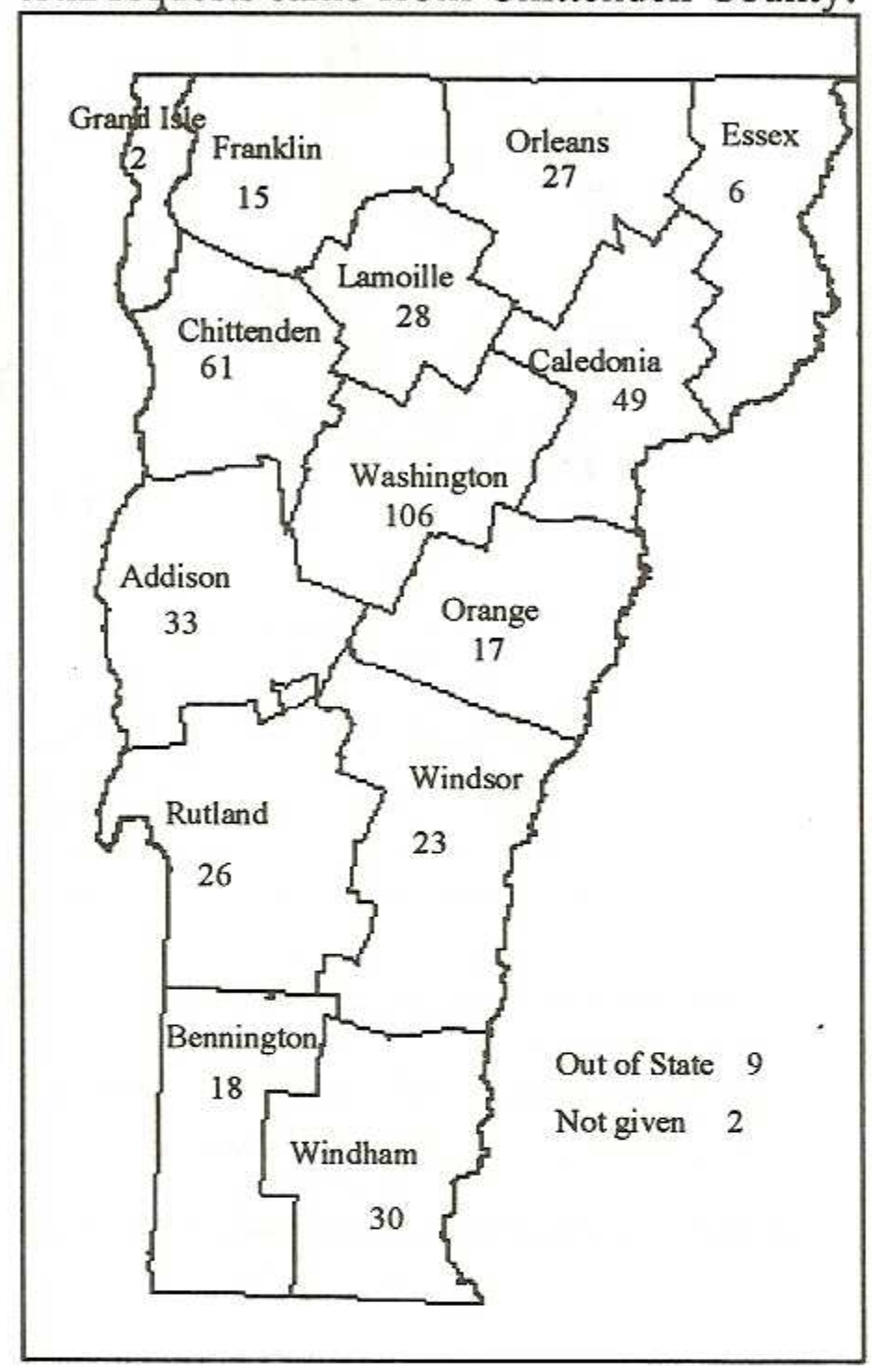
The Forest Biology Lab, located in Room 141 of the Environmental/Agriculture Building in Waterbury, is in its fifth year of existence. As our diagnostic and other services have become better known, numbers of requests for information and identifications have increased. This year we received 452 requests.



As you might expect, numbers of requests increase during spring and summer months. Peak months were June, July and August.



Insect specimens, plant disease samples, and requests for information come from throughout the State. About 23% of the total number of requests this year came from Washington County. Thirteen percent of total requests came from Chittenden County.



About 80% of the questions we received involved insects, disease or damage associated with trees and shrubs, while 20% involved non-pests, beneficials, requests for educational information, and other miscellaneous requests.

In addition to identifying unknowns, or acting as liaison when samples need to be sent elsewhere for identification, we are building reference collections of specimens (dry and wet) and photographs of insects, diseases, and damage.

PROCEDURES FOR SENDING SPECIMENS TO THE FOREST BIOLOGY LAB

When sending samples to the Forest Biology Lab, please follow these guidelines:

Send fresh specimens.

