AGENCY OF ENVIRONMENTAL CONSERVATION

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DEPARTMENT OF FORESTS, PARKS & RECREATION

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FOREST INSECT AND DISEASE

CONDITIONS IN VERMONT

CALENDAR YEAR 1986

Prepared by

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AGENCY OF ENVIRONMENTAL CONSERVATION

DEPARTMENT OF FORESTS, PARKS AND RECREATION

Division of Forestry

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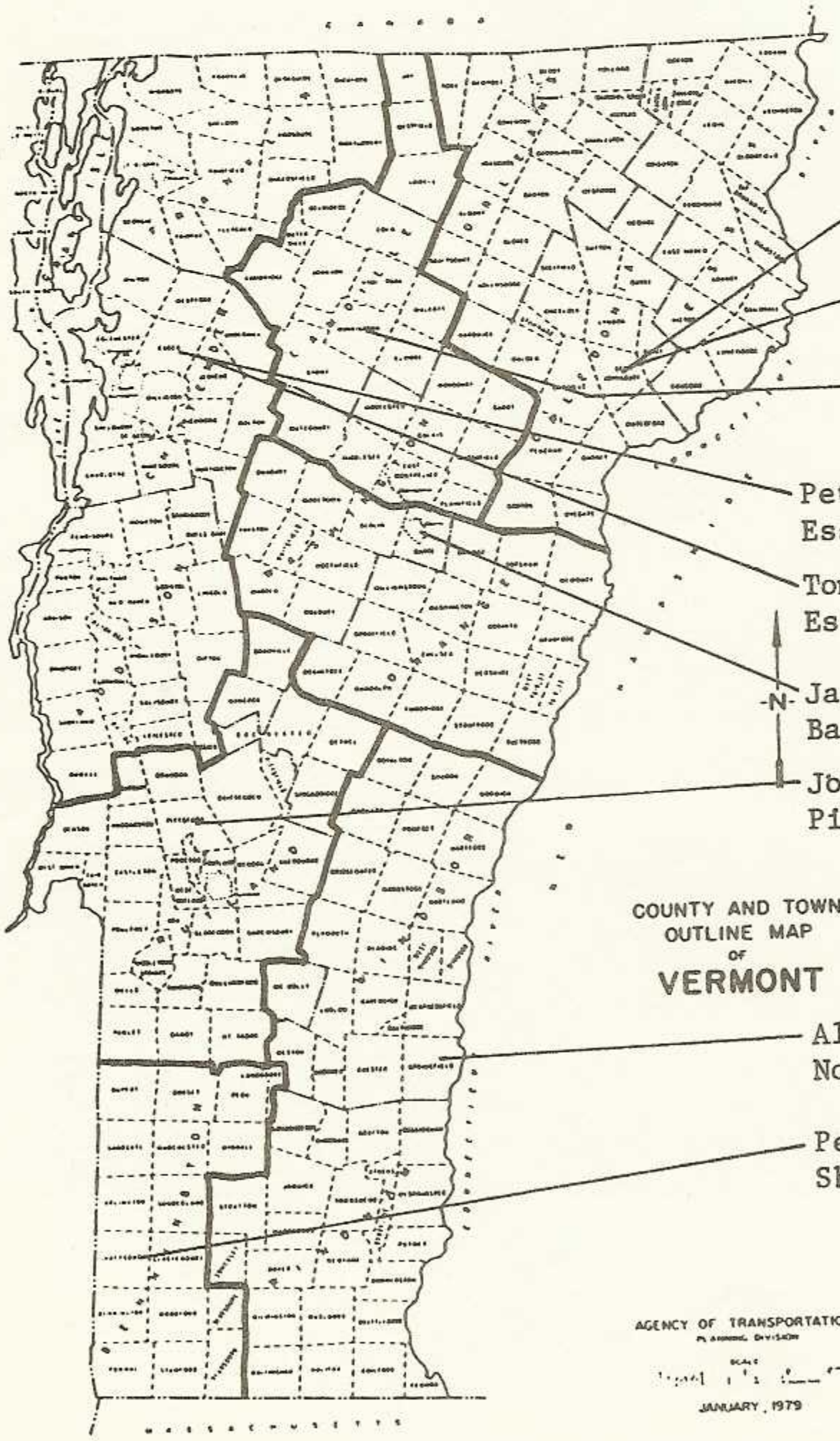

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VERMONT

INSECT AND DISEASE HIGHLIGHTS
1986

Forest Tent Caterpillar caused no visible defoliation. Pheromone trap moth catches indicate that populations are static at low levels. Preliminary results from the statewide forest tent caterpillar impact survey show a trend of increasing levels of mortality and crown dieback with increasing number of defoliations. It is recommended not to thin within four years of a predicted outbreak, or within three years after a stand has been defoliated.

Gypsy Moth focal point monitoring areas indicate that populations will remain low in 1987.

Spruce Budworm caused no visible defoliation for the third consecutive year, with overwintering larval surveys and pheromone traps indicating that populations will remain low in 1987. Previous defoliation is estimated to have caused volume loss from mortality of an additional 19,590 cords in 1986.

Lecanium Scale primarily on maple in southern Vermont, and Oystershell Scale primarily on beech in northern Vermont, caused severe twig dieback in scattered locations.

Pear Thrips caused less damage than in 1985, but remained widespread. Several monitoring methods are being tested for this insect.

Eastern Dwarf Mistletoe was detected for the first time in Vermont, causing witches brooms on old growth red spruce.

Scleroderris Canker was found in two new towns: Essex and Roxbury. No new infections were found in Christmas tree plantations. The rate of spread was slower than 1985 in infected stands.

Fir-Fern Rust increased due to an extremely wet June. Balsam fir can be protected by correct timing of fungicide applications.

Frost Damage was unusually severe, mostly from a heavy frost on June 3rd. Many hardwood stands, especially in the Northeast Kingdom, remained off-color through the whole growing season. Approximately 300 acres of balsam fir Christmas trees were severely damaged.

Hardwood Decline was assessed as part of a statewide hardwood tree health survey. Stand, site, tree and soils data were taken to provide a baseline for future surveys.

Ice Damage from storms in January and March caused extensive branch and top breakage.

INTRODUCTION

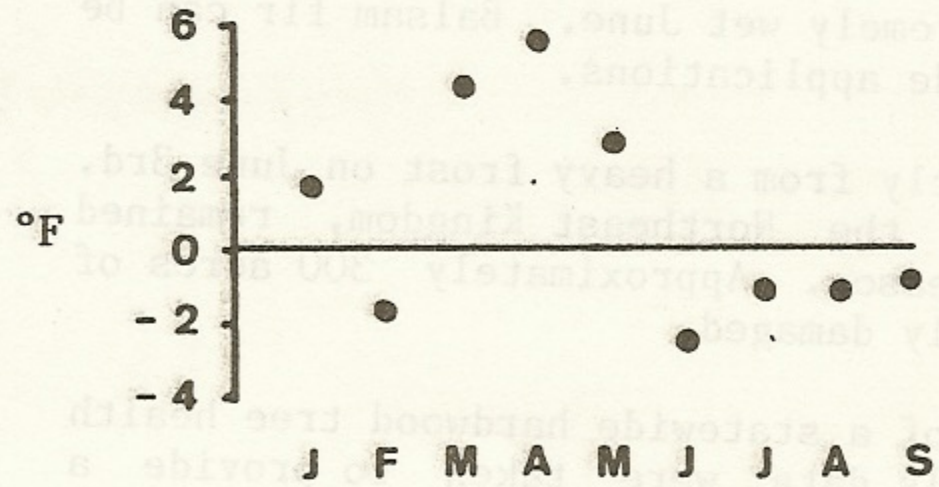
The information in this report is based on aerial surveys to detect defoliation, as well as ground surveys and observations of Forest Resource Protection personnel and other forestry staff. State-wide aerial surveys were flown late in the season (between 8/12 and 9/9). Additional surveys were a flight over southern Windsor County to assess ice damage (4/26) and a flight over the Green Mountain National Forest with U.S. Forest Service personnel (7/1). Diagnostic assistance was provided by the University of Vermont and the U.S. Forest Service.

The winter of 1986 had near normal snowfall and temperatures, but severe ice storms damaged many trees. The growing season began early, with warm weather in late March. Phenology remained one to two weeks ahead of schedule into June. Although April was dry, precipitation through the rest of the growing season was above average. Frosts in early May and on June 3rd, and several severe weather events, resulted in scattered damage. The season ended early, with some frost in late August, and peak foliage by the end of September (Figure 1).

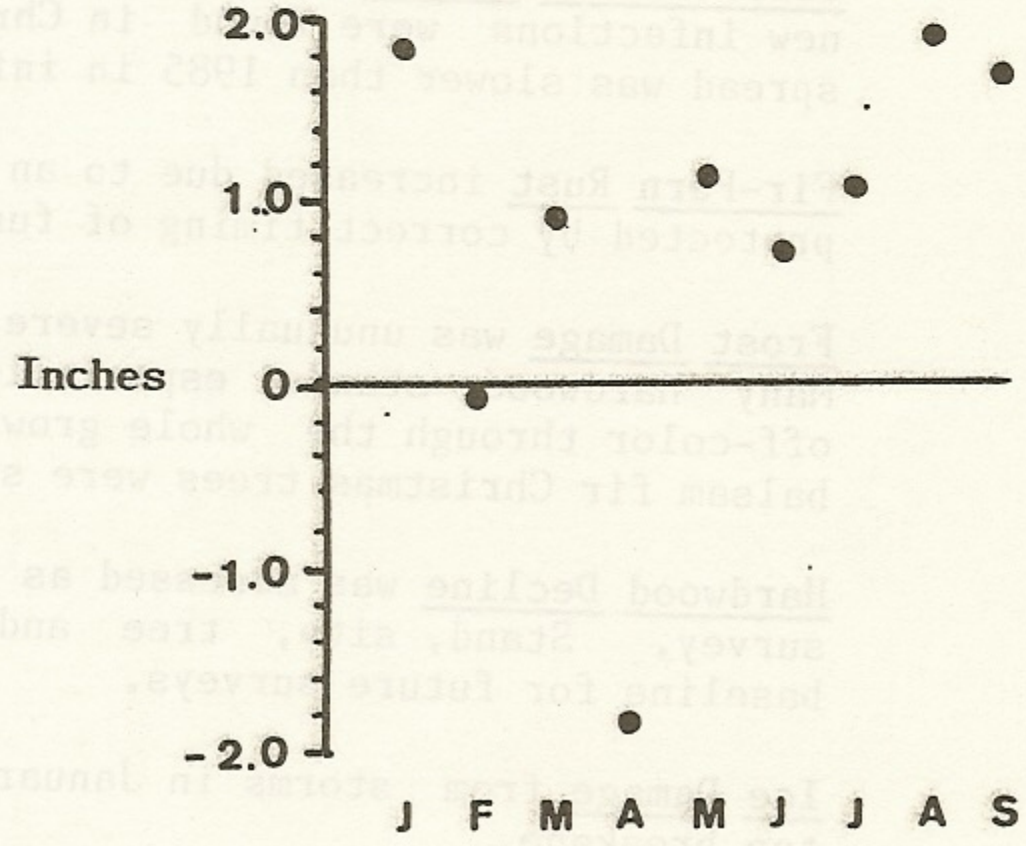
Figure 1: 1986 Weather Summary

Data from NOAA Local Climatological Data; Monthly Summary: Burlington International Airport

Temperature: Departure from Normal



Precipitation: Departure from Normal



The continual wet weather was conducive to the spread of many tree diseases. Foliage diseases were particularly noticeable on many species of trees. These, combined with off-color and thin crowns resulting from frost, gave tree crowns an unhealthy appearance for the remainder of the growing season. The wet weather may have helped keep insect populations in check. The return to more normal or above-normal precipitation levels should benefit future tree growth.

