



# Forest Insect and Disease Report 1983



Minnesota Department of Natural Resources, Division of Forestry

1983 FOREST PEST REPORT

BY

The Forest Insect and Disease Unit

Minnesota Department of Natural Resources

Division of Forestry

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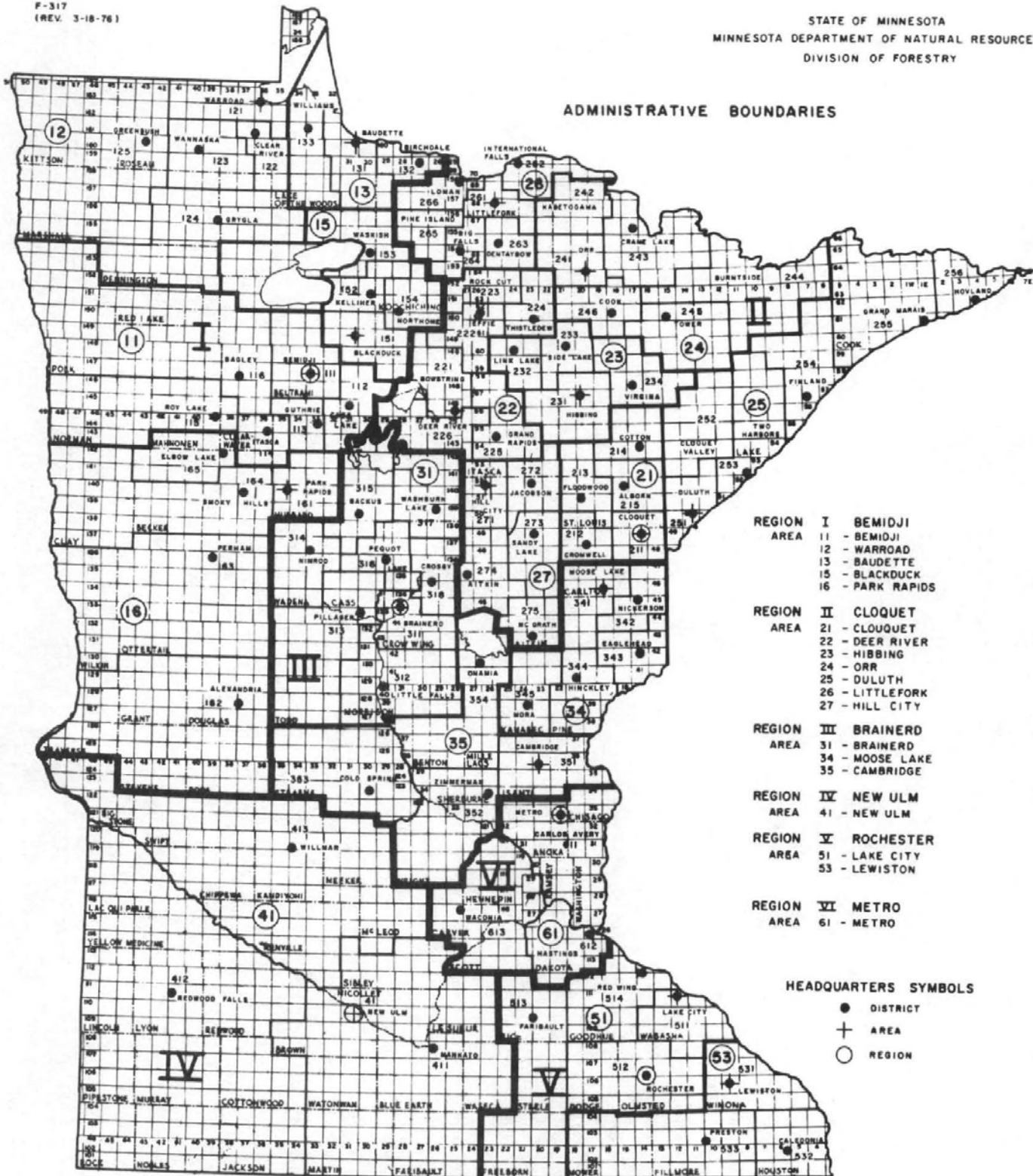
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ADMINISTRATIVE BOUNDARIES



- REGION I BEMIDJI
- AREA 11 - BEMIDJI
- 12 - WARROAD
- 13 - BAUDETTE
- 15 - BLACKDUCK
- 16 - PARK RAPIDS
  
- REGION II CLOQUET
- AREA 21 - CLOQUET
- 22 - DEER RIVER
- 23 - HIBBING
- 24 - ORR
- 25 - DULUTH
- 26 - LITTLEFORK
- 27 - HILL CITY
  
- REGION III BRAINERD
- AREA 31 - BRAINERD
- 34 - MOOSE LAKE
- 35 - CAMBRIDGE
  
- REGION IV NEW ULM
- AREA 41 - NEW ULM
  
- REGION V ROCHESTER
- AREA 51 - LAKE CITY
- 53 - LEWISTON
  
- REGION VI METRO
- AREA 61 - METRO

- HEADQUARTERS SYMBOLS
- DISTRICT
  - + AREA
  - REGION

## INTRODUCTION

There are approximately 16.5 million acres of forest land within the State of Minnesota. Over one-half of the commercial forest land within the state is publicly owned. These forests support a 2 billion dollar forest industry, which is the third largest industry within the state. The Minnesota Department of Natural Resources (MN-DNR) has been charged by the legislature with management efforts and/or support on Minnesota's state, county, and private forest lands.

Minnesota's Forest Insect and Disease Management Unit is contained within the Forest Management Section of MN-DNR Forestry Division. Field activities within this division have been regionalized into six regional administrative units (see Figure 1). The insect and disease unit consists of a Forest Insect and Disease Supervisor, one Field Coordinator, four Regional Forest Insect and Disease Specialists and six seasonal Plant Health Specialists. The four Specialists and the six seasonal Plant Health Specialists have regional responsibilities.

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1983 FOREST INSECT AND DISEASE HIGHLIGHTS

In general, insect pests increased over 1982 levels due to the warm growing season. While nearly undetectable in Regions I and III, jack pine budworm increased in Region II defoliating stands in the Virginia District in St. Louis county. Within these stands the budworm in combination with an outbreak of tarspot needlecast resulted in revising the 1983 forecast to include top kill and mortality. The red pine shoot moth and the red pine needle midge were reported active in Region III where the shoot moth was responsible for extensive stunting and shoot mortality in containerized red pine plantations. The fall defoliator complex diminished in Region III while greatly expanding in Region I.

Aerial spraying for gypsy moth eradication by the Minnesota Department of Agriculture in 1983 when two identified infestations, one in east St. Paul and another in Woodbury, were treated with Sevin 4-Oil<sup>R</sup>. Both treatment areas appeared to remain free of gypsy moth through the subsequent trapping season. Statewide new moth catches increased to 196 moths. Three additional areas are proposed for treatment in 1984.

An unusually high incidence of diplodia tip blight was found in one jack pine plantation in Region I where in 1982 a hail storm produced multiple wounds and subsequent infection sites for Diplodia pini. In Region V, zonate leaf spot was first reported in Minnesota causing defoliation in a pole size walnut plantation.

Special project and study work reported in 1983 included cooperative nursery projects with the U.S. Forest Service; a cone insect and disease study in a white spruce seed orchard; placement of permanent plots in jack pine for budworm evaluation; a schedule of activities covering the budworm infestation in Region II; and second year results from weed control plots in black walnut plantations.