Send any information that will aid in the diagnosis. If you do not use the diagnostic form provided by the lab, be sure to include a complete description of the problem, as well as the name of the host plant. Cultural aspects that may be of importance should be described.

Sending specimens:
Try to send several plants or leaves that show a range of symptoms. If insects are present, collect several. This allows us to mount, preserve, or photograph a series and/or to dissect some specimens (which is sometimes necessary for identification.)

a. **Insect specimens:** Live insects can be sent in containers with host foliage. Insects preserved in fluid are sometimes more difficult to identify because their colors change, and many diagnostic keys involve color patterns as aids in identification. Otherwise, immatures and other soft-bodied insects should be placed in 70% ethyl alcohol. (Rubbing alcohol may work in a pinch). Adults must be packaged carefully so that they are not crushed in the mail.

b. **Plant specimens.** Leaves can be laid flat between pieces of cardboard or rigid paper which are then wrapped in newspaper, wax paper, or plastic. Send leaves in a padded envelop or box. If you are able to insure rapid delivery of your specimen to the lab, you may be able to enclose the specimen in a plastic bag (moist paper towels are NOT needed) for transport. Entire plants can be dug from the soil, with roots wrapped in a plastic bag. With twig, branch and stem samples, try to include portions of the plant where diseased and healthy tissues meet. Place these in a plastic bag, or wrap in wax paper or newspaper. Mail in crush-proof containers.

Send specimens early in the week if possible.

NEW REFERENCE AVAILABLE

Field Guide to Common Insect Pests of Urban Trees in the Northeast

A new manual has been prepared by the Vermont Department of Forests, Parks and Recreation to provide tree health managers with a means for field identification of some common insect pests associated with trees in urban settings, with an emphasis on the behavior and the habitat needs diagnostic of each insect. A total of 46 insects and mites are described, and there are 86 color plates. The guide is made up of a series of individual leaflets in a field-sized 6-ring binder. The leaflets are numbered and tabulated separately for each tree host species, allowing further leaflets to be incorporated. This publication is available for $15. For more information about the field guide contact:

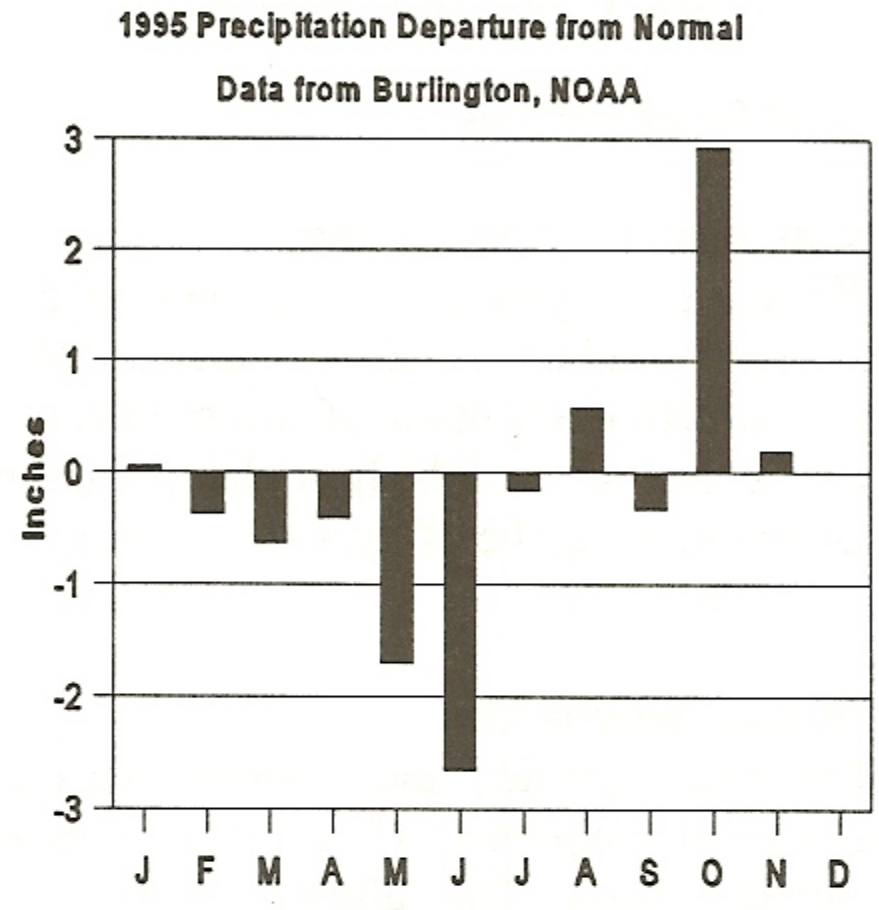
Tess Greaves
Vermont Department of Forests, Parks and Recreation
103 S. Main Street
Waterbury, VT 05671
Phone: (802) 241-3678