FOREST INSECTS

Hardwood Defoliators

Forest Tent Caterpillar, Malacosoma disstria, populations remained very low, with no visible defoliation. Pheromone traps were placed in the four sugar maple stands where they were first used in 1985. These are in the towns of Roxbury, Bethel, Waterbury and Fairfield. Average moth catch per trap, for five traps per location, ranged from 0.2 to 0.8. The average was 0.6 for all locations, the same as 1985. This indicates that populations probably remain static at very low levels. By continuing the annual use of these traps, we should be able to predict any future increase in population levels before noticeable defoliation occurs. Traps were also placed at seven locations by the U.S. Forest Service on the Green Mountain National Forest. The most moths were caught near Manchester, with trap catches decreasing in the more northern sites.

Total acres defoliated by forest tent caterpillar between 1976 and 1982 were determined by overlaying annual defoliation maps (Table 1). Statewide, 497,500 acres received at least one defoliation. This represents over one-fourth of all the northern hardwood type in the state. 32,000 of these acres received at least three consecutive defoliations. No new areas of mortality associated with the insect were detected by aerial survey this year. Total acres of dieback and mortality associated with the outbreak remain at 33,000 for the state, (Figure 1A).

Table 1. Acres defoliated by Forest Tent Caterpillar from 1977-1982 by number of years defoliated.

	Number of Years Defoliated					
	1	2	3	4	5	Total
Acres	378,000	87,370	25,290	5,390	1,450	497,500

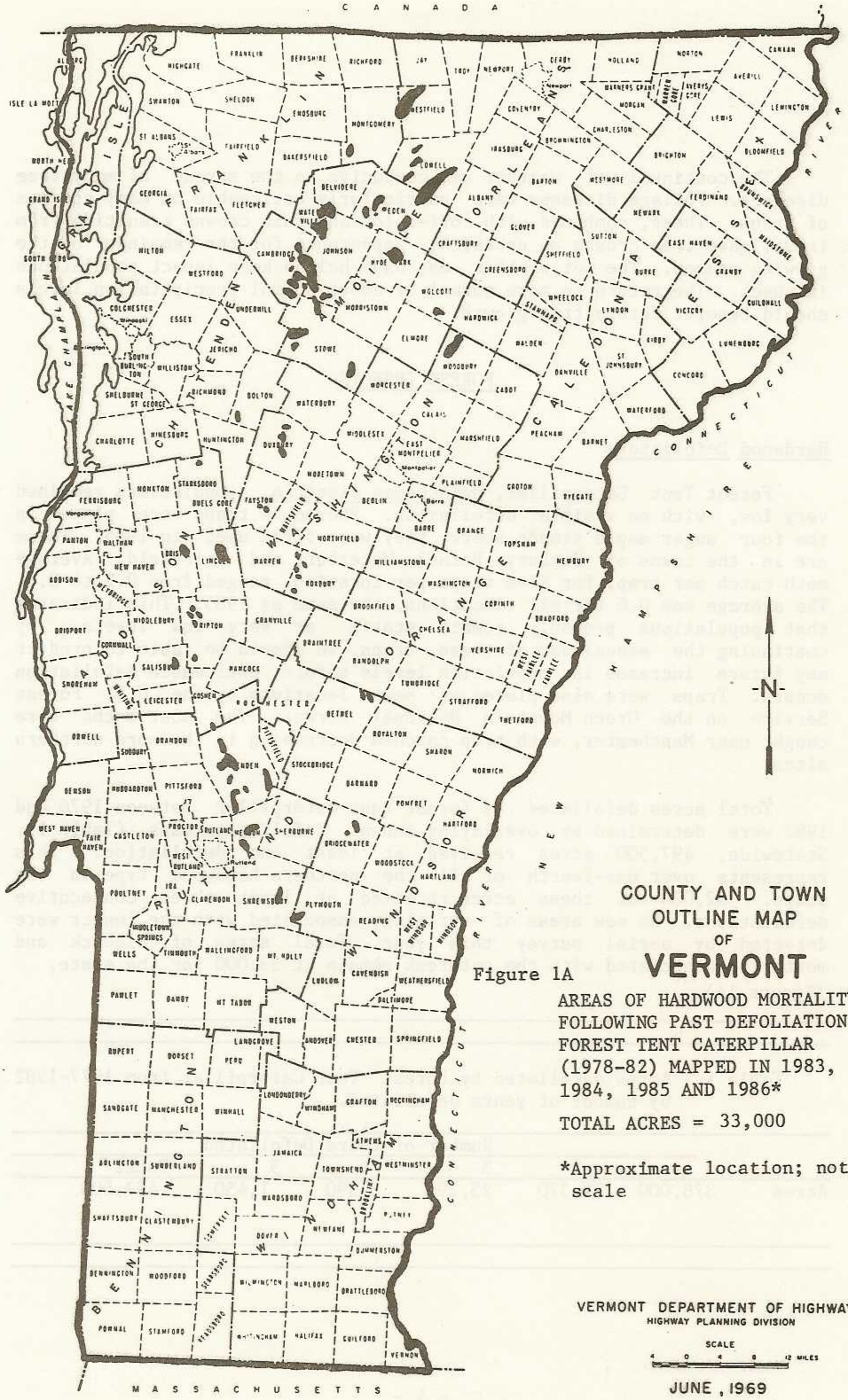


Figure 1A

COUNTY AND TOWN OUTLINE MAP OF VERMONT

AREAS OF HARDWOOD MORTALITY FOLLOWING PAST DEFOLIATION BY FOREST TENT CATERPILLAR (1978-82) MAPPED IN 1983, 1984, 1985 AND 1986*

TOTAL ACRES = 33,000

*Approximate location; not to scale

VERMONT DEPARTMENT OF HIGHWAYS
HIGHWAY PLANNING DIVISION

SCALE
4 0 4 8 12 MILES

JUNE, 1969

A statewide Forest Tent Caterpillar Impact Survey was conducted in 1984 and 1985. The randomly selected points included 40 defoliated stands with visible mortality (as detected during aerial surveys), 43 defoliated stands without visible mortality, and 16 undefoliated stands. Data was derived from at least five prism points (10 BAF) per stand. The data has not been fully analyzed. A preliminary analysis of the crown condition of the sugar maple basal area shows a trend of increasing tree mortality and crown dieback with increasing number of defoliations (Table 2).

Table 2. The impact of Forest Tent Caterpillar Defoliation on sugar maple tree condition (preliminary results, subject to minor change).

No. of Stands	Average Percentage of Sugar Maple Basal Area With Crown Dieback					
	Dead	75%	50-75%	25-50%	1-25%	0%
			-Mortality Stratum*-			
40	6	2	8	12	46	26
			-Defoliated 3 Years-			
14	2	3	2	7	45	41
			-Defoliated 2 Years-			
16	3	0.3	3	10	52	32
			-Defoliated 1 Year-			
13	0.4	1	2	7	45	45
			-Non-Defoliated-			
16	0.2	0.2	2	2	24	72

*Most of these stands received 2-3 years of defoliation.

Average sugar maple mortality does not exceed 1% of the basal area until trees have been defoliated at least twice (Table 2). Most of the dead trees averaged 8 to 14 inches DBH, with no trees over 20 inches DBH dead. Undefoliated stands had 72% of their sugar maple basal area with no observable crown dieback, compared to 26-45% in this "perfect health" category for defoliated stands. Trees with over 75% dieback seldom recover. If we consider these dying, the percent of sugar maple basal area dead or dying, for stands zero, one, two or three years defoliated,

or within the mortality stratum, averages 0.4, 1, 3, 5 and 8 percent, respectively. Individual stands most severely damaged within these strata averaged 2, 3, 13, 14, and 60 percent of the basal area dead or dying, respectively. Thus, stands with up to one year of defoliation lost no more than 3% of their sugar maple basal area, compared to up to a 60% loss for stands defoliated two or more times.

Once all of the data has been analyzed, a final report will be made available, including silvicultural recommendations for reducing the potential impact of this insect. At present, the best advice is to avoid thinning hardwood stands, particularly poletimber and young sawtimber, just prior to, during, or immediately after a major defoliation. Since there is some information to indicate that hardwoods actually lose vigor for the first two years following thinning, it would be advisable not to thin within four years of an outbreak, provided we can forecast that far in advance. Although data from one stand indicates no problem from thinning immediately after a defoliation, there are other examples where much of the residual stand was lost when this was done. Since dieback and mortality doesn't peak until about three years after defoliation, it would be advisable to wait this long before marking the trees to be removed.

Gypsy Moth, Lymantria dispar, populations remain low, with no noticeable defoliation. Nine focal point monitoring plots have been established; one each in Milton, Colchester, Sandgate, Benson, Rutland, Mendon, West Rutland, Rockingham, Brattleboro and near Pownal. This work, in cooperation with the University of Vermont, is designed to concentrate monitoring in areas where gypsy moth outbreaks are historically detected first.

The highest counts of live larvae were from the Brigham Hill site in Colchester, ranging from 16 to 57 per 7.5 meter radius plot. This was a new area this year, so trend is unknown. Mortality here increased noticeably by the fifth and sixth instars, at which time about one-fourth of the larvae under burlap bands were dead.

Maple Leaf Cutter, Paraclemensia acerifoliella, caused light defoliation, visible from the air, of over 270 acres in Rutland, Orange and Windsor County, including two sugarbushes. Towns affected were Rochester, Stockbridge, Bethel, Braintree and Sherburne (Figure 2). Elsewhere, populations were light, with scattered damage to lower crowns only.

Oak Skeletonizer, Bucculatrix ainsliella, was widespread in southern Vermont, especially Bennington and Windham Counties. Early June populations were light, with no significant defoliation. The second generation resulted in light defoliation throughout oak areas by early September. Light defoliation was also observed in an upper elevation oak stand in Chittenden County.

Saddled Prominent, Heterocampa guttivata, caused no visible defoliation, but larvae were more numerous than in 1985. Individual caterpillars were observed in Bennington, Rutland, Orange, Washington and Caledonia Counties. Five years after the last defoliation, some sugar maples in monitoring plots at Downer State Forest continue to decline, while others have recovered.

COUNTY AND TOWN OUTLINE MAP OF VERMONT

Figure 2

Areas of Maple Leaf Cutter Defoliation*

Total Acres = 270

* Approximate location not to scale

AGENCY OF TRANSPORTATION
PLANNING DIVISION

SCALE

JANUARY 1979

OTHER HARDWOOD DEFOLIATORS

INSECT	HOST(S)	LOCALITY	REMARKS
American Dagger Moth *Acronicta americana*	Hardwoods	Weathersfield	Individual caterpillars.
Apple & Thorn Skeletonizer *Anthophila pariana*	Flowering Crab	Orleans County	Moderate damage to ornamentals.
Birch Leaf Miner *Fenusa pusilla*	Gray Birch White Birch	Throughout	Lighter damage than in 1984 in Champlain Valley, but heavier elsewhere. 1051 acres of defoliation aerially mapped in Orleans, Caledonia and Essex Counties. Elsewhere defoliation widespread, but not mapable.
Birch Leaf Folder *Ancylis discigerana*	Yellow Birch	Warren	Light damage to yellow birch within a sugarbush.
Birch Skeletonizer *Bucculatrix canadensisella*	White Birch Yellow Birch		This insect was not observed, but light to moderate leaf skeletonizing was common through the state.
Bruce Spanworm *Operophtera bruceata*			Not observed.
Cecropia Moth *Hyalophora cecropia*	High Bush Cranberry	Stowe	Heavy defoliation at one resort motel.
Cherry Scallop Shell Moth *Hydria prunivorata*	Black Cherry	So. Vermont Stowe	Light damage in scattered locations.

OTHER HARDWOOD DEFOLIATORS

INSECT	HOST(S)	LOCALITY	REMARKS
Dogwood Sawfly Unidentified spp.	Gray Dogwood	So. Burlington	Occasional.
Eastern Tent Caterpillar Malacosoma americanum	Cherry Apple	Widespread	Populations remain light; only occasional nests and caterpillars observed.
Elm Leaf Beetle Pyrrhalta luteola	American Elm Chinese Elm	Scattered throughout	Populations down from last year in Addison County, but up in the Connecticut Valley.
Elm Sawfly Cimbex americana	Hardwoods	Woodford	Individual larvae.
Fall Cankerworm Alsophila pometaria			Not observed.
Fall Webworm Hyphantrea cunea	Many hdwds. and shrubs, including cherry, apple, and maple	All counties except Orleans, Caledonia and Essex	More common than in 1985. Some trees in Windsor County completely defoliated.
Forest Tent Caterpillar Malacosoma disstria			See narrative.
Green Striped Mapleworm Anisota rubicunda	Red Maple Sugar Maple	Danville Groton	Larvae occasionally observed, but no noticeable defoliation.
Gypsy Moth Lymantria dispar			See narrative.