The 1983 Insect and Disease accomplishment again included the administration of Division of Forestry's Herbicide Program.



INSECTS

PINE, JACK and RED

JACK PINE BUDWORM Choristoneura pinus Freeman

In Region 1 budworm activity was nearly undetectable. An early larval survey was conducted in Hubbard, Becker, Clearwater, Beltrami, Lake of the Woods and Roseau Counties. Within this area 59 sample sites were visited, and budworm larvae were found on only one site, 1315934, Lake of the Woods County. Egg mass surveys were conducted on 50 sites, and one egg mass was found in Hubbard County, 913932.

Similar results were found in Region 3. Early larval surveys were conducted from June 7th to June 23rd on 28 sites in Crow Wing, Cass, Wadena, Morrison and Pine Counties. Larval populations remained extremely low in the 197679 outbreak area that was centered in Wadena county. Populations appear to be building, however, in Mission Township of Crow Wing County, and Norman and Windemere Townships of Pine County. An aerial survey conducted in late July detected no noticeable budworm defoliation in Region 3 stands. Surveys conducted on 13 sites on August 4th and 8th detected only one egg mass, and that in Pine County.

In Region 2 budworm activity was present and noticeable. In the Virginia District, St. Louis County, approximately 2800 acres were defoliated during 1982. Defoliation occurring that year was generally light, but there were scattered spots having moderate to heavy defoliation. Little serious damage was predicted for 1983 because there was plenty of foliage left on the jack pine.

Survey data on 57 prism plots was completed during the winter of 1982-83. These plots were established to document stand condition, to monitor insect development, and to assess budworm impact. A summary of the data collected from the prism plots is as follows:

	range	average
Basal area, total	30 160 sq. ft.	93 sq. ft.
Basal area, dead	0 70 sq. ft.	10 sq. ft.
Site index	45 80	63
Age	32 90+ years	51 years

In late May and early June, 2 and 3 yearold needles turned orange and prematurely abscised due to infection by tarspot needlecast caused by Davisonmycella ampla (Dav.) Dark. (See Tarspot Needlecast). In the budworm outbreak area, 9% of the trees showed some defoliation due to this needlecast disease. The combination of defoliation due to this disease and budworm defoliation necessitated updating the forecast for 1983 to include accelerated top kill and possible mortality where both disease and budworm activity occurred on the same tree.

Thirty staminate flower clusters on each of 31 plots were examined for the presence of early larvae. On most of the plots, staminate flowering was common to heavy, which indicated that conditions were favorable for the budworm population. Thirtyfive percent of the plots had more than 19 infested clusters per plot, and these plots would most likely experience heavy defoliation. The remainder of the plots would experience only moderate to light defoliation.

Defoliation was aerially mapped on July 14th. See Map 1. Most of the defoliation was light to moderate with scattered pockets of heavy defoliation occurring in the moderately defoliated areas. Heavy defoliation occurred primarily near the junction of County Highways 334 and 342.

Pupal collections were made within the outbreak area, and 35% of the 950 collected pupae were parasitized or diseased. *Itoplectis* sp. and Tachinid flies were insect parasites that emerged from the collected pupae. Braconid wasp cocoons were common on jack pine twigs in early July, apparently parasitizing late instar larvae.

Egg mass collections in August predict a very high population in 1984. Seventeen of the 28 egg mass sampling sites (61%) should expect damaging defoliation. They are primarily located in the western half of the outbreak area, but there are a few plots with heavy egg mass counts between Lost and Eshquagama Lakes.

Elsewhere in the Region, the major jack pine areas were aerially surveyed, and no jack pine budworm was observed.

See Special Projects Section for a schedule of work accomplishments.

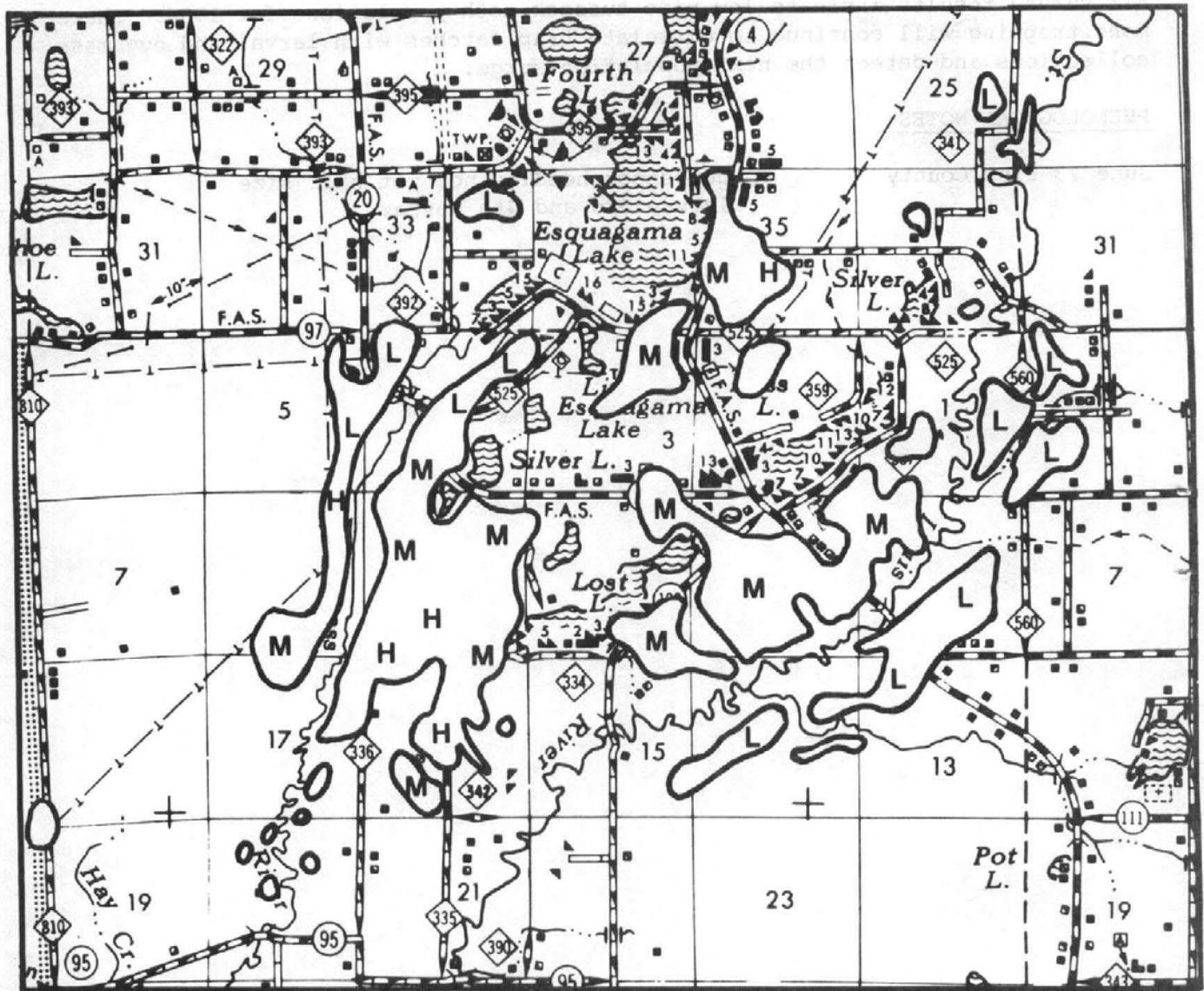
#### OUTLOOK FOR 1984

Damaging defoliation will likely occur in the outbreak area in Region 2 as indicated by the egg mass survey. Light activity and potential population buildup may occur in Crow Wing, Pine, Hubbard, and Lake of the Woods Counties. All major jack pine areas will be monitored via the early larval and egg mass surveys and by aerial reconnaissance.