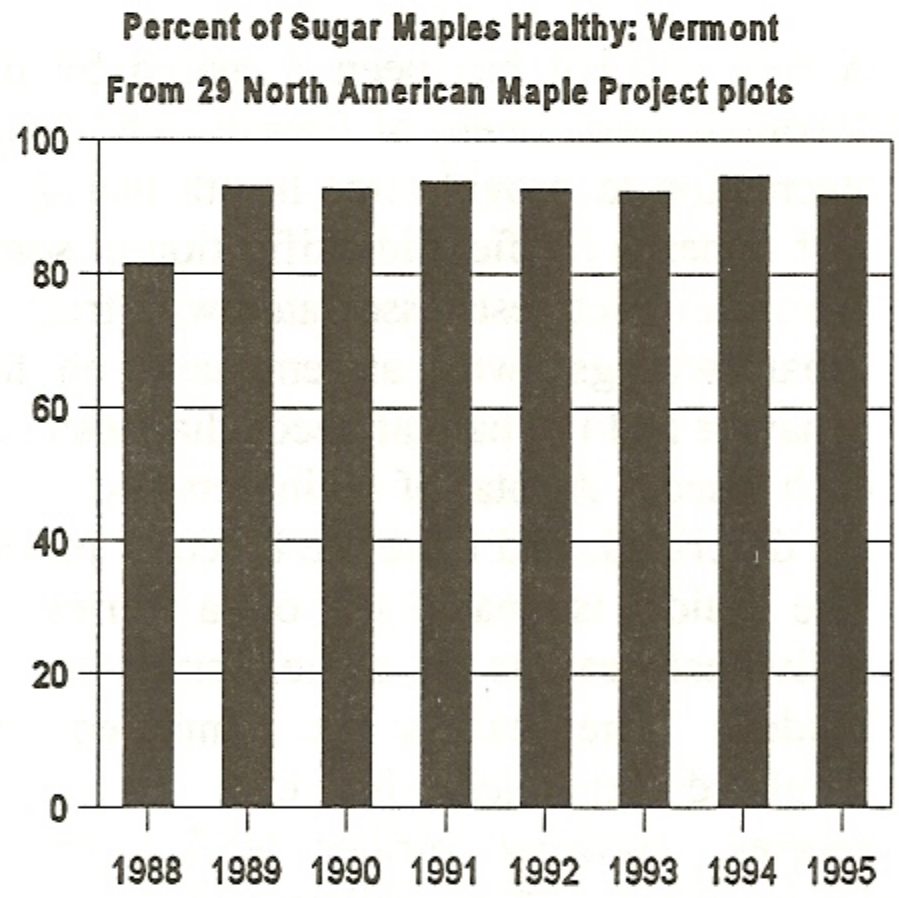
HEALTH OF SUGAR MAPLE IN VERMONT - 1995

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.

General Condition of maples was slightly less healthy than in the past six years, according to the North American Maple Project (the international effort to follow changes in maple health). Although forest pest populations remained low, the lack of rain early in the growing season led to thinner crowns, and more visible dieback.





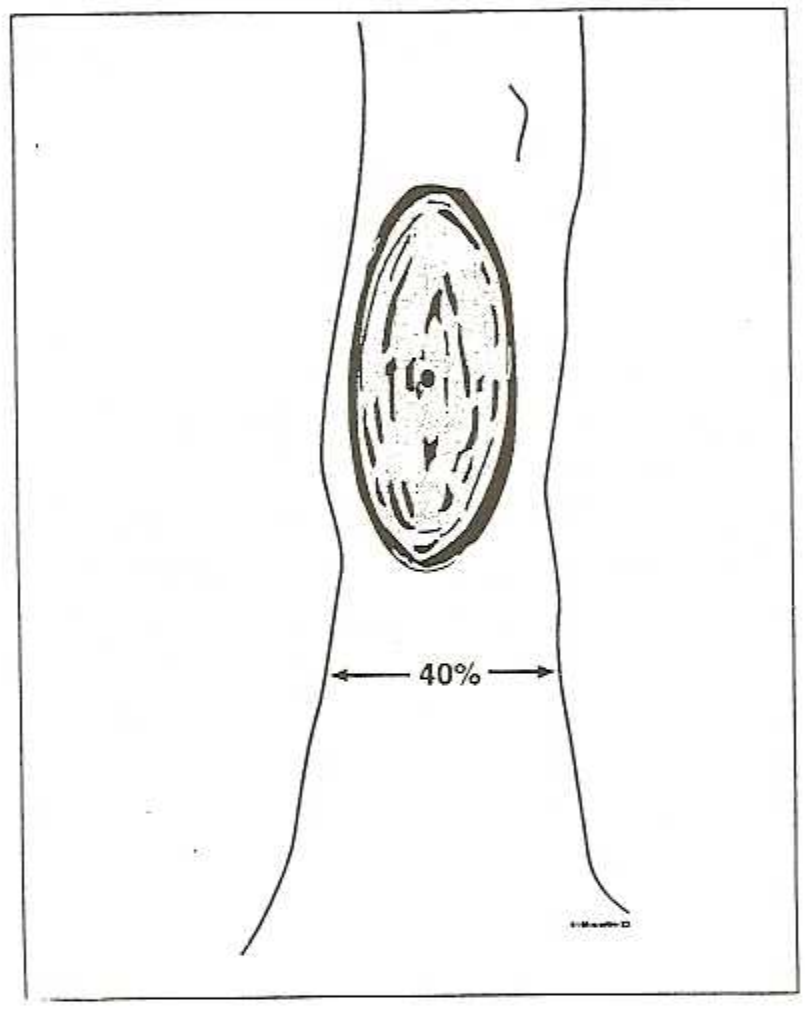
Drought was the major tree stressor in 1995. Rainfall was particularly low early in the growing season. By the end of July, total precipitation for the year was nearly six inches below average in Burlington, according to data from the National Weather Service. In August, rain was above average in northern Vermont, but in southern counties, it remained dry until late September.