OTHER HARDWOOD DEFOLIATORS

INSECT	HOST(S)	LOCALITY	REMARKS
Half Winged Geometer Phigalia titea	Red Oak	Middlesex	A few larvae observed.
Hickory Tussock Moth Halisidota caryae	Hickories	Danby Weathersfield Springfield	Individual caterpillars observed.
Japanese Beetle Popillia japonica	Ornamentals	Franklin, Chittenden, Addison Counties	Moderate damage.
Lace Bug Unknown species	Elm	Chittenden County	Light population.
Large Aspen Tortrix Choristoneura conflictana			Not observed.
Leaf Beetle Chrysomelidae Unidentified spp.	Aspen	Widespread but heaviest in Lamoille, Caledonia, Orleans and Essex Counties	Some moderate-heavy defoliation of quaking aspen.
Linden Looper Erranis tiliaria			Not observed.
Locust Leaf Miner Odontata dorsalis	Black Locust	Chittenden, Orange, Windsor and Windham Counties	Localized, moderate to heavy damage.
Maple Leaf Cutter Paraclemensia acerifoliella			See narrative.

OTHER HARDWOOD DEFOLIATORS

INSECT	HOST(S)	LOCALITY	REMARKS
Maple Trumpet Skeletonizer *Epinotia aceriella*	Sugar Maple Red Maple	Scattered throughout	Populations remain light.
Maple Webworm *Tetralopha asperatella*	Sugar Maple	Lamoille County	Light defoliation in one area.
Mountain Ash Sawfly *Pristophora geniculata*	Mountain Ash	Widespread in Northern Vermont	Common on ornamentals and wild trees; populations up from 1985.
Oak Sawflies *Periclista sp.*	Oak spp.	Benson Vernon	Common in late May and early June.
Oak Skeletonizer *Bucculatrix ainsliella*			See narrative.
Orange-humped Mapleworm *Symmerista leucitys*	Sugar Maple	Throughout	Indiviudal caterpillars common in scattered locations.
Pear Thrips *Taeniothrips inconsequens*			See narrative.
Pin Oak Sawfly *Caliroa sp.*			Not observed.
Red-humped Caterpillar *Schizura concinna*	Apple	Washington	

OTHER HARDWOOD DEFOLIATORS

INSECT	HOST(S)	LOCALITY	REMARKS
Red-Humped Oakworm *Symmerista canicosta*	Oaks	Woodford	Individual larvae.
Rusty Tussock Moth *Orgyia antiqua*		Springfield	Found on spruce under popple.
Saddled Prominent *Heterocampa guttivata*			See narrative.
Satin Moth *Leucoma salicis*	Poplar	Chittenden County Newport	Numerous on scattered ornamentals.
Solitary Leaf Roller *Sparganothis pettitana*			Not observed.
Spotted Tussock Moth *Halysidota maculata*	Flowering Crab Aspen	Orleans Lamoille Counties	Common in late summer but caused little damage.
Spring Cankerworm *Paleacrita vernata*			Not observed.
Uglynest Caterpillar *Archips cerasivoranus*	Cherry	Widespread	Occasional tents observed.
Unidentified Leaf Miner	Balsam Poplar	Widespread	Heaviest defoliation in Northeast Kingdom causing large black blotches on upper leaf surface.

Softwood Defoliators

Spruce Budworm, Choristoneura fumiferana, continued to be very low in 1986 with no visible defoliation for the third consecutive year. Average moth catch in pheromone traps, where the same trap, lure and killing agent (flea collars) were used as in 1985, was about half as much (0.4/trap vs. 0.8/trap). This probably indicates that budworm population levels continued to drop in 1986. This also corresponds to an almost total absence of budworms during our large larvae/pupae survey this year (0.007/branch compared to 0.2/branch in 1985). No moths were caught in traps placed by the U.S. Forest Service on the Green Mountain National Forest.

Pheromone traps were deployed in 15 stands again this year, using five traps per cluster. The trap methodology has finally been improved to the point that everyone in both Canada and the U.S. is using the same Multi-pher trap and PVC lure. With the addition of Vaportape II as a killing agent this year, traps everywhere were reported to be working well. Our Multi-pher traps with Vaportape averaged 1.2 moths per trap in 1986. Eight of 15 plots caught moths in 1986, while five of these plots yielded overwintering (L2) larvae from five branches per plot collected in September 1985. Pheromone trapping appears to be at least as sensitive as L2 surveys for detecting extremely light populations.

The overwintering larval survey predicts extremely low population levels for 1987. With 3 to 10 branches per host species per plot soaked-out for 45 plots, number of larvae per 100 square feet of foliage averages less than one (0.4), compared to Sevin in 1985 and over 1000 at the peak of infestation in 1981. Only 5 of 215 branches yielded overwintering larvae this fall and then only one second instar larva per branch.

Spruce-fir mortality detected during this annual aerial survey increased slightly from 11,750 acres in 1985 to 14, 045 acres this year. This is probably due to better detection weather during the survey this year rather than any actual increase in damage (Table 3, Figure 3).

Table 3. Acres of Mortality in 1986 due to Spruce Budworm

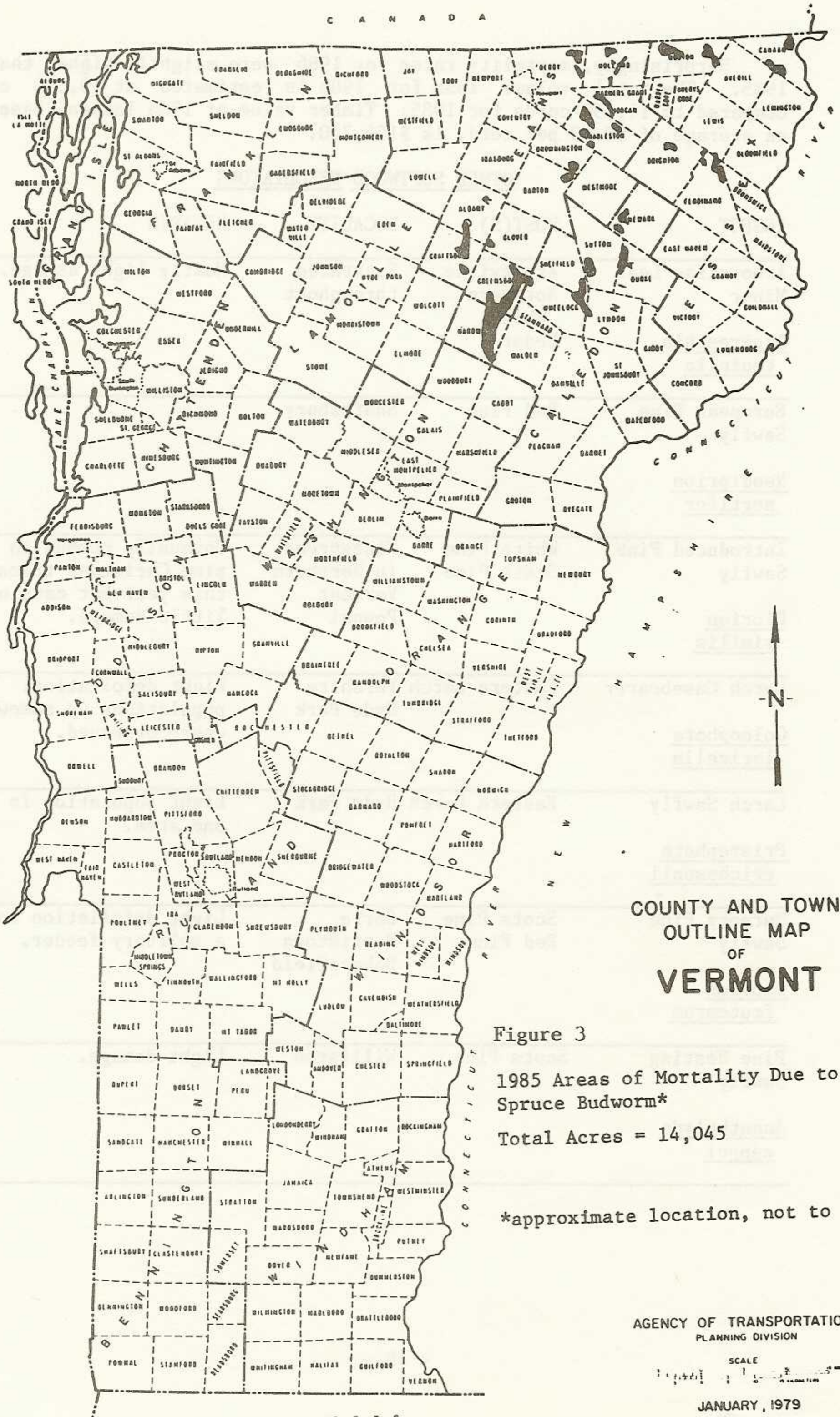
County	Acres of Mortality*			
	Light	Moderate	Heavy	Total
Caledonia	228	1,521	1,961	3,710
Essex	75	2,441	2,785	5,301
Orleans	243	2,131	2,660	5,034
TOTAL	546	6,093	7,406	14,045

*Light mortality = 1-10% scattered or patchy
Moderate mortality = 11-25%, scattered
Heavy mortality = over 25%

Budworm-caused mortality of fir and spruce that occurred during the past year was estimated from a survey of 11 plots that contain light, moderate, and heavy mortality. Mortality rates (percent of original number of trees over 4.5 inches DBH) for 1985 were 3.2, 4.5 and 6.8 percent, respectively, for lightly, moderately, and heavily damaged stands compared to 2.5, 2.5, and 6.5 percent in 1985. These percentages were applied to average per acre volume and density data from the 1980 Orleans County Spruce Budworm Mortality Survey and acres of mortality from Table 3 to produce the loss estimates in Table 4.

Table 4. Estimated tree mortality in 1986 due to Spruce Budworm.

County	Number of Trees Dead	Total Volume Lost (Cords)
Caledonia	48,000	5,150
Essex	69,280	7,430
Orleans	65,340	7,010
TOTAL	182,620	19,590



COUNTY AND TOWN OUTLINE MAP OF VERMONT

Figure 3

1985 Areas of Mortality Due to Spruce Budworm*

Total Acres = 14,045

*approximate location, not to scale

AGENCY OF TRANSPORTATION
PLANNING DIVISION

SCALE

JANUARY, 1979

Surprisingly, mortality rates for 1986 were slightly higher than in 1985. The total volume loss for 1986 is estimated at 19,590 cords compared to 14,430 cords for 1985. Timber value of 1986 losses, based on an average of $8.00 per cord, is $156.720.

OTHER SOFTWOOD DEFOLIATORS

INSECT	HOST(S)	LOCALITY	REMARKS
Arborvitae Leaf Miner *Argyresthia thuiella*	Arborvitae Northern White Cedar	Scattered throughout	Mostly light damage.
European Pine Sawfly *Neodiprion sertifer*	Red Pine	Shaftsbury	
Introduced Pine Sawfly *Diprion similis*	White Pine Scots Pine	Widespread in Northern Vermont Pownal	Unusually common on pine Christmas trees this year but causing little damage.
Larch Casebearer *Coleophora laricella*	Eastern Larch	Vershire Hyde Park	Light defoliation; populations up somewhat where observed.
Larch Sawfly *Pristophora erichosonii*	Eastern Larch	Hyde Park	Light population in one area.
Nursery Pine Sawfly *Diprion fruteorum*	Scots Pine Red Pine	Barre Morristown Bakersfield	Light defoliation only; a solitary feeder.
Pine Nesting Sawfly *Acantholyda zappei*	Scots Pine	Williston	Light damage.