#### PHENOLOGICAL NOTES

- May 26: St. Louis Co. Biwabik: 2nd instar larvae, 12mm long located at base of staminate cones; small rove beetles noted on cones; possible predators.
- June 2: St. Louis Co. Most 2nd instar larvae with some 3rd instars present; staminate cones not open.
- June 7: Crow Wing Co. 80% of the jack pine pollen shed; 2nd instar larvae present.
- June 11: St. Louis Co. 3rd instar larvae mainly present, but some 2nd instar larvae are still present.
- June 15: Lake of the Woods Co. 3rd instar larvae present.
- June 22: St. Louis Co. 4th instar larvae mainly present, but some 5th instar larvae found.
- June 23: Pine County: Pollen shed complete; needles on the new shoots are not yet half size; and larvae are mainly 3rd instar.
- June 24: St. Louis Co. Big Sandy Lake District: 4th instar larvae present.
- June 28: Crow Wing Co. Mature larvae present and new pupae found.
- July 1: St. Louis Co. Biwabik: Mainly 4th and 5th instar larvae present.
- July 6: St. Louis Co. Mainly 5th instar larvae present.
- July 11: St. Louis Co. 75% pupation has occurred.
- July 14: St. Louis Co. Adults present.
- August 8: Hubbard Co. Unhatched egg mass found.

**Map 1 JACK PINE BUDWORM DEFOLIATION OF JACK PINE**  
**AERIAL SURVEY JULY 14<sup>th</sup> 1983**



- = jack pine stands**
- H = heavy 50-100%**
- M = moderate 20-49%**
- L = light 1-19%**

PINE TUSSOCK MOTH Dasychira pinicola (Dyar)

Larval surveys conducted in the General Andrews State Forest on June 23, 1983 indicated continuing low level populations in this historic outbreak area. Aerial surveys in late July in Mission Township in Crow Wing County and Sturgeon, Windemere, Kettle River and Norman Townships in Pine County detected no defoliation. Pheromone and egg mass survey results are summarized in Tables 1, 2 and 3.

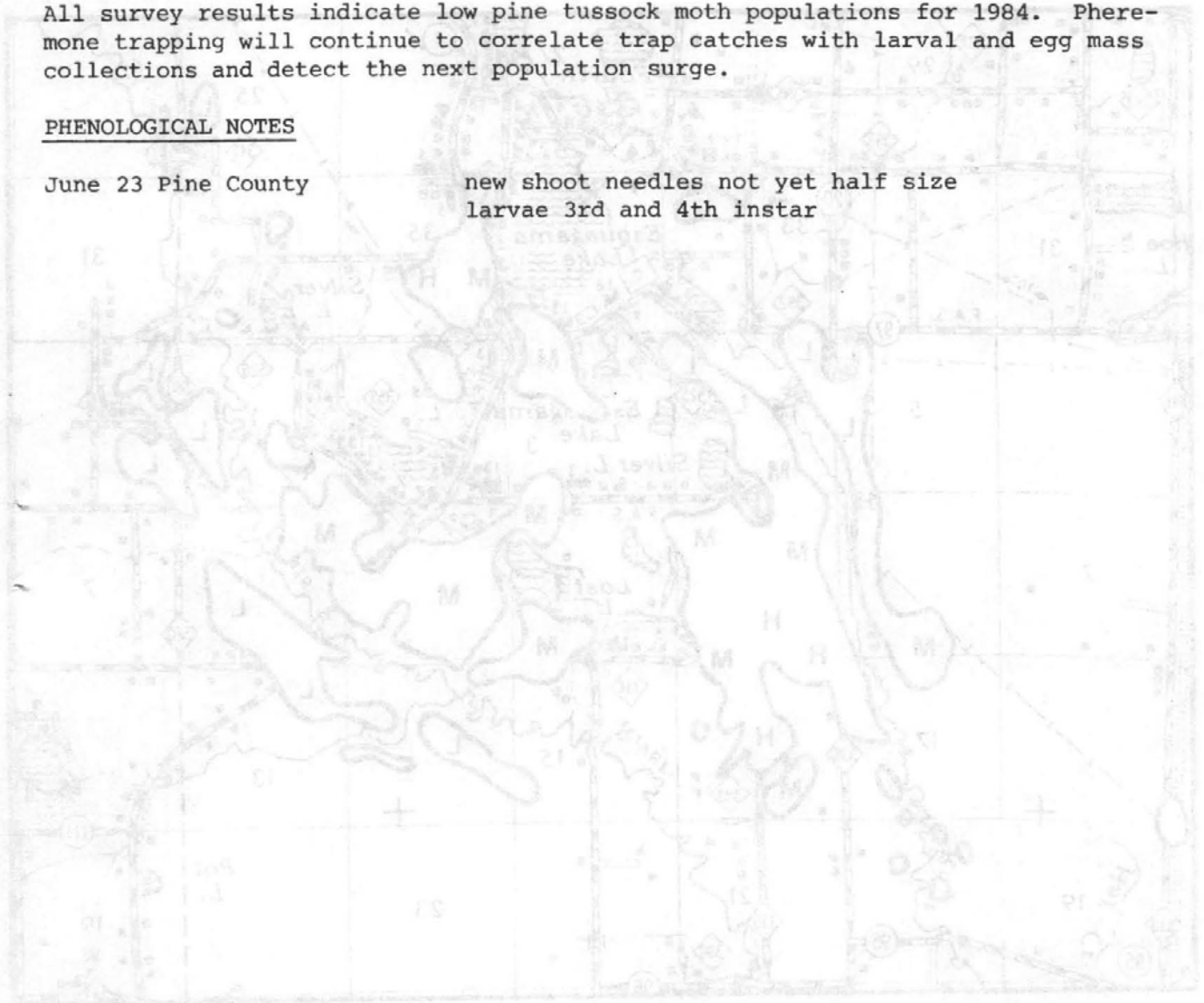
OUTLOOK FOR 1984

All survey results indicate low pine tussock moth populations for 1984. Pheromone trapping will continue to correlate trap catches with larval and egg mass collections and detect the next population surge.