When under drought stress, trees produce smaller leaves and less sugar. Fine roots die, diameter and height growth are reduced, and less food is stored. This leads to fewer leaves the following year, again resulting in lower sugar production, reduced growth, and less food storage. Because this cycle can continue for several years, symptoms may not show up until two or three years after a drought, and it can take several years for trees to recover. During this period of recovery, trees are particularly vulnerable to additional stresses.

Trees growing on poor sites are most affected by drought. These include ledge, extremely coarse soils, and wet sites.

Because drought reduces diameter growth, most trees have been closing tapholes and replacing tappable wood more slowly. Normal tapping levels may not be sustainable on drought stressed trees. It is especially important to tap conservatively and limit wounds to the stem and roots this year.

Wounds to trees cause discoloration and decay, decrease the amount of tappable wood, and reduce tree health. A study of logging wounds on sugar maple, completed in 1995, found that the amount of discoloration and decay 15 years after wounding was related to wound size. Eighty percent of the trees with at least 20% of the circumference of the stem wounded had decay. None of the trees with only 10% of the circumference wounded were decayed. When thinning a sugarbush, trees with wounds over 20% should be discriminated against. (You can see about 40% of the circumference at a time, so 20% is half of what you can see).



A wound larger than 20% of the circumference.

Maple Insect populations were generally low in 1995. Forest tent caterpillar, saddled prominent, and maple leaf cutter were occasionally observed, but no significant damage was reported.

Bruce Spanworm, the green inchworm which defoliates maples in May and early June, was more widespread than in 1994, but defoliation was less severe. Almost all of the damage was restricted to lower branches and understory trees.

Pear Thrips populations remained extremely low, with only occasional light damage detected. Soil samples were taken again in the fall of 1995 to indicate how high populations will be next spring.

The relationship between the number of thrips in the soil and damage is complex. However, damage is more likely in sugarbushes with high numbers. Sugarmakers who wish to sample for pear thrips themselves may do so using methods described in the *Sugarmaker's Guide to Pear Thrips Monitoring,* recently produced by the University of Vermont.

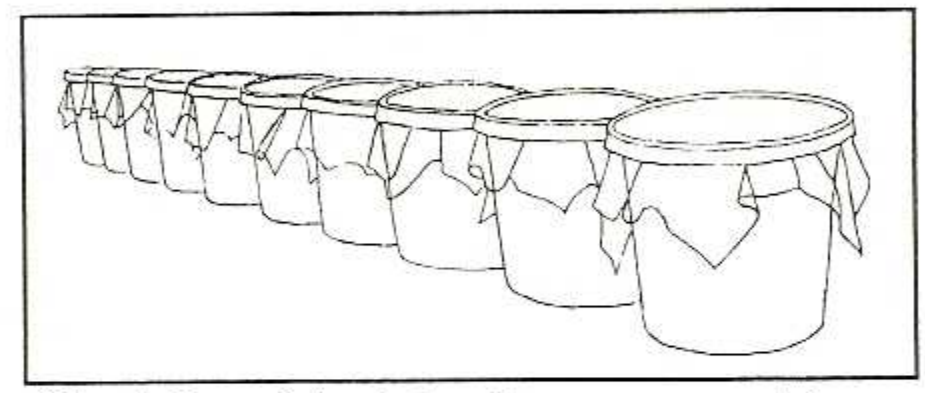


Fig. 5. Pear thrips induced emergence containers.

From the *Sugarmaker's Guide to Pear Thrips Monitoring*

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	447-7106/362-5533
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 1995
REPORTED BY THE
DEPARTMENT OF FORESTS, PARKS AND RECREATION

INTRODUCTION

A survey is conducted annually on nearly 1800 acres of Christmas tree plantations in North-Central Vermont as part of the Scleroderris quarantine. Another 620 acres in Southern Vermont were added to the survey this year. Observations are made on all pests during this survey. In 1995, pest incidence was evaluated on the following tree species in northern Vermont: balsam fir - 440 acres, Fraser fir - 150 acres, Scots pine - 340 acres, white pine - 335 acres, white spruce - 165 acres, blue spruce - 295 acres, and Douglas-fir - 80 acres. Acreage comparisons reported for Christmas tree problems refer to changes in these surveyed plantations and are not statewide totals.