OTHER SOFTWOOD DEFOLIATORS

INSECT	HOST(S)	LOCALITY	REMARKS
Red Headed Pine Sawfly *Neodiprion lecontei*	Red Pine Scots Pine Mugho Pine	Georgia Essex Roxbury Wolcott Shaftsbury	Light populations but more common than in 1985; moderate damage to a few Scots pine Christmas trees in Wolcott.
Spruce Budworm *Choristoneura fumiferana*			See narrative.
Spruce Bud Moth *Zeiraphera canadensis*	White Spruce	Essex, Orleans, Caledonia Counties	Very light populations.
Spruce Webspinning Sawfly *Cephalacia fascipennis*	White Spruce	Hartford	Ornamental.
White Pine Sawfly *Neodiprion pinetum*	White Pine	East Concord	Light defoliation on one ornamental.
Yellow-headed Spruce Sawfly *Pikonema alaskensis*	White Spruce Red Spruce	Westfield Barre	Moderate to heavy defoliation of ornamentals.

Sapsucking Insects, Midges and Mites

Cooley Spruce Gall Aphid, *Adelges cooleyi*, caused heavy damage in some southern Vermont locations, particularly on Douglas Fir Christmas trees. Elsewhere damage was mostly light. Spring applications of insecticide to Douglas fir have not been uniformly effective in controlling the pest. Several Christmas tree growers sprayed again in early fall to reduce overwintering insect numbers.

Lecanium Scale, Lecanium sp., was common, especially in southern Vermont (Figure 4). Damage was most noticeable on sugar maple, including one sugarbush. It was also observed at moderate levels on individual red oak and striped maple. The insect occurs throughout the crown, and on regeneration. Dieback from lecanium scale, to a northern hardwood stand in Plymouth, was severe enough to be visible from a distance.

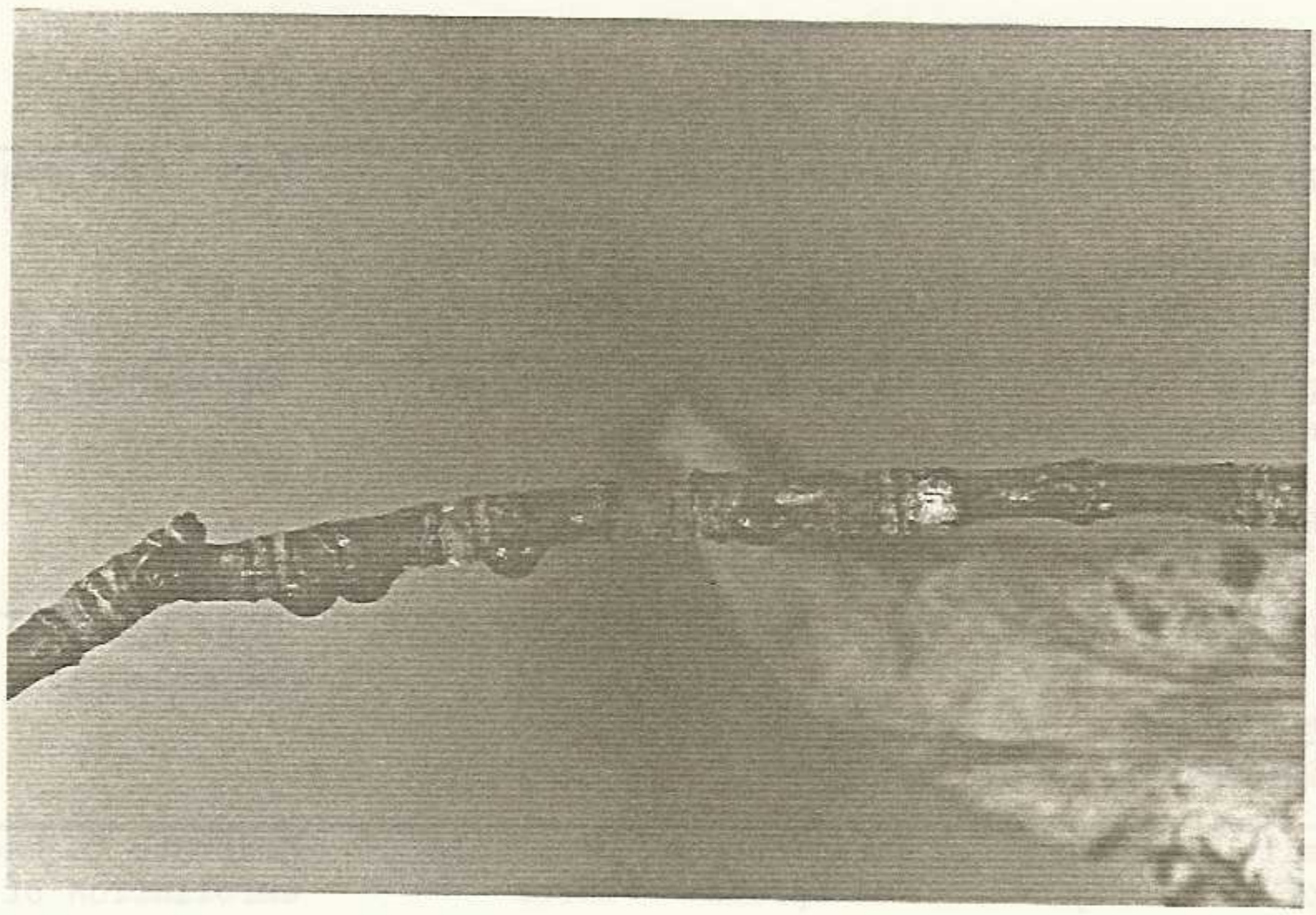


Figure 4: Lecanium Scale on a Maple Twig

Pear Thrips, Taeniothrips inconsequens, damaged sugar maple foliage again this year. One sugarbush in Windsor County sustained enough damage to cause refoliation. Elsewhere, defoliation from pear thrips was less than in 1985. Leaf development was up to two weeks ahead of normal this spring. Since the most severe damage is done by adults feeding within expanding buds, the early season may have given the leaves more time to grow before all of the overwintering thrips had come out of the ground.

Thrips monitoring plots were established in affected sugarbushes and several methods were tried which could be used to predict damage from pear thrips. Sticky traps to catch adults coming out of the ground caught too many other insects to be useful. Counting thrips in developing buds is promising. This and other methods will be tried in 1987.

Experimental ground treatments using Sevin formulations to control thrips were effective, reducing insect numbers by up to 98%. Sevin was tried because it is registered for use in Vermont sugarbushes. The spray was applied when leaves were about one third of full size, which is too late to prevent damage in the current year. The effects on natural enemies of thrips are unknown. Since populations for the following year may be reduced by spraying, it may be justified in sugarbushes if thrips become a persistant problem.

Pine Leaf Chermid, Pineus pinifoliae, damage from 1985 infestations was widespread and very common this year. Scattered shoot dieback caused by this aphid was reported in 12 white pine Christmas tree plantations comprising 127 acres, as well as in two Scots and one red pine plantation. Shoot dieback on wild white pine was also common. This insect alternates between red spruce and pine, spending a year on each host. Eggs are laid in late June, on previous year needles of white pine. Hatching nymphs migrate to the new shoots and feed on them, frequently killing them. This year most of the insects were forming galls on red spruce. Look for them on white pine in 1987.

Oystershell Scale, Lepidosaphes ulmi, populations have noticeably increased during the past two years. This year, heavy populations were reported causing diebeack on ornamental oak and wild apple in Lamoille County, as well as on beech in scattered Chittenden County locations. Mortality of understory beech and heavy dieback of overstory beech was evident in hardwood stands in Bolton and Georgia, wherever small pockets of almost pure beech occurred (Figures 5 and 6). Elsewhere in northern Vermont, light populations of scale were commonly found on beech, sugar maple, striped maple, and yellow birch.

OTHER SAPSUCKING INSECTS, MIDGES & MITES

INSECT	HOST(S)	LOCALITY	REMARKS
Aphids Cinara sp.	Balsam Fir White Pine	Elmore Brookfield Weston	Occasionally observed on Christmas trees. Responsible for foliage yellowing on white pine Christmas trees, making some of them unmarketable.
Balsam Gall Midge Paradiplosis tumifex	Balsam Fir	Widespread, especially in Northern Vermont	Populations mostly light; only 15 acres of moderate Christmas tree damage known compared to 95 acres in 1985.