PHENOLOGICAL NOTES

June 23 Pine County

new shoot needles not yet half size  
larvae 3rd and 4th instar



□ - jack pine stands  
H - heavy 50-100X  
M - moderate 20-49X  
J - light 1-19X

1983 PTM Pheremone Trapping Results:

Table 1 Canadian Lure Mix Test<sup>1</sup>  
 Location Sec. 25 Twp. 45 Rge. 20

1	(Date)	726	83	812	819	823	Sum		
	Lure A	1	0	0	1		2		
	C	2	0	0	1		3		
	G	1	1	1	0		3		
	Con	0	0	0	0		0		
<hr/>									
2	A		0				0		
	C		0				0		
	G		4				4		
	Con		0				0		
<hr/>									
								83 Totals	
3	A		2	0			2	A	9
	C		0	1			1	C	5
	G		0	1			1	G	11
	Con		0	0			0	Con	1
<hr/>									
4	A			4	0		4		
	C			1	0		1		
	G <sup>2</sup>			1	1		2		
	Con			1	0		1		
<hr/>									
5	A			1			1		
	C			0					
	G			1			1		
	Con			0					

<sup>1</sup> Traps were placed on July 19, 1983, after first pupal elcosion in laboratory on July 18 and retrieved on October 3, 1983. Figures represent the sum of five replicates at each location. Materials were provided by G.G. Grant.

<sup>2</sup> Trap G22 was destroyed by a bear on 8383 and replaced on 81983.

Table 2

## General Survey catches using Douglas Fir Tussock Moth Lure

A. General Andrews Nursery  
Traps placed July 20

Trap Number	Date				Totals
	July 26	Aug. 3	Aug. 12	Aug. 19	
1	0	0	0	1	1
2	0	0	2	0	2
3	0	1	0	0	1
4	0	0	0	0	0
5	1	0	0	0	1
6	0	0	0	0	0
7	1	0	0	0	1
8	1	0	0	0	1
9	0	0	0	0	0
10	0	0	0	0	0
11	0	0	0	0	0
12	0	0	1	0	1
13	1	0	0	4	5
14	0	0	0	0	0
15	0	0	0	0	0
16	1	0	0	0	1
17	0	0	0	0	0
18	0	0	0	1	1

B. Mission Township  
Traps placed July 22

Trap Number	Date				Totals
	July 27	Aug. 5	Aug. 15	Aug. 22	
1	4	3	5	0	12
2	3	1	9	0	13
3	3	0	1	0	5
4	2	1	0	0	3
5	6	2	5	0	13
6	0	3	3	0	6
7	5	1	7	0	13
8	0	0	0	0	0

Table 3

Pine Tussock Moth Egg Mass Survey August 4, 1983.

<u>Location</u>	<u># Egg Masses</u> <sup>1</sup>
SWSW 64419	0
NWSE 274519	1
NWSE 294519	0
SWSE 294519	0
SESE 254520	0
NWSE 134520	0
SENE 254520	0

<sup>1</sup> Number of egg masses present on the amount of foliage encompassed in a two arm length sweep on six trees per site.

BARK BEETLES Ips spp.

In Region 3, a 165 acre sale (2541 cords) in the Sand Dunes State Forest of Sherburne County during December salvaged declining jack pine that was heavily infested with bark beetles. Stand mortality had exceeded 30%. Additional requests for bark beetle control information were serviced concerning cut products on landings in Aitkin County, damaged trees along power lines, and yard and roadside trees scorched by severe heat in July. The Chapel Grove Pines in St. Croix Park were selectively marked to reduce future beetle hazard. Thinning of private plantations in Cass County enforced restrictions on product removal during hazard periods and utilization to a 3" top.

In Region 2, bark beetles were found in decadent and dying red pine south of Eveleth in St. Louis County. At the Eshquagama golf course in central St. Louis County, bark beetles killed a few mature jack pine.

A common homeowner problem was observed in the jack pine budworm outbreak area in central St. Louis County. Bark beetle infested jack pine fuelwood was stacked against or adjacent to live conifers. Bark beetles attacked those trees and, if successful, contributed to their decline and death.

In Region 1, significant bark beetle activity was minimal. On May 9, newly constructed nuptial chambers were observed in piled red pine logs in Lake of the Woods County. No egg galleries were found and only a solitary beetle was found at each nuptial chamber. The pile of logs remained into June and no additional bark beetle activity was detected.

Bark beetle activity will be dependent on weather and stand conditions. However, in Sherburne, Stearns and Isanti Counties, two major windstorms in July damaged in excess of 2,000 acres of pine plantations. Beetle populations will be monitored in the winddamaged area as well as in the salvaged sale in the Sand Dunes State Forest. Monitoring activities will help to determine if trap trees will be used or if salvaging is necessary.

WHITE PINE WEEVIL Pissodes strobi (Peck)

Weevils were collected throughout Region 2 in pine plantations and in areas of natural jack pine regeneration. In the Grand Marais District, a new infestation in jack pine regeneration was found, and leader mortality was occurring. A jack pine plantation in the Cook District and another one in the Orr District (306517) continued to be infested.

In Region 3, white pine yard trees in Cass and Crow Wing Counties were infested with this weevil, and blue spruce yard trees in Kanebec County also were infested.

REDHEADED PINE SAWFLY Neodiprion lecontei (Fitch)

No sawflies were found in plantations, but sawfly activity was observed occasionally along the roadsides in Carlton County causing defoliation to jack pine.

PHENOLOGICAL NOTES

August 10: Carlton Co. Predominantly 5th instar larvae present.

JACK PINE SAWFLIES

Neodiprion pratti banksianae (Rohwer)

Populations of this sawfly are currently at subeconomic levels, although populations seemed to have increased from the 1982 levels. Occasional defoliation was noted in the Biwabik area of St. Louis County. Small, localized populations were detected in the Floodwood District (St. Louis County) and in the Big Sandy Lake District (Aitkin County).

PHENOLOGICAL NOTES

- June 22: St. Louis Co. Biwabik: Egg masses
- June 24: St. Louis Co. Egg masses hatched
- June 24: Aitkin Co. Big Sandy Lake: 4th instar larvae
- July 15: St. Louis Co. Biwabik: 4th instar larvae



Neodiprion maurus (Rohwer)

PHENOLOGICAL NOTES

July 5: Aitkin Co. Big Sandy Lake: 2nd and 3rd instar larvae  
July 12: Aitkin Co. Jacobson District: 3rd instar larvae

Neodiprion virginicus

Occasional roadside defoliation of jack pine in St. Louis County was observed. This sawfly was responsible for the defoliation which was considered noneconomic.

PHENOLOGICAL NOTES

June 24: St. Louis Co. Paupore: Unhatched eggs  
July 1: St. Louis Co. Eggs hatched  
August 5: St. Louis Co. 5th instar larvae; most of the feeding was completed.

Neodiprion rugifrons Middleton (Redheaded Jack Pine Sawfly)

Noticeable defoliation occurred to a small, isolated area of jack pine in the Kelliher area in central Beltrami County. Larvae were also collected in central Hubbard County, but no defoliation had occurred.

INTRODUCED PINE SAWFLY Diprion similis (Hartig)

This defoliator of white pine was found scattered throughout central and northern Minnesota. Nowhere, however, were populations large enough to cause any significant defoliation.

Aerial surveys conducted in August in Region 3 detected only light defoliation in the Belle Prairie Morrison County Park (1441N32W). Ground checks in Morrison, Chisago and Isanti Counties indicated low larvae populations with high incidence of parasites and disease. No direct control was undertaken.

In Waseca County, introduced pine sawfly was found in September feeding on Scots pine in a shelterbelt.

PHENOLOGICAL NOTES

July 1: St. Louis Co. Crane Lake: 4th instar larvae  
Wadena Co. Mature larvae on red pine  
July 11: Morrison Co. 1st generation prepupal stage and new cocoons  
Sept. 16: Morrison Co. 2nd generation mature larvae, prepupae, and cocoons

RED PINE SHOOT MOTH Rhyacionia adana (Heinrich)

In July, a shoot borer larvae from a private red pine plantation in Stearns County was identified as R. adana. Larvae of this shoot moth had been found in previous years elsewhere in Region 3. It had been found primarily in red pine plantations and volunteer jack pine regeneration which was 2 to 5 years of age.