INSECTS

Balsam Gall Midge populations increased this year and were found lightly infesting 102 acres in northern Vermont. Damage was especially notice-able where the midge is commonly found even in light years, with a few individual trees per plantation that were heavily infested. Damage is likely to increase in 1996.

Balsam Shootboring Sawfly has been exhibiting even-year population peaks while steadily increasing overall. It was reported infesting 441 acres in northern Vermont compared to 655 acres in 1994 and 329 acres in 1993. This pest remains to be the single most prevalent on fir Christmas trees throughout the native range of balsam fir in northern Vermont.

Unlike 1994, most of the damage this year was to balsam fir rather than fraser fir. Balsam fir had light damage to 229 acres

and moderate damage to 94 acres while fraser fir had light damage to 80 acres and moderate damage to 36 acres. If some of the larvae overwinter a second year, as suspected, causing the even-year peaks, then the later maturing larvae from fraser fir are more likely to spend two years in the ground than the earlier maturing larvae from balsam. This would mean that most of the adults seen this spring originated from balsam fir and would explain the more abundant damage to that host this year.

Despite the overall trend of more damage to balsam this year, within moderately-infested plantations, shoot damage to fraser (17% of branches damaged) was similar to that on balsam (19% of branches damaged) and was higher than the 6% and 10% for balsam and fraser, respectively, recorded for the same plantations in 1994. Percent of branches with at least one bud killed ranged up to 37 for fraser and 36 for balsam, which is also higher than the 30% and 14% reported in 1994 and when the insect had a choice between various sources of balsam and fraser within the same block, fraser fir was preferred. A second year of damage assessments to John Ahren's seed-source planting in Woodbury revealed that fraser fir and fralsam (a fraser-balsam cross) had by far the most damage while Canaan (another fraser-balsam cross) had the least damage. All of the balsam in this block had less than half the damage of fraser and fralsam. The eggs or young larvae do not survive well on early-breaking balsam fir (personal observations), hence the selection pressure for late-breaking balsams or frasers. The apparent resistance of Canaan fir was a surprise and may relate to foliar chemistry of this particular cross.

Even though the spring of 1995 was cold, with slow bud development, adult sawflies began emerging the end of April, with moderate numbers on May 1 (at 0 growing degree days {GDD}) and abundant numbers on May 4 (3 GDD) and 9 (10 GDD) in Elmore, VT. Balsams here broke bud May 15, just after adult sawflies disappeared. This confirmed that the sawflies are laying eggs through the unbroken bud sheath.

Three insecticides were tested on May 2 for control of this insect: Dimilin 25W (an insect growth regulator), Merit 75W (a new systemic) and Lorsban 4E. Material was applied to foliage of individual trees in Elmore that had heavy past damage, using a back-pack sprayer. Dimilin and Merit failed to provide any control. Bayer, the manufacturer of Merit, no longer recommends foliar treatments for this product. However, soil injections are worth trying in the future. Fall soil injections of Merit beneath birch trees have been shown to control birch leaf miner (a sawfly) the following spring. A single application of Lorsban gave a 30% reduction in shoot damage. Multiple applications of this material just after adult emergence will probably be necessary for decent control.

Given the current upward population trend of this insect, with higher damage in even years, **growers should expect heavier damage in 1996, especially to fraser fir.**

Balsam Twig Aphid was detected on 379 acres of fir in northern Vermont compared to 237 acres in 1994. Another 129 acres of infestation was reported for southern Vermont. Most of the damage was light, but 86 acres of moderate infestation and 35 acres of heavy infestation were recorded scattered throughout the survey region. Very few overwintering eggs could be found on shoots collected from Woodbury, Bristol and Springfield, and very few stem mothers could be found in beating surveys early this spring just after egg hatch, yet noticeable damage resulted in these surveyed plantations. Perhaps the unusually dry weather this spring led to much better than normal survival and reproduction of additional aphids. Damage appeared to be increasing in some Bennington County plantations, particularly in towns with a native balsam fir component.

Researchers at the U.S. Forest Service Experiment Station in Burlington recently documented that twig aphid injury caused a 22 percent reduction in needle area on injured shoots. This resulted in a twenty percent reduction in photosynthesis that persisted throughout the growing season. This could help explain reductions in balsam fir growth following aphid infestations that some growers have reported.

Cooley Spruce Gall Adelgid damage to Douglas fir was reported moderately infesting 40 acres. This is a decrease of about 30 acres from 1994 but severity has increased from last year. Only scattered light damage was reported in southern Vermont.

Cinara Aphids were detected lightly infesting 300 acres of white pine and balsam fir. Population clusters remained small and no obvious damage was reported.

Eastern Spruce Gall Adelgid damage to white spruce in northern Vermont increased by 20 acres from 1994, for a total of 150 acres. Another 42 acres of light to moderate damage were defected in southern Vermont. Mortality of galled shoots occurred in some plantations probably due to the dry conditions experienced this summer in conjunction with the vascular disturbance caused by the galls themselves. Similar observations were made throughout New England. This is the first time in the survey that such injury to white spruce has been reported.