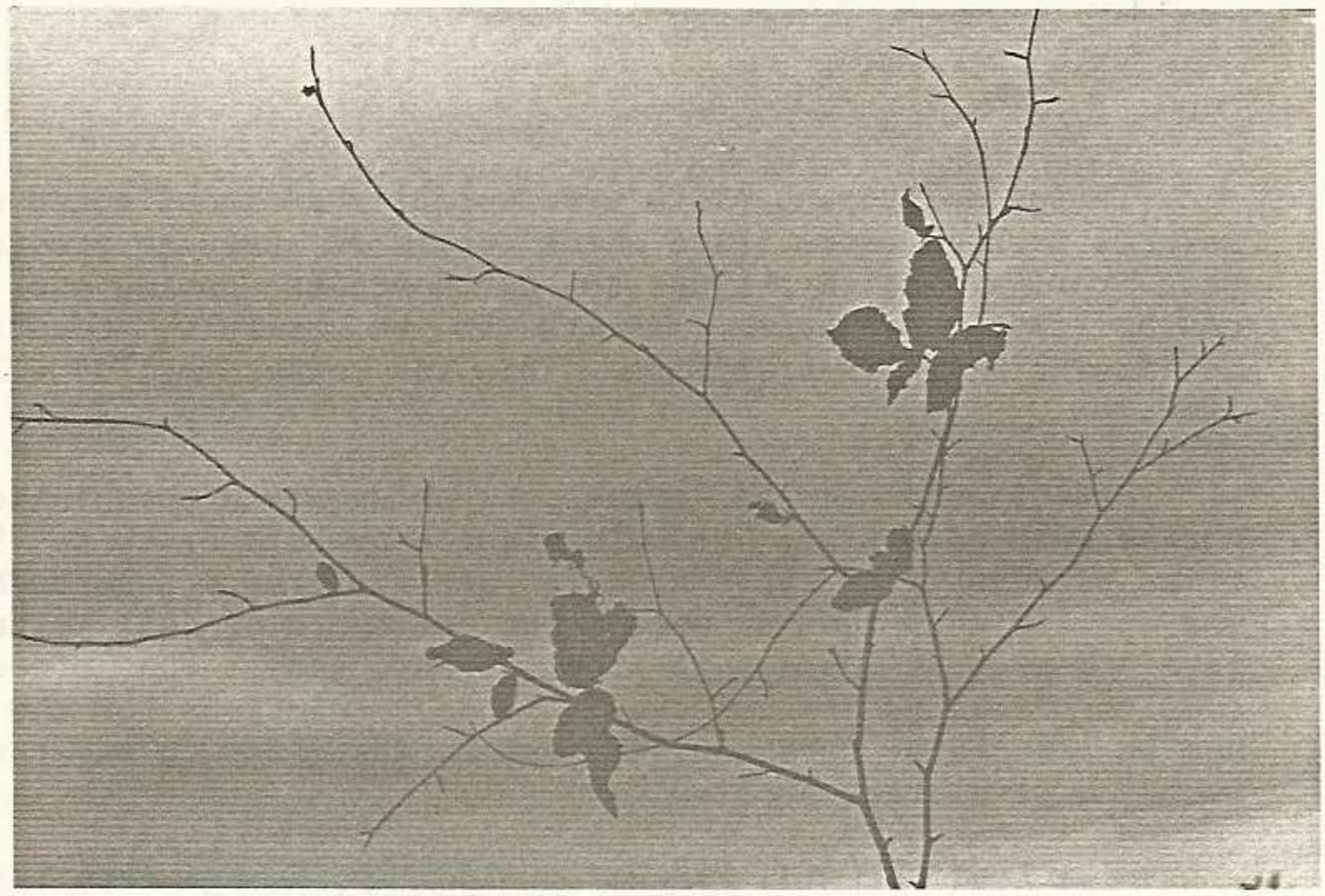


Figure 5: Twig Mortality and leaf stunting of beech due to oystershell scale

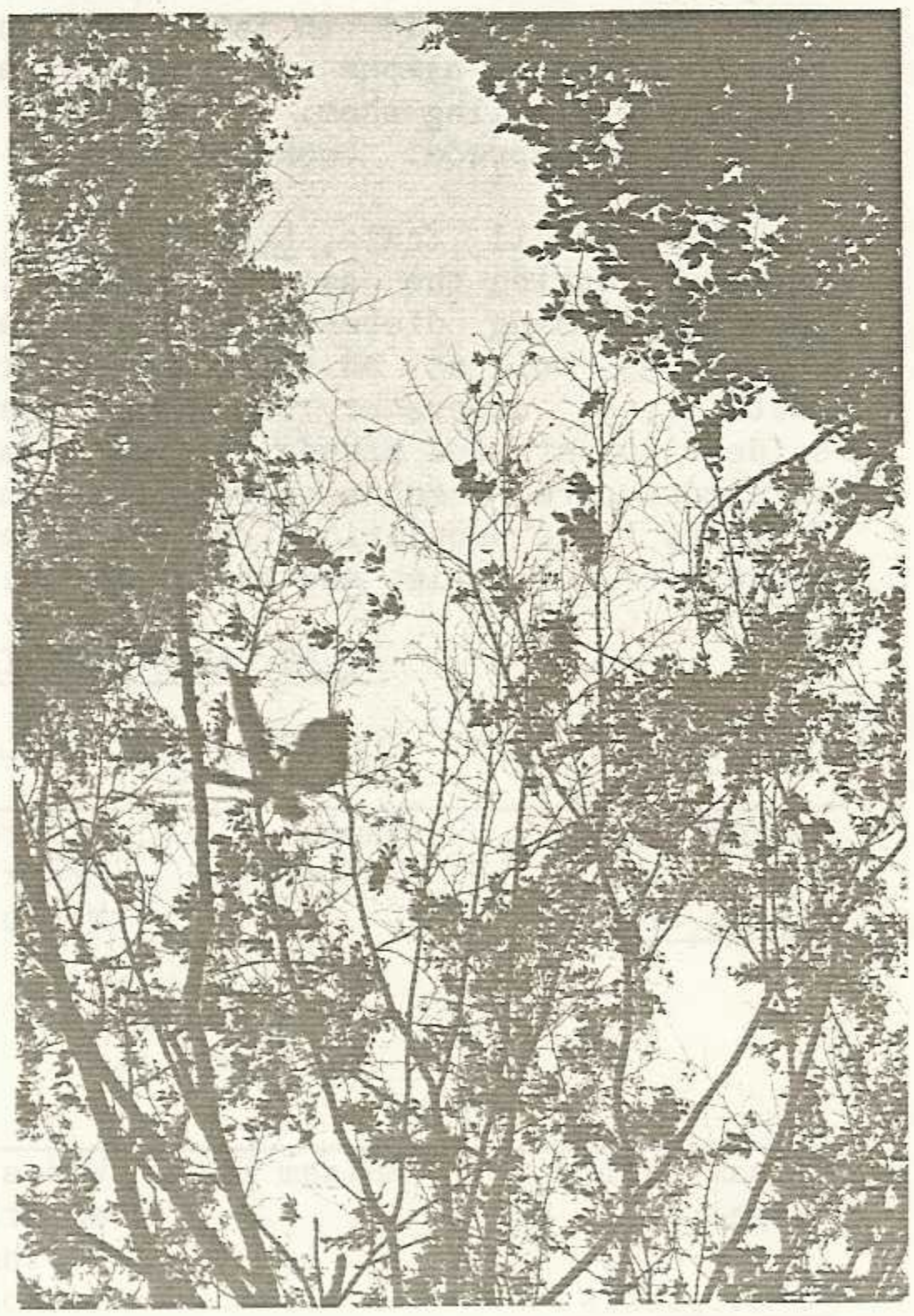


Figure 6: Heavy Crown dieback of beech due to oystershell scale

OTHER SAPSUCKING INSECTS, MIDGES & MITES

INSECT	HOST(S)	LOCALITY	REMARKS
Balsam Twig Aphid *Mindarus abietinus*	Balsam Fir	Widespread	Populations increased in some plantations but decreased in many others. Overall Christmas tree damage levels decreased slightly compared to 1985, particularly in the heavy category.
Balsam Woolly Aphid *Adelges piceae*			Not observed.
Cottony Maple Scale *Pulvinaria innumerabilis*	Maple	Windsor County	Ornamental.
Eastern Spruce Gall Aphid *Adelges abietis*	Red Spruce White Spruce	Widespread	Damage heavy in southern Vermont, common throughout on ornamentals and natural regeneration. An occasional problem on Christmas trees.
Gouty Vein Midge *Dasineura communis*	Sugar Maple	Essex	Noticeable on maples at the nursery, but not damaging.
Kermes Scale *Kermes sp.*	Red Oak	Bethel	Causing cankers and dieback.
Lecanium Scale *Lecanium sp.*			See narrative.
Maple Bark Scale *Cryptococcus williamsi*	Sugar Maple	Readsboro	Occasionally heavy in a recently thinned stand with some dying trees.
Oystershell Scale *Lepidosaphes ulmi*			See narrative.

OTHER SAPSUCKING INSECTS, MIDGES & MITES

INSECT	HOST(S)	LOCALITY	REMARKS
Pear Thrips *Taeniothrips inconsequens*			See narrative.
Pine Bark Aphid *Pineus strobi*	White Pine	Widespread	Less evident in southern Vermont, but commonly observed in the north. Reported as present for the first time in 7 Christmas tree plantations comprising 90 acres.
Pine Leaf Chermid *Pineus pinifoliae*			See narrative.
Pine Needle Midge *Contarinea baeri*	Scots Pine	Bakersfield	Light damage to Christmas trees.
Pine Needle Scale *Phenacapsis pinifoliae*	Scots Pine	Middlebury Essex Jct.	Heavy on a few Christmas trees in Middlebury; light on ornamental in Essex.
Pine Spittlebug *Aphrophora parallela*	White Pine Scots Pine Red Pine Balsam Fir	Widespread	Common on Scots pine and Balsam Fir Christmas trees for second year in a row. Less common on white pine. At least 200 acres infested, of which 80 acres had moderate-heavy infestations. Little damage observed.
Root Aphid *Prociphilus americanus*	Balsam Fir Fraser Fir	Lamoille County Windham County	Still present in young Christmas tree plantings but no new locations reported. Also common on roots of some wild balsam fir seedlings.

OTHER SAPSUCKING INSECTS, MIDGES & MITES

INSECT	HOST(S)	LOCALITY	REMARKS
Spruce Spider Mite Oligonychus ununguis	Fraser Fir Balsam Fir Hemlock Spruce	Bennington, Windsor, Lamoille, Orange, Chittenden, Counties	Some scattered, moderate to heavy damage on Christmas trees, especially young seedlings. Where both Fraser and balsam fir are grown, Fraser appears to be preferred.
Treehoppers Membracidae	Red Oak Sugar Maple Chestnut and others	Bennington and Windham Counties	Common on regeneration; associated with distorted foliage.

BUD, SHOOT & STEM INSECTS

INSECT	HOST(S)	LOCALITY	REMARKS
Balsam Shootboring Sawfly Pleroneura bruneicornis	Balsam Fir Fraser Fir	Scattered in Northern Vermont	Expected to be more prevalent than in 1985 and started out this way, but damage was difficult to detect because of widespread frost damage to new growth.
Ghost Moth Hepialis gracilis	Red Spruce Balsam Fir	Scattered	Root feeding associated with upper elevation spruce and fir decline.
Maple Petiole Borer Caulocampus acericaulis	Sugar Maple	Richmond Hardwick	Some damage to ornamentals but less than in 1985.
Northern Pine Weevil Pissodes approximatus			Not observed.

BUD, SHOOT & STEM INSECTS

INSECT	HOST(S)	LOCALITY	REMARKS
Northern Pitch Twig Moth *Petrova albicapitana*	Scots Pine	Craftsbury Orange Wolcott	Causing scattered light branch mortality in three Christmas tree plantations.
Pales Weevil *Hylobius pales*	Scots Pine	Widespread in Northern Vermont	Damage detected in 18 Christmas tree plantations (308 acres) compared to 6 plantations (137 acres) in 1985. Little twig mortality in most locations however.
Pitted Ambrosia Beetle *Corthylus punctatissimus*	Sugar Maple Seedlings	Scattered throughout Northern Vermont	Scattered light mortality of seedlings, especially where sugar maple reproduction was thick.
Poplar Petiole Gall *Ectoedemia populela*	Quaking Aspen	Chittenden, Lamoille, Orange, Caledonia, Counties	Common this year but not damaging.
Red Maple Cambium Borer *Phytobia setosa*	Red Maple	Shaftsbury	On declining and nearby healthy trees.
Spruce Coneworm *Dioryctria reniculella*	Fraser Fir Blue Spruce White Spruce	Springfield Shrewsbury	Christmas trees.
Twig Pruner *Unidentified species*	Oak	Burlington	Light damage.
White Grubs *Phyllophaga sp.*	Fraser Fir	Springfield	Causing mortality on converted agricultural land.

BUD, SHOOT & STEM INSECTS

INSECT	HOST(S)	LOCALITY	REMARKS
White Pine Weevil *Pissodes strobi*	White Pine Scots Pine Blue Spruce Norway Spruce White Spruce Douglas Fir	Widespread	More noticeable than usual in Christmas tree plantations causing scattered terminal mortality in nine white pine, nine Scots pine, and one Douglas Fir plantation, totalling over 200 acres.
White Spotted Sawyer *Monochamus scutellatus*	White Pine	Springfield	On ornamentals planted too deep.

BARK BEETLES

INSECT	HOST(S)	LOCALITY	REMARKS
Balsam Fir Bark Beetle *Pityokteines sparsus*	Fraser Fir	West Fairlee	Associated with the death of scattered Christmas trees in one plantation. Trees thought to be stressed by excess water.
Eastern Ash Bark Beetle *Hylesinus aculeatus*	White Ash	Springfield	Associated with dying trees.
Eastern Larch Beetle *Dendroctonus simplex*	Eastern Larch	Widespread	Associated with larch decline.
Elm Bark Beetles *Hylurgopinus rufipes* *Scolytus multistriatus*	American Elm	Widespread	See Dutch Elm Disease.

BARK BEETLES

INSECT	HOST(S)	LOCALITY	REMARKS
Pine Engraver *Ips pini*	Red Pine Red Spruce	Southern Vermont	Cause of mortality where populations have built up on trees stressed by root rot, poor drainage, or compaction.
Red Turpentine Beetle *Dendroctonus valens*	Red Pine	Windsor County	Occurring in stands affected by Annosus root rot.

FOREST DISEASES

Stem Diseases

Beech Bark Disease, caused by Cryptococcus fagisuga and Nectria coccinea var. faginata, is increasingly visible during aerial surveys. Pockets of chlorosis and dieback occur throughout the state; 371 acres of damage in Orleans and Caledonia Counties were mapped. Statewide, scale and Nectria populations seem to be increasing. Monitoring plots in Ludlow and Sherburne show that levels have increased, while scale populations in the Woodford plot are down from 1985. Some stands with heavy scale and Nectria were observed in Orleans County.

Dutch Elm Disease, caused by Ceratocystis ulmi, was heavier than usual again this year. Mortality of young trees was especially common. A tree in Springfield which has received annual fungicide injections since 1982, is now infected with the disease and dying.

Eastern Dwarf Mistletoe, caused by Arceuthobium pusillum, was discovered for the first time in Vermont in an old growth red spruce stand, in Hancock, by Dr. Frank Hawksworth of the U.S. Forest Service. This parasitic plant was forming large witches brooms (Figure 7) and causing heavy branch mortality and some tree mortality. It was also found on old growth red spruce on Mt. Mansfield in Stowe at about 3500 feet in elevation. It is likely to be more widespread in the state than presently known.

Figure 7: Large Witches Broom on Red Spruce caused by Eastern Dwarf Mistletoe

Scleroderris Canker, caused by Gremmeniella abietina, was found in two previously negative towns this year compared to eight in 1985 (Figure 8), during a survey of 84 plantations in 10 towns bordering the quarantine zone. The new infections were found in a 20 acre red pine plantation in Essex, and a two acre red pine plantation in Roxbury.