At an international nursery conference held in Duluth during the early part of August, forest industry personnel reported that extensive stunting and shoot mortality was occurring in containerized red pine plantations in Cass, Morrison Crow Wing and Wadena Counties. A field check of an industry plantation in 513230, Morrison County, confirmed that up to 40% of the planted containerized red pine stock had been stunted by one or more shoot borer attacks. Another plantation in 1114333, Hubbard County, was checked and found that nearly 100% of the trees had multiple tops. Eleven out of 30 shoots collected were infected with Sphaeropsis ellisii Succ. (See tip blight). R. adana was not found, but is suspected to be the cause of the uninfected, multiple topped seedlings.

In the Pillsbury State Forest, in Sections 1, 21 and 22 of 13430, plantations were surveyed for R. adana. Plantations inspected were all established from bare root stock and were about the same age as the industry plantations. Less than 5% of the trees were affected.

Larvae of the genus Rhyacionia were collected in damaged shoots in a red pine plantation established with bare root stock. The plantation was in Section 22, 14737, Becker County. Damage was confined to less than 5% of the trees.

#### OUTLOOK FOR 1984

Both industry and state plantations will be inspected in June of 1984 to collect larvae, verify identification, assess population levels and evaluate the interaction of S. ellisii, R. adana, site, and planting stock.

#### RED PINE NEEDLE MIDGE Thecodiplosis piniresinosa (Kearby)

Red pine needle loss and shoot mortality occurring in a private plantation in Wadena County (2813733) was first noted in November of 1982. Only a pocket of slow growing trees were affected and surrounding trees had no noticeable defoliation. Row thinning was conducted in the winter of 1983 to increase the vigor of remaining trees. Damage patterns fit those described by Kearby and Benjamin (1964) as being caused by Thecodiplosis piniresinosa Kearby. Distinct needle bending present in the sheath area, however, has been attributed to fungal tip blights, physiological droop, or damage by Contarinia midges. Litter and foliar samples were collected in the stand from May to October. Damage levels were greatly reduced in 1983. No adult midges were obtained, and no primary pathogens were isolated from foliar samples. Orange midge larvae were collected in needle fascicles in October and preserved for identification.

1 Canad. Ent. 96:13131322 (1964)

#### PHENOLOGICAL NOTES Wadena Co.

June 2 most trees with expanding candles  
no new needles  
old foliage thin  
shoots infested last year weak in flushing or dead

- June 14 affected pocket of brown trees visible from road  
new candles still elongating  
dead tips now distinctly shriveled
- July 19 affected pocket still visible from the air but more green (new  
growth) showing than brown (old damage)
- October 11 affected pocket appears green from the road  
dead leaders are still visible but laterals have taken over  
pocket has not enlarged, little new damage visible

SPRUCE, WHITE

YELLOWHEADED SPRUCE SAWFLY *Pikonema alaskensis* (Rohwer)

In all 3 northern Regions, population numbers were low and occurrence was spotty. This was a continuation of the 1982 trend.

Moderate defoliation was observed in the southeastern portion of a white spruce plantation at the junction of State Highway 200 and U.S. Highway 2 in the Jacobson District in Aitkin County. Thirtyfive trees were involved. Light defoliation was observed on the south and southwest sides of the white spruce seed orchard near Cotton in St. Louis County. Ichneumonid wasps and Pentastomid bugs were commonly found in this area, and the Pentastomids were observed actively feeding on sawfly larvae.

Plantations in Aitkin County at Cross Meadows, Swatara, Hill City, Quadna Mountain, McGrath, and Big Sandy Lake, and at Canyon in St. Louis County were inspected for yellowheaded spruce sawfly. Neither sawfly larvae or defoliation was observed.

Direct control was carried out on 14 acres of a plantation in Aitkin County and in the spruce seed orchard in Pine County.

As part of a cooperative risk rating project being conducted by the U of M, pheremone traps were placed in the seed orchard, the General Andrews State Forest Nursery, and the Badoura State Forest Nursery to monitor adult activity and to time larval surveys to assess control needs. Low populations in test areas resulted in few trap catches and limited control needs.

OUTLOOK FOR 1984

A continued low level of activity from this sawfly is expected. However, in those areas where defoliation had occurred in 1983, field checks will be made to determine if controls are needed.

PHENOLOGICAL NOTES

- May 27: Itasca Co. Adults present in pheremone traps
- June 8: Pine Co. In the seed orchard, adults found in pheremone traps;  
some trees showed swelling buds; some trees were fully  
flushed with new shoot growth.
- June 14: Carlton Co. 1st instar larvae

- June 20: Aitkin Co. Some adults still present; 1st and 2nd instar larvae  
 June 23: Pine Co. Females still ovipositing; 1st and 2nd instar larvae present on trees that had flushed by June 8th.  
 June 24: Aitkin Co. Jacobson: 2nd and 3rd instar larvae  
 July 5: Aitkin Co. Jacobson: 4th and 5th instar larvae; parasite eggs in larvae common  
 July 11: St. Louis Co. Cotton seed orchard: Pentastomid bug and Itoplectis wasps common

FIR, BALSAM

SPUCE BUDWORM Choristoneura fumiferana (Clemens)

Since 1973, budworm populations have defoliated and killed mature and over-mature balsam fir in southern St. Louis and southwestern Lake Counties. These activities continued during 1983. A new area occurred in 1983 in northwestern Cook County. See Map 2.

In 1983 the defoliated acreage increased slightly; however, the number of acres in the heavy category more than doubled when compared to the 1982 acreage.

Heavy	=	72,000 ac	50100% defoliated
Moderate	=	47,700 ac	20 44% "
Light	=	19,000 ac	1 19% "
		<u>138,700 ac total</u>	