European Pine Sawfly larvae were seen on Scots Pine in West Windsor.

Pales Weevil damage was more widespread this year. Noticeable feeding injury by this large weevil was observed on 77 acres of white and Scots pine.

Pine Leaf Adelgid injury to white pine shoots was reported on 62 acres, 50 acres of which were lightly infested. Incidence of this pest was about half of that in 1994. Flagging of lateral shoots occurs but is difficult to record in plantations because shearing removes many of the injured shoots.

Pine Needle Midge populations increased to 170 acres in 1995, 155 acres of which were reported as light injury. One 15-acre plantation of Scots pine in Wolcott was reported with heavy infestations. At this site, at least 50 percent of the needles were stripped from current shoots of the upper crowns. Look for needles that bend downward from the fascicle and then droop. Symptoms begin to show around early August.

Introduced Pine Sawfly injury to Scots and white pine was reported on 98 acres, with only light populations. Occurrence of the pine sawfly in 1995 was less frequent than in previous surveys.

Pine Bark Adelgid was seen on white and Scots pine in scattered locations but was not causing noticeable damage.

A Pine Fascicle Mite was unusually heavy 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 Needle Scale was observed in moderate numbers of occasional branches in a Scots pine plantation in Shaftsbury.

Pine Spittlebug on Scots and white pine was observed throughout mixed plantations of pine and fir in northern Vermont for a total of 200 acres. One Scots Pine plantation (25 acres) in Danville had heavy populations but no shoot mortality, while another in West Windsor had very high populations resulting in scattered shoot mortality.

Pine Shoot Borer injury to Scots and white pine was commonly reported throughout the survey region in 1995. Larvae of these moths all have the same feeding patterns but are from at least three different genera: The Eastern Pine Shoot Borer, *Eucosma gloriola*; European Pine Shoot Moth, *Rhyacionia buoliana* and the Fir Coneworm, *Dyorictria abitevorella*. The fir coneworm is the only one of the three mentioned that is a pest of both fir cones and pine shoots, galls and bark. Infested shoots wilt and flag by mid-summer; this injury is conspicuous since it somewhat resembles that of the pine shoot beetle, *Tomicus piniperda.* Additional damage

to white pine caused by the Zimmerman Pine Moth (*Dioryetria zimmermani)* was detected in Bristol, Shaftsbury and Bennington, as well as spruce coneworm (*D. reniculelloides*) damage to blue spruce in Ludlow.

Pine Thrips continue to cause lightly scattered injury to Scots pine. This year, two northern Vermont plantations (26 acres) had noticeably higher populations. Very light damage was detected in a Townshend plantation.

Pine Tortise Scale was observed on individual Scots pine trees in one plantation in Barre. This insect has only been found at this site during the annual Christmas tree survey.

Red Headed Pine Sawfly caused light damage to occasional Scots pine Christmas trees in Clarendon and Bennington County.

Sawyer Beetles were responsible for light balsam fir twig mortality in widely scattered locations. One plantation in Craftsbury (15 acres) was reported with light injury. The fir trees at this site are natural regeneration, which requires thinning. Basal pruning and brush cutting without debris removal encourages this pest since its larvae brood in recently dead softwood.

Spruce Bud Moth injury to white spruce was reported for 68 acresin northern Vermont. All of this damage was light, except for 14 acres reported as moderate.

Spruce Spider Mite injury in northern Vermont was more common this year; 155 acres were reported with light injury and 10 acres were reported with moderate injury. An additional 8-acre balsam fir plantation in Starksboro that was not part of this survey was reported to have heavy damage. Populations in southern Vermont decreased somewhat compared to 1994 but heavy damage was seen on balsam and fraser fir in Bennington and Pownal and Townshend, and spruce in Rupert and Rutland. Fir as well as spruce trees are preferred by this pest. The hot, dry conditions encouraged population outbreaks, but intense rain storms such as were common this summer probably washed mites off feeding sites and helped to keep populations in check.

White Pine Weevil damage increased in 1995. A total of 464 acres of pine and spruce in northern Vermont were reported with damage this year. This is an increase of almost 200 acres from last year, but was almost equal to the amount of damage reported in 1993. White pine continues to be the preferred host with 232 acres of reported damage. Scots pine had 69 acres of damage and blue spruce had 163 acres of damage. This weevil was also one of

the more common problems on blue spruce Christmas trees in southern Vermont this year. Weevil injury rarely kills trees but more often delays marketability of the trees and leaves them misshapened.

DISEASES

A Balsam Fir Needlecast caused by *Lirula nervata* caused browning and premature needlecast in a small patch of balsam fir Christmas trees in Weston.

Cylaneusma Needlecast (formerly *Naemacyclus)* of Scots pine remains common with 276 acres of damage reported for northern Vermont compared to 176 acres in 1994. (280 acres were reported in 1993). It was observed at mostly light and moderate levels in Townshend (20 acres) but had little impact on merchantability here.