Fifty-one pine Christmas tree plantations, within 27 towns inside the quarantine area, were inspected this year. The disease was not found in any previously uninfected plantations.

Scleroderris continues to cause tree and branch mortality of understory Scots and white pine in the Lyndon State Forest. Thirty-six percent of the branches on Scots pines and 13 percent of the branches on the white pines examined had died during the past year due to Scleroderris. Shoot dieback observed in 1986 (from 1985 infections) was considerably lower than in 1985. New shoot infections on Scots pine averaged 0.2 per live branch in 1986, compared to 2.1 per live branch in 1985. New shoot infections on white pine beneath Scots pine or beneath white pine averaged 0.2 and 0.03 per live branch, respectively, compared to 0.3 and 0.05 in 1985.

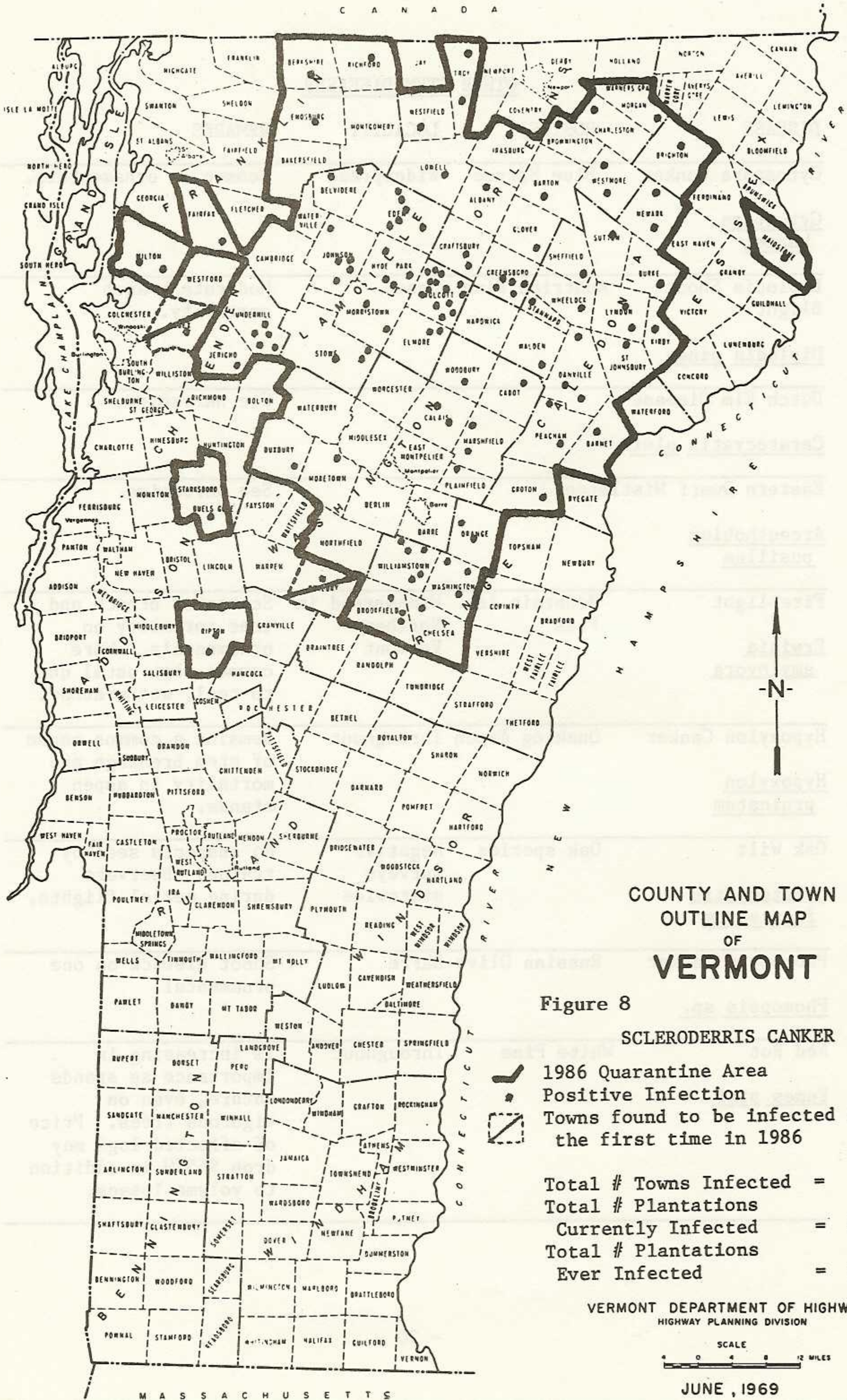
Infection of the white pine seedlings planted in 1984 was also down. Twelve percent of the seedlings were newly infected compared to 29 percent in 1985. The incidence of infection was noticeably higher on seedlings closest to the Scots pine overstory. Hopefully, the removal of Scots pine saplings within the interior section of the planting site in 1985 is responsible for the reduced infection there.

The total number of plantations in the state known to be infected is now 124, consisting of 106 red pine and 18 Scots pine plantations. This represents 842 and 150 acres, respectively, for a total of 992 acres infected. Another six plantations were infected at one time, but have since had the disease eradicated or the trees cut.

White Pine Blister Rust, caused by Cronartium ribicola, continues to cause mortality statewide. The disease was found in 100 acres of Christmas trees this year, causing moderate mortality in three plantations (20 acres). The alternate host is sometimes difficult to find despite widespread pine infection.

OTHER STEM DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Beech Bark Disease			See narrative.
Cryptococcus fagisuga and Nectria coccinea var. faginata			



COUNTY AND TOWN OUTLINE MAP OF VERMONT

Figure 8

SCLERODERRIS CANKER

1986 Quarantine Area

Positive Infection

Towns found to be infected for the first time in 1986

Total # Towns Infected	=	64
Total # Plantations Currently Infected	=	124
Total # Plantations Ever Infected	=	130

VERMONT DEPARTMENT OF HIGHWAYS
HIGHWAY PLANNING DIVISION

SCALE
4 0 4 8 12 MILES

JUNE, 1969

OTHER STEM DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Cytospora Canker *Cytospora kunzei*	Blue Spruce	Widespread	Common on ornamentals.
Diplodia Shoot Blight *Diplodia pinea*	Austrian Pine	Essex	Moderate branch mortality.
Dutch Elm Disease *Ceratocystis ulmi*			See narrative.
Eastern Dwarf Mistletoe *Arceuthobium pusillum*			See narrative.
Fireblight *Erwinia amylovora*	Mountain Ash Plum	Widespread in Northern Vermont	Scattered branch and tree mortality on ornamentals. More common than usual due to cool, wet weather.
Hypoxylon Canker *Hypoxylon pruinatum*	Quaking Aspen	Throughout	Remains a common cause of stem breakage and mortality in aspen stands.
Oak Wilt *Ceratocystis fagacearum*	Oak species	Negative surveys statewide	No suspects seen by trained observers during aerial flights.
Phomopsis Canker *Phomopsis sp.*	Russian Olive	Barre	Shoot dieback on one ornamental.
Red Rot *Fomes pini*	White Pine	Throughout	Is increasing in importance as stands mature, even on vigorous trees. Price of affected logs may drop $65/M in addition to volume losses.

OTHER STEM DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Sapstreak Ceratocystis coerulescens	Sugar Maple	Orange, Windsor, Washington Counties	Trees in several locations supect. Confirmed for a forest stand in Middlesex and a Vershire sugarbush by D. Bergdahl. Associated with basal injuries.
Scleroderris Canker Gremmeniella abietina			See narrative.
Unidentified Canker	White Pine	West Fairlee	Causing internodal pitch flow in a pine stand. Could be confused with Blister Rust but causing small cankers on smooth bark only, and not associated with branches. Has the potential to kill trees, but no mortality. Identification is being investigated.
Verticillium Wilt Verticillium albo-atrum	Maple	Chittenden County	Light damage.
White Pine Blister Rust Cronartium ribicola			See narrative.
Woodgate Gall Rust Endocronartium harknessii	Scots Pine	Widespread	Detected in 17 Christmas tree plantations comprising approximately 250 acres. About 100 acres had moderate to heavy shoot and branch mortality.

Foliage Diseases

Anthracnose, caused by Gloeosporium sp., was common this year on many species due to the wet weather. The disease was responsible for lower crown twig dieback, and defoliation, of ornamental red oaks in Windsor and Windham Counties. It was frequently observed on butternut in Orange County, and was especially common in the Northeast Kingdom.

Fir-fern rust of balsam fir, caused principally by Uredinopsis mirabilis, increased this year due to an extremely wet June. This was in spite of the frost damage, which killed many fir shoots as well as sensitive fern, the alternate host. 254 acres of balsam fir were found to be infected during the annual Scleroderris survey of Christmas tree plantations. Of these, 86 acres had moderate to heavy damage. This compares to 94 acres in 1985, of which 40 acres were moderate to heavy. Bayleton 25 provided adequate protection of fir this year, if applied at bud break and again when new shoots averaged two-three centimeters (about one inch) in length. Since this was an extremely wet spring, a third treatment at about 6 centimeters was needed to provide complete protection. Eliminating the sensitive fern is still recommended for long term control.

OTHER FOLIAGE DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Anthracnose Gloeosporium spp.			See narrative.
Brown Rot Monilinia fructicola	Sweet Cherry	Chester	Ornamentals completely defoliated.
Bulls Eye Spot Chrystolariella pyramidalis	Boxelder	Pomfret	
Cedar-Apple Rust Gymnosporangium juniperi-virginianae	Eastern Red Cedar Apple	Newport Weathersfield	Numerous galls on ornamentals.
Fir-Fern Rust Uredinopsis mirabilis	Balsam Fir		See narrative.

OTHER FOLIAGE DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Lophodermium Needlecast *Lophodermium pinastri*	Scots Pine	Widespread	Heavy in some southern Vermont locations. Otherwise, light damage similar to 1985 levels in Christmas tree. plantations.
Naemacyclus Needlecast *Naemacylus niveus* (now *Cylaneusma minus*)	Scots Pine	Franklin, Windsor, Lamoille, Orleans, Caledonia Counties	Increasing in Christmas tree plantations; about 50 acres known infested, including 20 acres of moderate damage in Troy.
Pine Needle Rust *Coleosporium asterum*	Red Pine	Ludlow	Ornamentals.
Rhabdocline Needlecast *Rhabdocline pseudotsugae*	Douglas Fir	Barton Essex	Occasionally heavy in Christmas tree plantations.
Rhizosphaera Needlecast *Rhizosphaera kalkhoffi*	Blue Spruce	Walden Dorset	Causing moderate needle loss in Christmas tree plantations.
Serviceberry Rust *Unidentified fungus*	Serviceberry	Winooski	Light damage.
Spruce Needlecast *Lirula macrospora*	Red Spruce	Landgrove	On regeneration.
Swiss Needlecast *Phaeocryptopus gaumani*	Douglas Fir	Jeffersonville Essex Stowe Mt. Holly	Occasionally heavy on Christmas trees.

OTHER FOLIAGE DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Tar Spot Rhytisma acerinum Rhytisma punctatum	Red Maple Silver Maple Sugar Maple	Widespread	R. punctatum, which produces many small spots that don't coalesce, was extremely common on sugar maple for the first time this year. Especially heavy on understory leaves in sugarbushes. R. acerinum, which causes large tar spots on red maple, was more scattered.

ROOT ROTS

Annosus Root Rot, caused by Heterobasidion annosum, was responsible for mortality of red pine adjacent to the North Springfield Reservoir. No other new infection sites were reported. Spore traps were set in a known infection center in the Chester Town Forest at monthly intervals from November to May. Five 4" diameter disks of fresh, aseptically debarked red pine stem wood were placed within forty feet of H. annosum sporophores, and left in place for at least four hours. After incubation at room temperature for over a week, they were checked for growth of the Oedocephalum stage. No growth occurred in the traps put out from December through March, when there were at least 8" of snow on the site. Growth occurred on all five disks put out on both dates which had no snow cover.