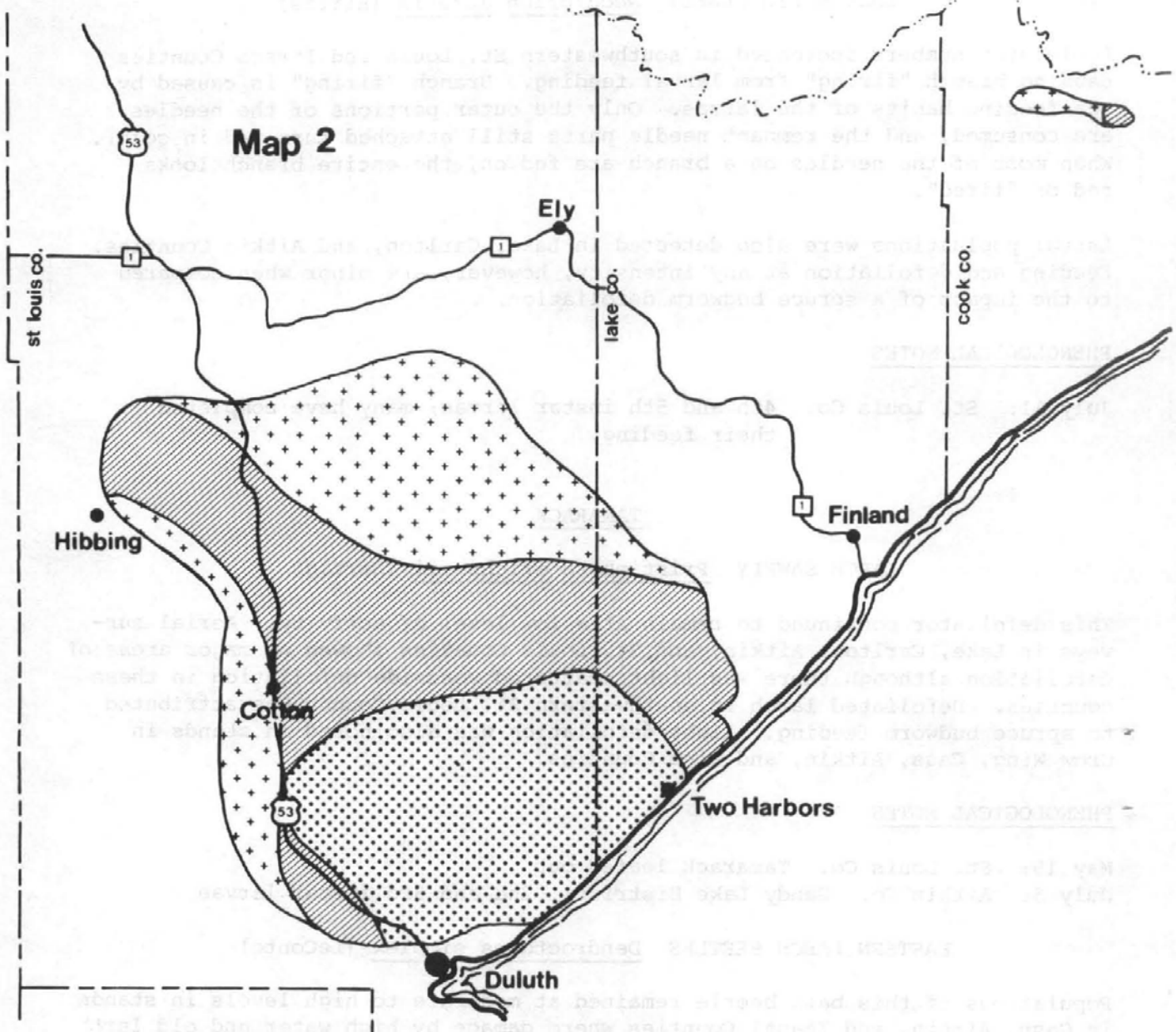
OUTLOOK FOR 1984

- Stands in southern St. Louis and southwestern Lake Counties can expect continued infestations with heavy to moderate defoliation, top kill, and mortality. In Cook County, some top kill should be expected, but mortality should not occur.




PHENOLOGICAL NOTES

- June 1: St. Louis Co. Cotton Seed Orchard: Larvae found under bud scales of spruce causing a curling of new growth; fir bud scales cast; larvae found feeding in edges of new growth; webbing present.
- June 16: St. Louis Co. 4th instar larvae
- June 22: St. Louis Co. Cotton Seed Orchard: 5th instar larvae
- July 1: St. Louis Co. Pupae predominate
- July 7: St. Louis Co. Adults emerged
- July 11: St. Louis Co. Adults common on fir
- July 13: Cook Co. 25% adults; 75% pupae
- Aug. 12: St. Louis Co. Of 500 pupae collected, 46% parasitized; parasites were mostly Ichneumonid wasps.

Map 2



**SPRUCE BUDWORM  
Defoliation 1983**

-  **heavy** 50-100%
-  **moderate** 20-49%
-  **light** 1-19%



BALSAM FIR SAWFLY Neodiprion abietis (Harris)

Population numbers increased in southwestern St. Louis and Itasca Counties causing branch "firing" from larval feeding. Branch "firing" is caused by the feeding habits of the larvae. Only the outer portions of the needles are consumed, and the remnant needle parts still attached turn red in color. When most of the needles on a branch are fed on, the entire branch looks red or "fired".

Larval populations were also detected in Lake, Carlton, and Aitkin Counties. Feeding and defoliation at any intensity, however, are minor when compared to the impact of a spruce budworm defoliation.

PHENOLOGICAL NOTES

July 11: St. Louis Co. 4th and 5th instar larvae; many have completed their feeding.

TAMARACK

LARCH SAWFLY Pristiphora erichsonii (Hartig)

This defoliator continued to remain at a low level of activity. Aerial surveys in Lake, Carlton, Aitkin, and St. Louis Counties showed no major areas of defoliation although there was light scattered roadside defoliation in these counties. Defoliated larch in southwestern St. Louis County was attributed to spruce budworm feeding. Light defoliation was also noted in stands in Crow Wing, Cass, Aitkin, and Pine Counties.

PHENOLOGICAL NOTES

May 19: St. Louis Co. Tamarack leafed out

July 5: Aitkin Co. Sandy Lake District: 2nd and 3rd instar larvae

EASTERN LARCH BEETLES Dendroctonus simplex (LeConte)

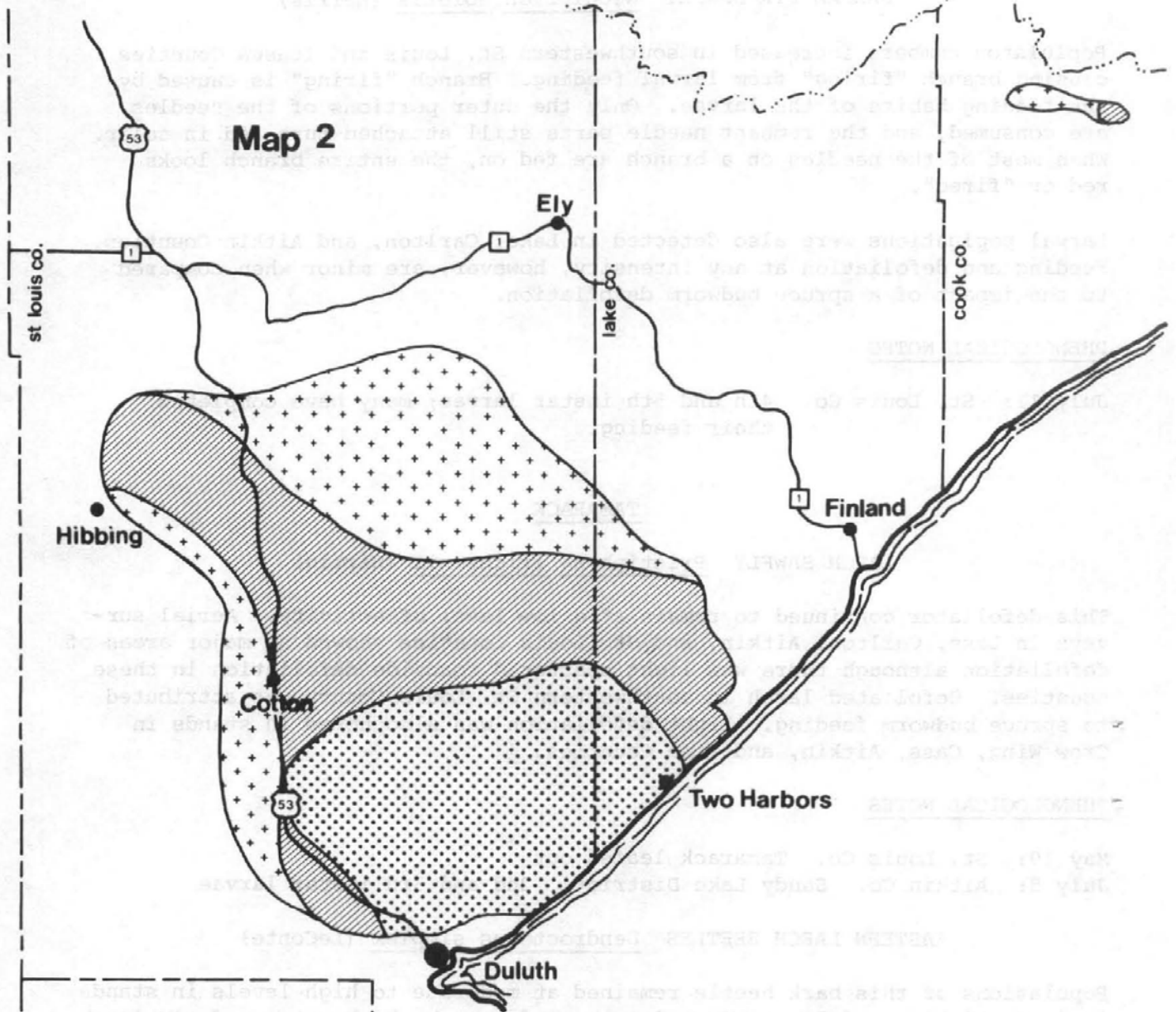
Populations of this bark beetle remained at moderate to high levels in stands in Cass, Aitkin, and Isanti Counties where damage by high water and old larch sawfly feeding had predisposed the stands to successful beetle attacks. In Region 2, beetles were recovered from tamarack in 45617, St. Louis County.