Delphinella Tip Blight of fir was reported for 185 acres of balsam and fraser fir. All of this damage was light except for two plantations: one in East Montpelier (2 acres) and one in Wolcott (14 acres) which had moderate levels of infection. Infected trees received dieback to lateral shoots as well as scattered individual needle loss. Delphinella is also the suspected cause of heavy shoot dieback on several subalpine firs in Wolcott. Abundance of this disease has increased since its first report in 1994.

Diplodia (Sphaeropsis) Tip Blight caused widespread scattered shoot mortality of pine and fir throughout northern Vermont. Frequency of this disease has increased, but extent of the injury remains light. Balsam and fraser fir were reported with 200 acres of injury. Infected shoots become resinous and often form a crook from the point of infection.

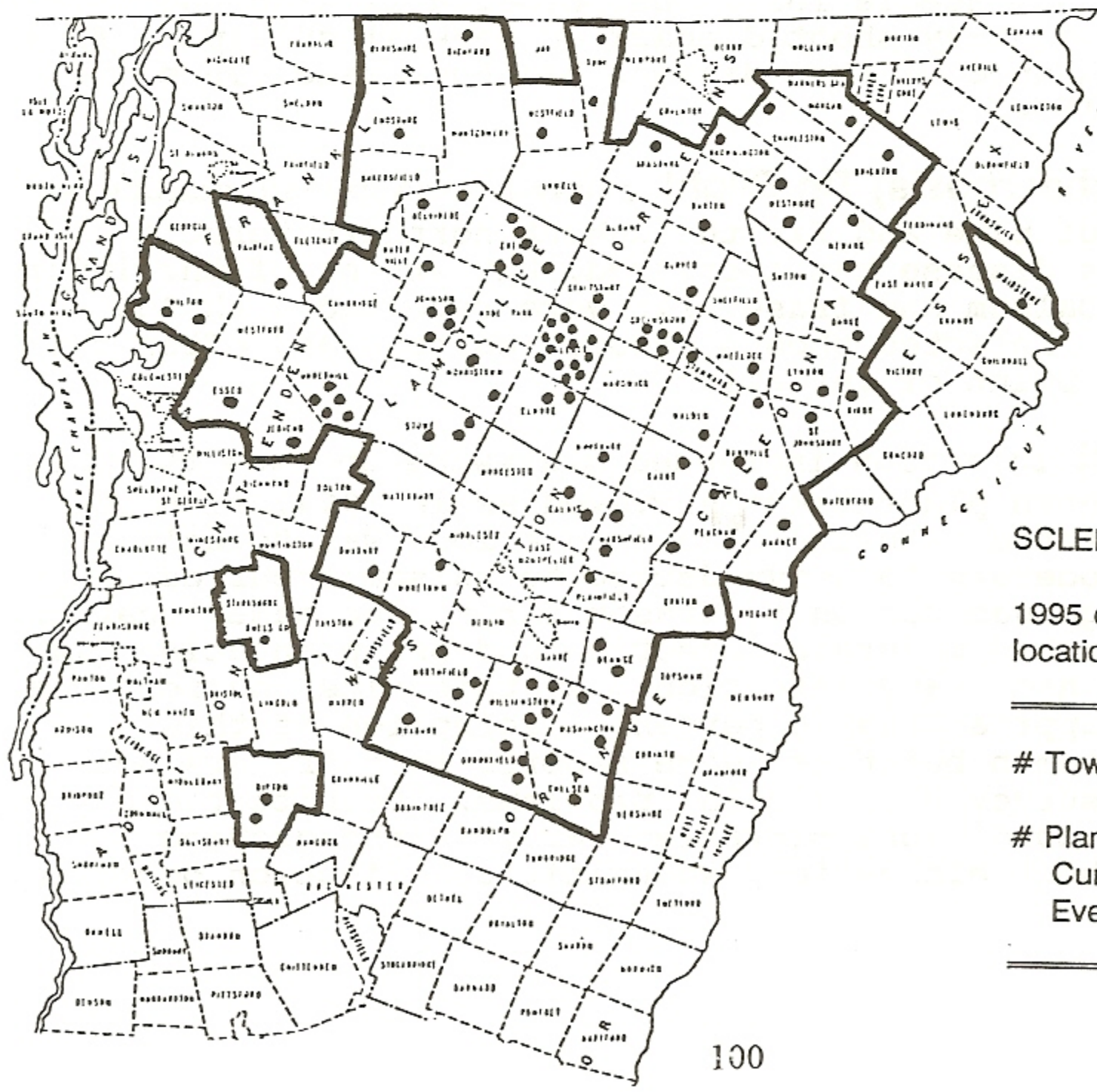
Fir-Fern Rust infection increased statewide and was twice as abundant in northern plantations surveyed as in 1994, with 364 acres of fir infected. Most of the needle loss was to balsam fir, but where moderate to heavy damage to balsam occurred, light to moderate damage was common to fraser fir at the same location. Ninety-four acres had moderate infection and one plantation (14 acres) in Albany had heavy infection. At this site, current year needle loss was approaching 50 percent. Infection of this magnitude is uncommon but there were reports from growers not included in the survey with similar problems. Despite the dry summer, cool wet conditions prevailed early in the growing season, during shoot elongation, when initial infection occurred.