Shoestring Root Rot, caused by Armillaria mellea, continues to be common on stressed trees exhibiting dieback. It is found on spruce trees dying following thinning. Bark beetles (Ips) are associated with new mortality in red spruce monitoring plots in Plymouth and Peru, where previous mortality has been attributed to Armillaria. No new mortality occurred in a thinned Norway spruce stand in Sharon where Armillaria has been associated with previous mortality. A. mellea was also found to be associated with scattered mortality of three-year old white pine seedlings in Lyndon State Forest.

DIEBACKS, DECLINES & ENVIRONMENTAL DISEASES

Ash Dieback remains common throughout the state, with mortality most noticeable in pole-sized and young sawtimber trees on higher and/or drier sites. Pockets of dying ash are more common in the Champlain Valley and in the southern part of the state. Microscopic analysis of a witches' broom from Addison County, using Diene's stain, tested positive for the presence of mycoplasma-like organisms.

Birch Decline of upper elevation yellow birch was common in Orleans and Essex Counties this year. The affected trees were reported to have unusual branch development in their lower crowns. Birch dieback in Northwest Plymouth was associated with the presence of nodules on the twigs, apparently caused by a small unidentified insect larva.

Drainage Change is responsible for decline and mortality in a small white pine stand in Woodstock where trees had been stressed by a wet site.

Frost Damage was especially severe this year. Some leaves were injured by scattered frosts in May. The heavy widespread frost that occurred June 3rd was especially severe, because new growth was two weeks ahead of normal and temperatures were well below freezing. Many species were affected, but damage was most noticeable on balsam fir, Douglas-fir, aspen, red maple, sugar maple, beech and white ash. Many hardwood stands, especially those in the Northeast Kingdom, remained off-color for the rest of the growing season. All of the 572,900 acres of hardwood type in this district was affected to some degree, based on aerial and ground observations. Affected trees commonly suffered 10 to 25 percent foliage loss, mostly in the upper third of the tree crowns. Damage was heaviest at higher elevations and upper crowns.

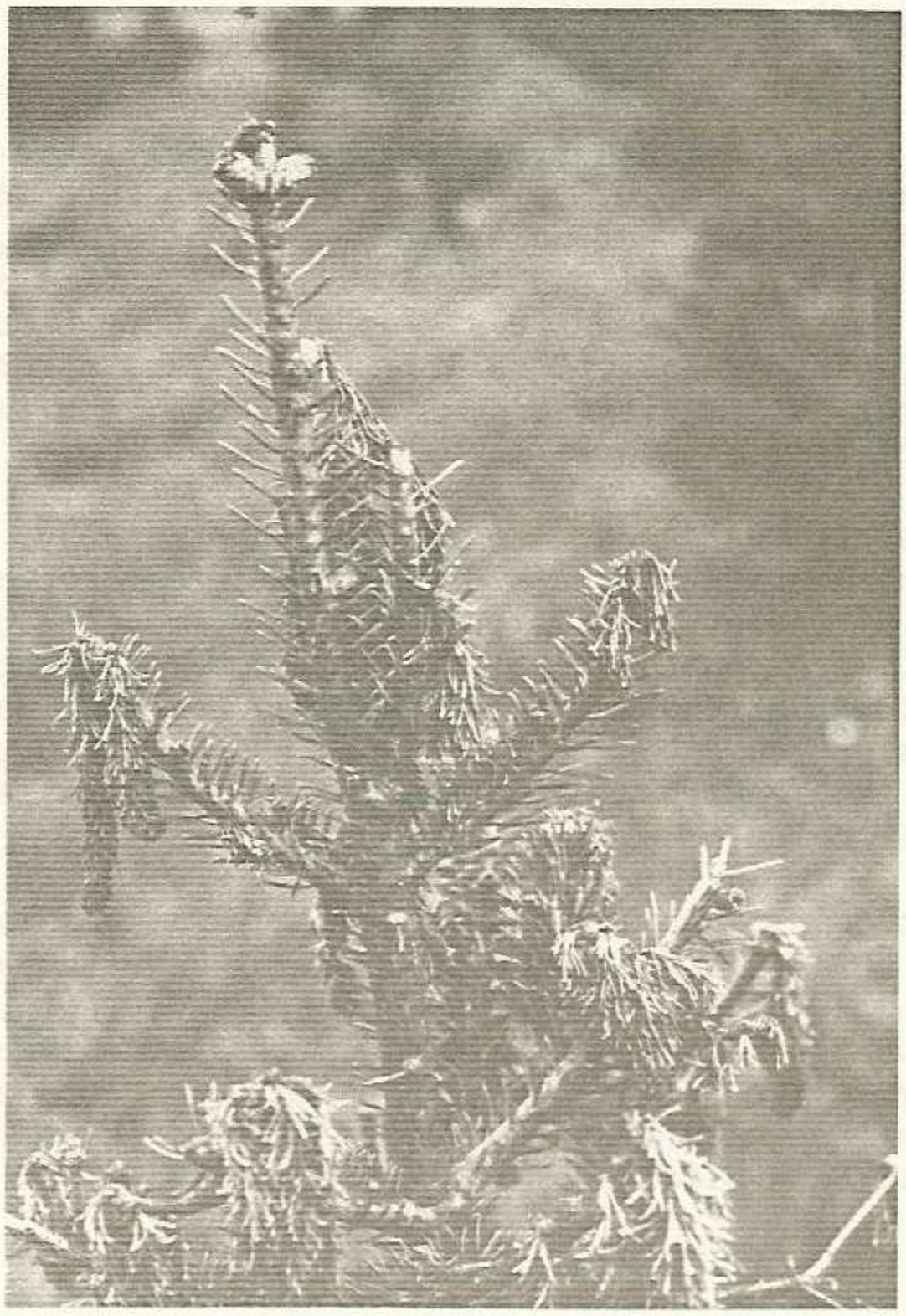


Figure 9: Heavy Frost Damage to a Balsam Fir Christmas Tree

Christmas tree damage was the worst anyone can recall. Temperatures as low as 25°F were recorded near some plantations. Balsam fir, fraser fir and Douglas-fir were the most severely damaged, leaving many trees unmarketable this year (Figure 9). Some recently planted seedlings were a complete loss. In the most severe cases, heavy dieback of 1985 fir growth also occurred, with most new buds for 1987 developing on 1984 and even 1983 growth. Wilted shoots which survived often curled and discolored. Approximately 300 acres of fir were heavily damaged. Some shoot mortality also occurred on white pine and white spruce in scattered locations. Scots pine suffered the least damage with shoot curling in the coldest locations. Damage in softwood stands was not as noticeable, except for scattered areas in the Northeast Kingdom where air drainage was poor.

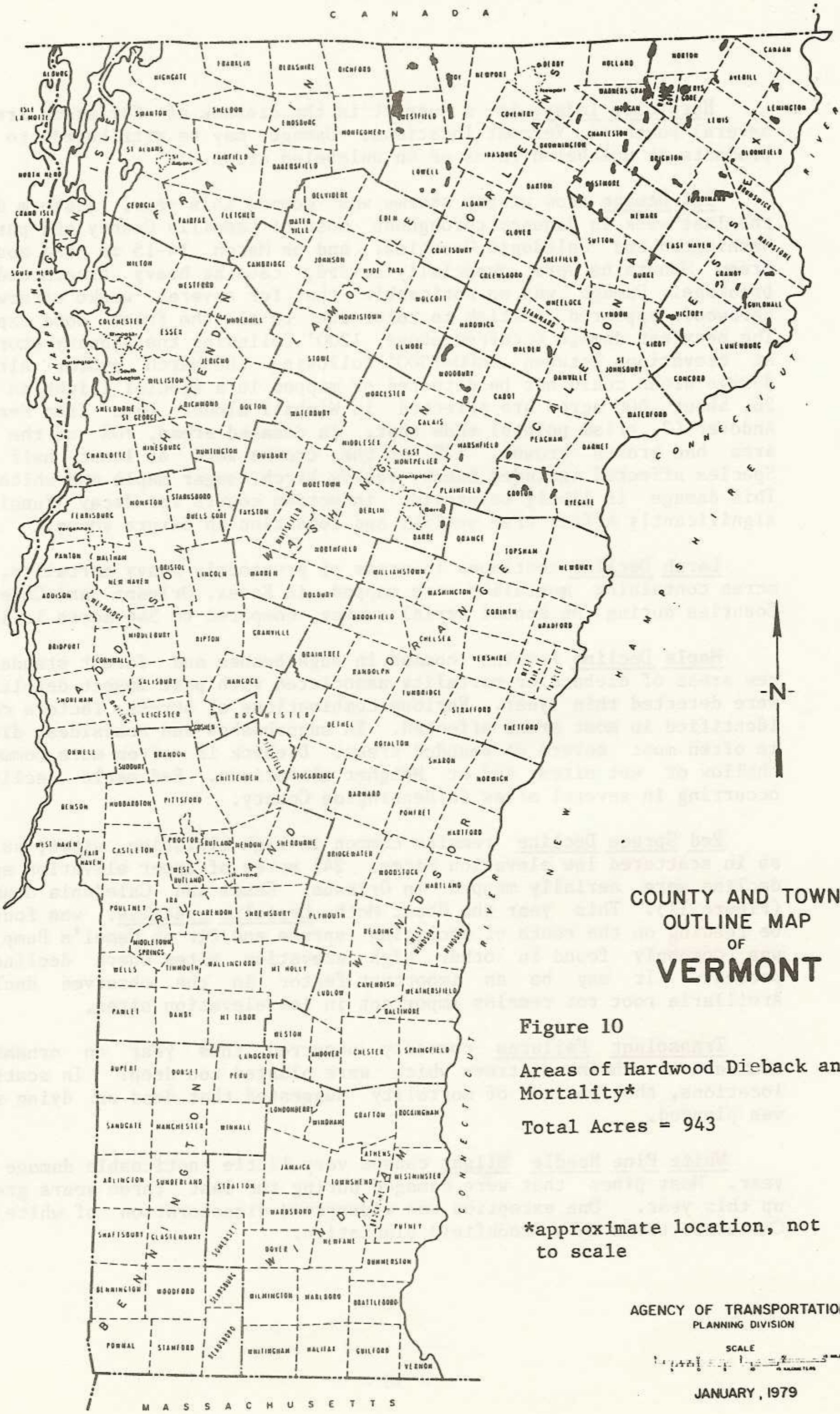
Hail Storms on June 1 caused defoliation and leaf tattering in scattered Windsor County locations.

Hardwood Decline continues to be noticeable throughout the state but was difficult to detect this year because of the frost damage. 943 acres of decline were aerially mapped in the Northeast Kingdom this year (Essex County-165 acres, Orleans County-242 acres, Caledonia County-241 acres) compared to 3,259 acres last year (Figure 10). Most of this acreage is not associated with any known defoliation, and includes such things as birch dieback, and dieback and mortality of beech due to beech bark disease.

A statewide hardwood tree health survey was begun early this year, utilizing photography taken by the U.S. Forest Service late in the summer of 1985. Color-infrared transparencies at a scale of 1:8000, were obtained for 169 usable points, randomly gridded over the entire state. Stereoscopes and grid overlays were used to divide a 360 acre block, at the center of each point, into 2.5 acre cells. These were stratified into hardwood type or other classifications. All hardwood was further stratified into two size classes and three mortality classes.

Of the 26,000 acres of hardwood examined by photography, 99.2 percent fell into the light mortality class (less than 10 percent of the trees dead). Ten percent of these light mortality cells, and all of the moderate and heavy cells, were photointerpreted for number of recently dead, older dead and declining hardwood trees. This was followed up by a ground survey of 75 cells, representing all (2) of the heavy mortality cells, 50 percent (22) of the moderate mortality cells, and five percent (51) of the light mortality cells.

Ground data on crown condition and timber volume will be used to adjust the photo data to obtain a statewide estimate of the number and volume per acre of dead and declining hardwoods. Other stand, site, tree and soils data taken during the ground survey will be analyzed to determine what factors may relate to dieback and mortality. This survey will also serve as an excellent data base for future tree health surveys. A preliminary report should be available by the spring of 1987.