ASPEN




FOREST TENT CATERPILLAR Malacosoma disstria (Hubner)

In Region 1, FTC populations remain nearly nonexistent. An egg mass survey in December, 1982, resulted in finding only one egg mass in the Zippel Bay State Park area, Lake of the Woods County. No defoliation could be found around the egg mass plot or throughout the rest of the Region. In December, 1983, 24 areas throughout the Region were sampled for egg masses; none were found.

Map 2



**SPRUCE BUDWORM  
Defoliation 1983**

-  **heavy 50-100%**
-  **moderate 20-49%**
-  **light 1-19%**



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In Region 3, aerial surveys detected only moderate and light pockets of defoliation. See Map 3. Noticeable defoliation occurred in the Blackhoof and Nemadji river drainages of Carlton County. Isolated pockets of FTC defoliation were visible along I35 around Sandstone and Hinckley in Pine County. There were also pockets of visible defoliation along the north shore of Lake Koronis in Stearns County.

In Region 2, populations continued to decline in 1983; only 168,100 acres of defoliation were detected during an aerial survey on July 6th and 7th. Seventysix thousand acres of moderate to heavy defoliation occurred in northern Carlton, southwest St. Louis Counties and in an isolated area between Ray (Kooch. Co.) and Iddington (St. Louis Co.). See Map 3.

Cocoons began to appear in southwestern St. Louis County on June 30th with most feeding activity completed by July 5th. Few larvae were observed to be "sacked out" indicating low disease control of the population which is in contrast to 1982. Major moth flight occurred from July 15th 20th. Of 1000 pupae collected, 80% were parasitized predominatly by Sarcophaga aldrichii Park.

In an aspen stand which had been defoliated for 6 consecutive years, a 1/10th acre plot was established to observe FTC impact. There was 25% tree mortality on the plot, but Hypoxylon canker was the main cause of death. Despite the break up of the stand, no aspen regeneration was evident on the plot.

#### OUTLOOK FOR 1984

A continued decline in population in Region 2 is expected. In the other Regions, it is expected that activity will be confined to small, isolated areas, but generally little to no defoliation will be detected.

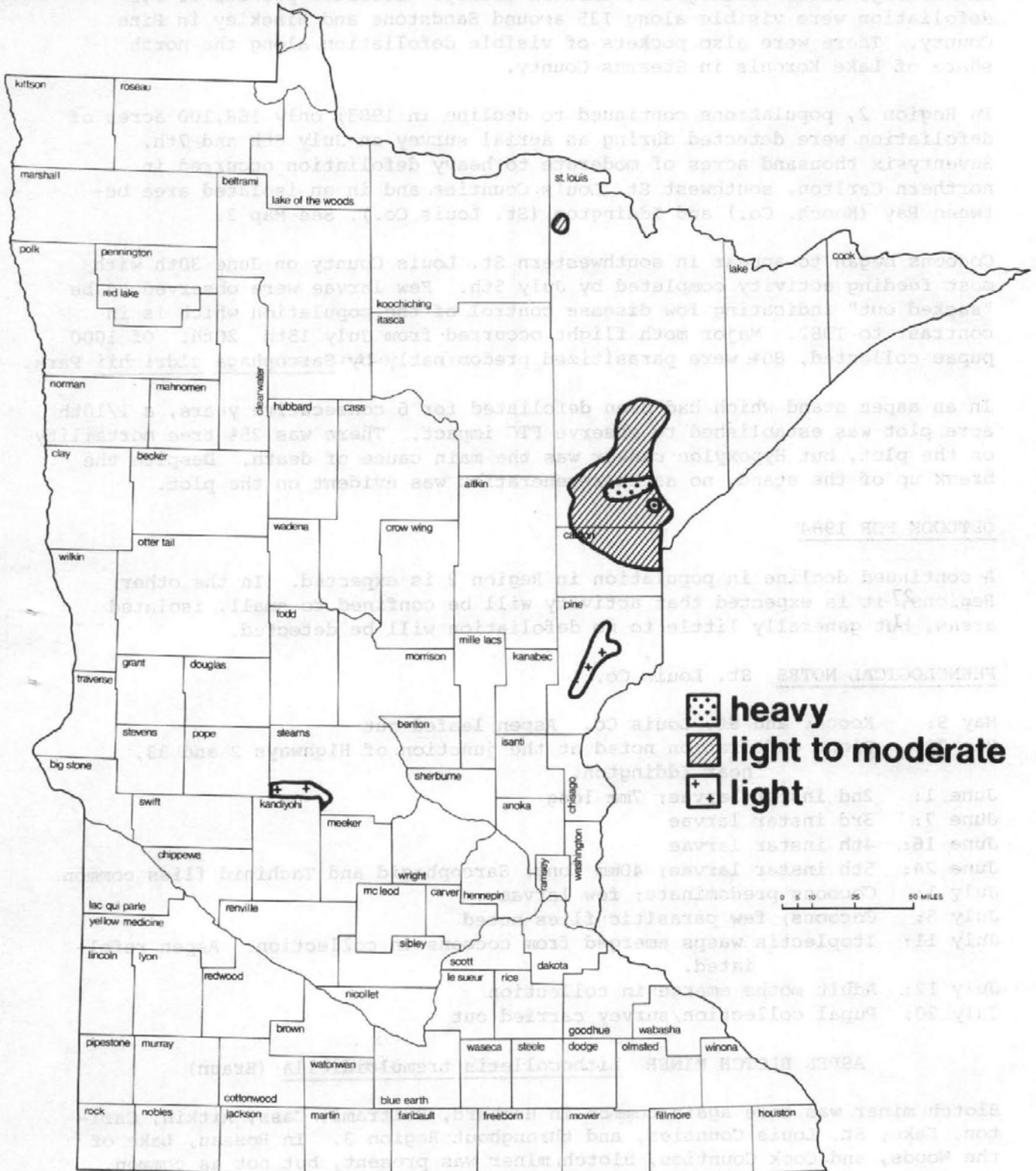
#### PHENOLOGICAL NOTES St. Louis Co.