Lophodermium Needlecast of Scots pine increased by 120 acres from 1994 levels. In northern Vermont, 191 acres were reported with light infection and 30 acres were reported with moderate infection, for a total of 221 acres. Many of these pine plantations have Cyclaneusma present. Inspection of pine plantations in Rutland and Windsor counties revealed that these two major Scots pine needlecasts were less common overall, possibly due to drier conditions which would inhibit infection. This needlecast was occasionally seen on Scots pine Christmas trees in Bennington County.

Rhabdocline Needlecast was observed on 50 acres of Douglas fir compared to 65 acres in 1994. Damage was less severe this year. It continued to cause heavy damage to some Douglas-fir in Bennington County.

Rhizosphaera Needlecast of blue and white spruce remains common, with 175 acres reported in 1995 compared to 160 acres in 1994. Damage was light on 160 acres and only 5 acres was reported with moderate infection (white spruce). As in the past, most injury occurred in blue spruce plantations (140 acres).

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



SCLERODERRIS CANKER

1995 quarantine area and location of positive infection

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

Sirococcus Shoot Blight was reported in blue spruce on 26 acres and white spruce on 4 acres. The extent of infection in 1995 was entirely light with no new sites of damage.

Spruce Needle Rust injury to scattered current year needles of blue spruce was reported on 50 acres within two plantations in Craftsbury and Brookfield. The extent of this injury was limited to less than ten percent of the needles on a given tree.

Swiss Needlecast of Douglas fir remained constant in northern plantations with 50 acres of infection, all of which was light. It was responsible for heavy defoliation of Douglas-fir in Springfield and Rochester but was observed at lower levels elsewhere in the south.

White Pine Blister Rust damage remained common, with 229 acres of mostly light damage in northern Vermont. One 25 acre plantation in central Vermont was reported with heavy amounts of infection. Blister Rust was observed occasionally throughout southern Vermont. Ten percent of the white pine in one Christmas tree plantation (11 acres) had cankers. During a survey to document the presence of Ribes species in and around young white pine stands, Ribes plants were found in each of the 11 Rutland County stands visited. Prickly gooseberry was the most common species observed. The survey also found white pine blister in all the stands visited. However, lower Ribes populations were associated with lower levels of blister rust.

White Pine Needlecast, formerly called White Pine Needle Blight, was observed on 233 acres of white pine plantations. This is a large increase over a light amount of infection detected in 1994, but similar to 1993 levels. Typically, only scattered susceptible trees are affected. Tips of scattered needles or whole needles turn brown by early fall but most affected needles have green bases and remain on the tree into the next growing season. This needlecast is caused by an unnamed fungus (Pseudovirgella sp.) which does not produce fruiting bodies until the following spring about the time that new needles are emerging.

Woodgate Gall Rust damage to Scots pine decreased slightly, with 172 acres reported in northern Vermont compared to 180 acres in 1994. The decrease in this disease is in part due to culling of infected plantations by some growers, since this is the most effective means of control where the disease is established. Elsewhere, this rust was seen in Brandon, Pittsford and Townshend.

Yellow Witches Broom Rust of balsam fir was found within 190 acres of balsam and fraser fir plantations (116 acres in 1994). This was mostly limited to just a few trees per plantation with one or two small brooms. In most cases, the

this disease begins with the eradication of chickweed, its alternate host.

Chlorosis of current foliage of white spruce Christmas trees was more common statewide than normal this year. Lack of water may have exacerbated the nutrient deficiency causing this symptom.

Frost Injury was not reported in any plantations in Northern Vermont during the 1995 survey. This is the first time since 1989. In southern Vermont, only trace levels of frost damage were reported.

Drought Injury to newly planted Christmas trees was common throughout the survey in 1995. Most recently planted trees suffered mortality or at least received tip dieback similar to frost injury. On drier sites, established trees received some injury. One plantation of 2-3′ white spruce on heavy clay soil in Rutland has about one-fourth of the trees die. Drought damage to some 14-year-old crosses between fraser fir and balsam fir at the U.S. Forest Service Experiment Station in Burlington revealed some differences based on sex of the parent. The balsam (♀) - fraser (♂) crosses resisted drought much better than the fraser (♀) - balsam (♂) crosses. Some of the fraser firs on this dry site were killed by the drought.

ANIMAL DAMAGE

Deer Damage is increasing in balsam and fraser fir plantations throughout much of the state.

Mouse Damage from the winter of 1993-94 caused scattered Scots pine discoloration and mortality in a plantation in Dummerston. Drought probably caused the additional stress leading to symptoms on damaged trees.

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