COUNTY AND TOWN OUTLINE MAP OF VERMONT

Figure 10

Areas of Hardwood Dieback and Mortality*

Total Acres = 943

*approximate location, not to scale

AGENCY OF TRANSPORTATION
PLANNING DIVISION

SCALE

JANUARY, 1979

Herbicide Injury is a suspect in the dieback of Christmas trees in several southern Vermont locations. Damage may be attributed to using products at unlabeled rates or on unlabeled crops.

Ice Damage from winter storms was common this year. A storm during the last week in January throughout most of Lamoille County and parts of Washington and Caledonia Counties, and on March 14-15 in the southern Green Mountains were especially severe, causing heavy branch and top breakage. Damage was so noticeable that for several weeks afterwards, hardwoods appeared whitish in color due to all the fresh wood exposed. The heaviest damage occurred above 1200' following the January storm and at elevations between 1800-2500' following the March storm. Although damage areas could not be detected or mapped in a special flight on April 26, about 600 acres are affected in Winhall alone. Data from Peru and Andover (7 prism points) show that, in damaged areas, 70% of the basal area had broken crowns. 17% of the crowns were at least half gone. Species affected included beech, yellow birch, sugar maple and white ash. This damage is likely to provide infection courts for decay fungi, and significantly affect tree quality and condition in future years.

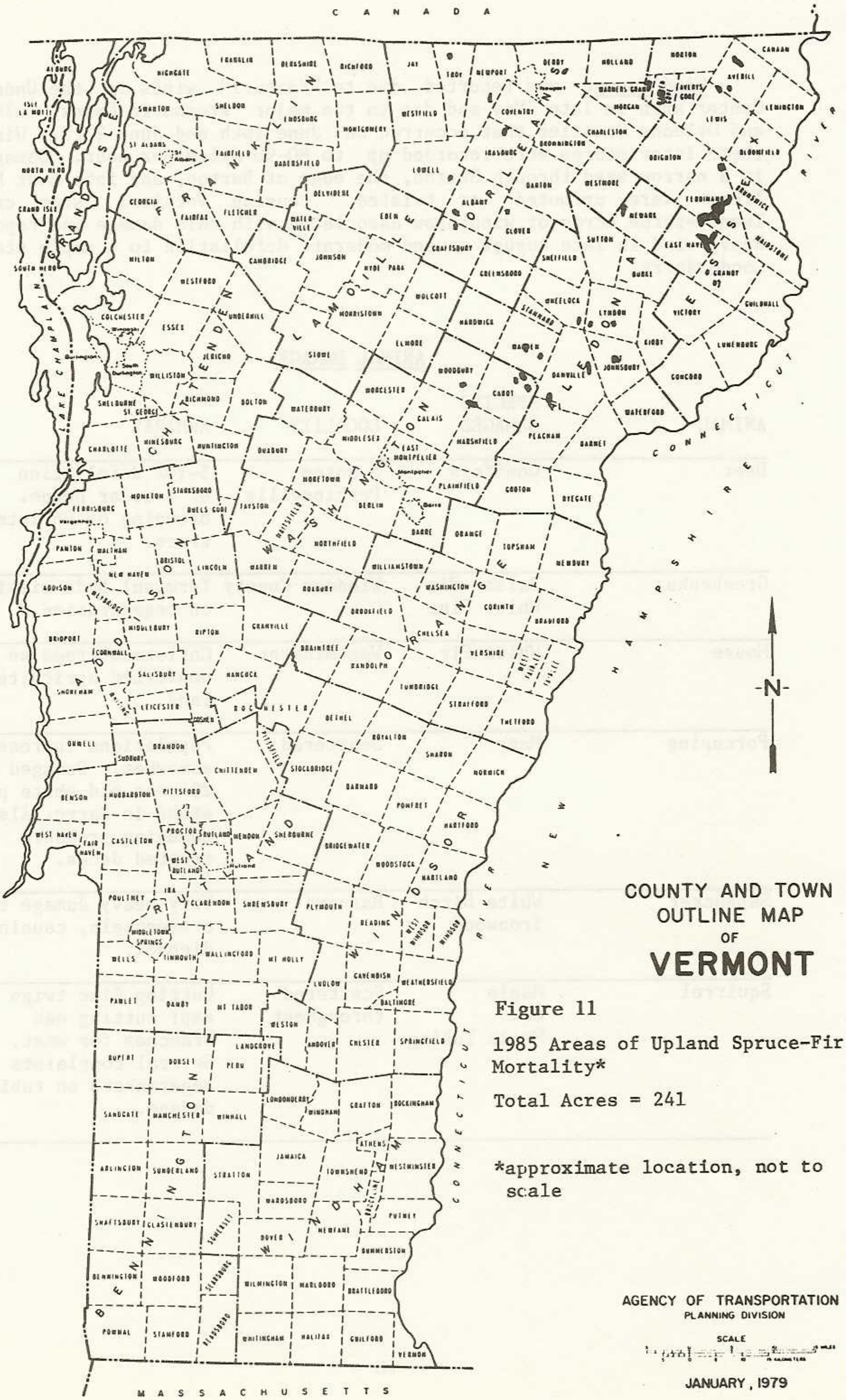
Larch Decline continues in areas of previously heavy mortality. 108 acres containing mortality were mapped in Essex, Orleans and Caledonia Counties during the annual aerial survey, compared to 544 acres in 1985.

Maple Decline remains common in sugarbushes and forest stands. No new areas of dieback or mortality associated with past insect defoliation were detected this year. Various combinations of stress factors can be identified in most areas affected. In sugarbushes and roadsides, dieback is often most severe on wounded trees. Dieback is often more common on shallow or wet sites, and at heigher elevations. Red maple decline is occurring in several areas in Bennington County.

Red Spruce Decline remains common in high elevation sites, as well as in scattered low elevation sites. 241 acres of upper elevation spruce decline were aerially mapped in Orleans, Essex and Caledonia Counties (Figure 11). This year the Ghost Moth, Hepialis gracilis, was found to be feeding on the roots of declining spruce and fir on Camel's Hump, and was commonly found in other high elevation sites where decline is present. It may be an important factor in the observed decline. Armillaria root rot remains important in low elevation sites.

Transplant Failures commonly occurred this year on ornamental conifers or Christmas trees which were planted too deep. In scattered locations, the pattern of mortality suggested that dead or dying stock was planted.

White Pine Needle Blight caused very little noticeable damage this year. Most pines that were damaged during the last three years greened up this year. One exception was widespread discoloration of white pine Christmas trees in a Brookfield plantation.



COUNTY AND TOWN OUTLINE MAP OF VERMONT

Figure 11

1985 Areas of Upland Spruce-Fir Mortality*

Total Acres = 241

*approximate location, not to scale

AGENCY OF TRANSPORTATION
PLANNING DIVISION

SCALE

JANUARY, 1979

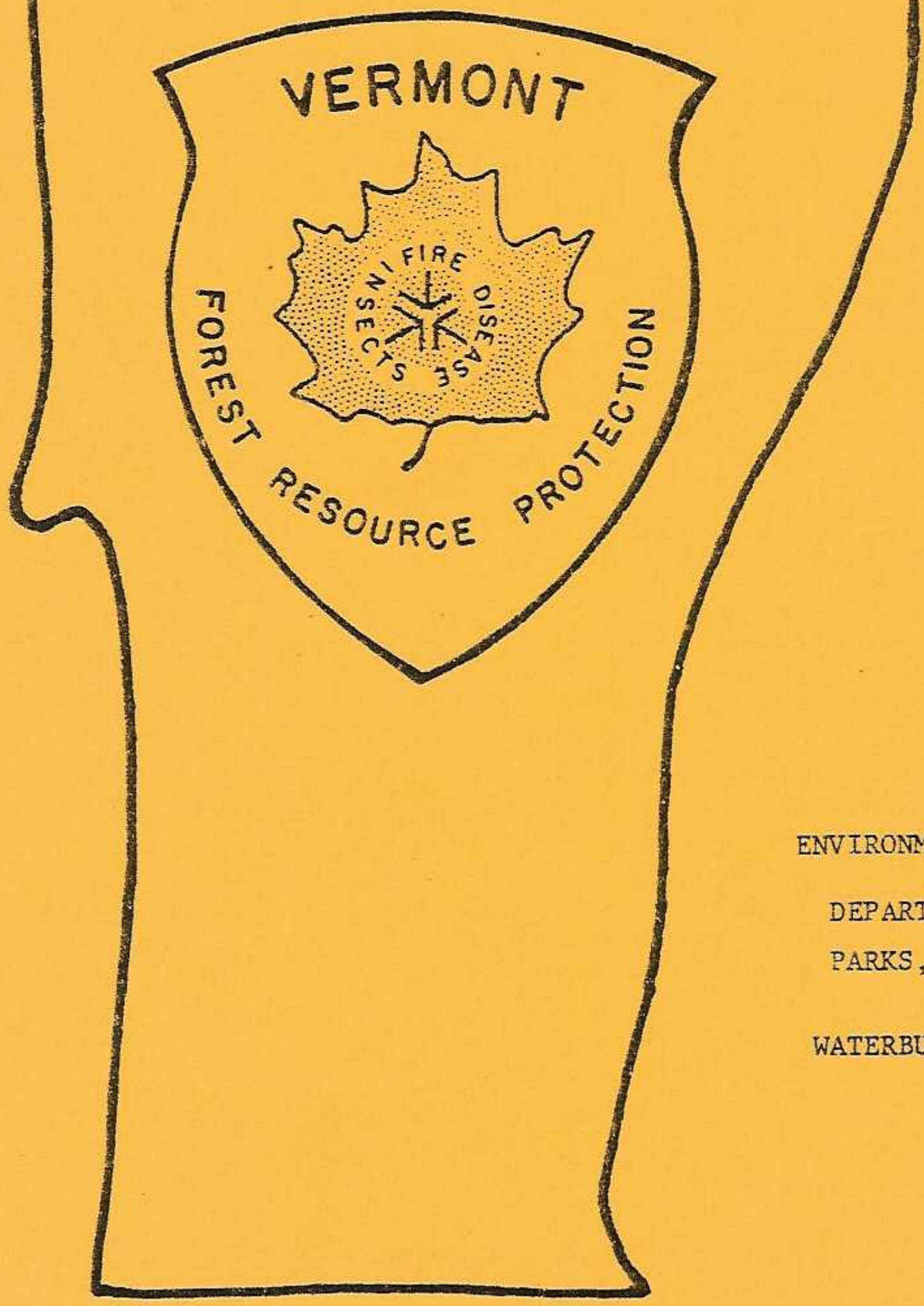
Wind Damage was reported due to "Venturi" winds in the Underhill Center area in late May and due to two major storms in Essex, Caledonia and Orleans Counties that occurred on June 16th and June 23rd. Winds in these later storms were recorded up to 80-90 miles per hour. Damage was in a narrow band through Sutton, the edge of Barton, and into East Haven. Trees were uprooted or twisted, causing vertical stem cracks. Twenty-three acres of windthrow associated with this damage was reported. Heavy wind in late August caused moderate defoliation to a maple stand in Londonderry.

ANIMAL DAMAGE

ANIMAL	SPECIES DAMAGED	LOCALITY	REMARKS
Deer	Conifers	Swanton Perkinsville	5-10% defoliation of a cedar hedge. Browsing on Christmas trees.
Grosbeaks	Balsam Fir White Pine	Windsor County	Terminal buds missing on regeneration.
Mouse	White Fir	Westminster	Christmas trees on converted agricultural land.
Porcupine	Many	Scattered	Populations increasing somewhat. Damaged a 20 year old white pine stand in Barre. Also damaging pressure treated decks.
Sapsucker	White Birch Ironwood	Barnard	Very heavy damage to ornamentals, causing dieback.
Squirrel	Maple Oak Maple Tubing	Scattered throughout	Cutting fine twigs for sap; cutting oak branches for mast. Several complaints from sugarmakers on tubing damage.

FOREST INSECT AND DISEASE CONDITIONS IN VERMONT

CALENDAR YEAR 1986



AGENCY OF
ENVIRONMENTAL CONSERVATION

DEPARTMENT OF FORESTS,
PARKS, AND RECREATION

WATERBURY, VERMONT 05676