- May 9: Kooch. and St. Louis Co. Aspen leafed out  
May 22: Light defoliation noted at the junction of Highways 2 and 33, near Iddington.  
June 1: 2nd instar larvae; 7mm long  
June 7: 3rd instar larvae  
June 16: 4th instar larvae  
June 24: 5th instar larvae; 40mm long; Sarcophagid and Tachinid flies common  
July 1: Cocoons predominate; few larvae  
July 5: Cocoons; few parasitic flies noted  
July 11: Itoplectis wasps emerged from cocoons in collection. Aspen refo-  
liated.  
July 12: Adult moths emerge in collection  
July 20: Pupal collection/survey carried out

#### ASPEN BLOTCH MINER Lithocolletis tremuloidiella (Braun)

Blotch miner was once again common in Hubbard, Beltrami, Cass, Aitkin, Carlton, Lake, St. Louis Counties, and throughout Region 3. In Roseau, Lake of the Woods, and Cook Counties, blotch miner was present, but not as common. In the FTC defoliated area of St. Louis County, FTC larvae avoided feeding in blotch miner feeding areas on each leaf.

# Map 3 FOREST TENT CATERPILLAR DEFOLIATION - 1983



-  heavy
-  light to moderate
-  light

ASPEN LEAF ROLLER Anacampsis innocuella (Zeller)

Populations were subeconomic to undetectable. Occasional collections were made from Aitkin, Carlton, and southwestern St. Louis Counties.

PHENOLOGICAL NOTES

June 1: Carlton Co. 2nd instar larvae

ASPEN LEAF TIER Enargia decolor (Walker)

Population numbers were increased since 1982, but the populations were still considered subeconomic. This defoliator was found occasionally in Aitkin, Carlton, and southwestern St. Louis Counties.

PHENOLOGICAL NOTES

June 1: Aitkin Co. Jacobson District: 2nd instar larvae

July 5: Carlton Co. Egg mass

LARGE ASPEN TORTRIX Choristoneura conflictana (Walker)

Low level populations were detected in Aitkin, Carlton, St. Louis, Crow Wing and Pine Counties.

PHENOLOGICAL NOTES

May 27: Itasca Co. 3rd instar larvae

June 1: St. Louis Co. 3rd instar larvae

July 10: St. Louis Co. Egg masses

BIRCH

BIRCH LEAF MINER Fenusa pusilla (Lepeletier)

High population numbers were again observed in Carlton and St. Louis Counties. Low population numbers and spotty distribution occurred in Aitkin, Itasca, and Lake Counties. In Crow Wing and Cass Counties, this mining insect was an urban problem. An aerial survey on July 9th detected two areas between Two Harbors and Silver Bay, Lake County, which were noticeably discolored from leaf miner feeding.

PHENOLOGICAL NOTES Carlton County

The cool spring and early summer not only delayed insect activity, but also caused differences in emergence and feeding within a localized area.

May 11: Birches leafed out

May 25: Few adults noted

June 1: Adults common

June 7: Adults were gone from area where they were observed on June 1, but they were present in another location in Carlton County.

BIRCH SKELETONIZER Bucculatrix canadensisella (Chambers)

Heavy feeding by this insect caused premature color change on birch in southern Beltrami, northern Hubbard and northwestern Cass County. Browning started to show up in midAugust. The area involved was less than in 1982 and feeding impact was reduced. This was primarily caused by heavy and widespread fall defoliator activity. Both skeletonizer and the fall defoliators occurred in the same area, often on the same trees, and occurred at the same time. (See fall defoliator complex).

Elsewhere in the state, this skeletonizer was present but caused little impact. In Cook County, evidences of feeding were spotty and only light scarification of epidermal tissues resulted.

BASSWOOD

BASSWOOD THRIPS Seriocothrips tilae (Hood)

It was suspected that basswood trees in two locations in Carlton County were damaged by basswood thrip feeding (144816 and 214918). The former site was apparently in an early stage of infestation and had light mortality. The latter had apparently longer history with little remaining foliage and tree mortality. Thrips damage buds and leaves by repeatedly piercing the epidermis and sucking ing out cell sap. These wounded areas will dry up; damaged areas will coalesce causing the leaf to wither and drop prematurely. Trees often refoliate by mid-July, but this depletes carbohydrate reserves. After several consecutive years of defoliation and refoilation, the trees may die.

Moderate to heavy pockets of thrip damaged basswood were found throughout the southeastern part of the state. Thrip defoliation was found in combination with anthracnose defoliation.

MOUNTAIN ASH

MOUNTAIN ASH SAWFLY Pristiphora geniculata (Hartig)

In Region 2, there was a general depression of the population compared to 198182. Defoliation was generally light on understory forest trees and the lower branches of ornamentals in Lake, Cook, Carlton, and St. Louis Counties.

In Region 3, noticeable defoliation occurred to yard trees in Crow Wing and Carlton Counties.

PHENOLOGICAL NOTES Carlton County

- June 7: Adults common
- June 15: 1st and 2nd instar larvae
- July 12: 5th instar and 1st instar larvae present indicating an overlap of generations
- July 25: 5th instar larvae and eggs
- Aug. 19: 2nd instar larvae of the second generation

## GENERAL HARDWOODS

### FALL DEFOLIATOR COMPLEX

In Regions 1 and 2, heavy and widespread defoliation was caused by the variable oakleaf caterpillar, Heterocampa manteo (Dblidy.); the redhumped oakworm, Symmerista canicosta Franclement; the false or pale tussock moth, Halisidota tessellaris (J.E. Smith); and other Lepidopterous defoliators. In Region I, walking sticks, Diapheromera femorata (Say) were also involved in causing defoliation.

The area of heavy defoliation was greatly enlarged over what was defoliated during 1982 and involved approximately 700,000 acres of hardwoods. See Map 4. In 1982, the defoliated area in Region 2 involved only 7,500 acres in north-eastern Cass County and southwestern Itasca County. In 1983, the area dramatically increased to include most of Itasca County with scattered pockets of infestation in Koochiching and St. Louis Counties.

In order of preference, hardwood species defoliated were basswood, birch, oak, elm, ash, and aspen. Because defoliation occurred late in the growing season, little damage was done to the trees. The premature loss of foliage and caterpillar invasion of cabins, tents and homes did provide a nuisance to homeowners and did adversely impact the tourist and resort businesses.

In Region 3, heavy defoliation from the fall defoliator complex was reduced over that experienced during 1982. Heavy defoliation was limited to the northern portions of Cass, Wadena, Crow Wing, and Aitkin Counties. Populations were greatly reduced in the southern portions of the 1981-82 outbreak areas. These areas only experienced light defoliation. There was a 70% parasitism rate of egg masses collected in July from oak stands in Cass County (13329). August and September larval collections verified increased disease incidence in southern Crow Wing and Morrison Counties.

Walking stick populations were also increased in 1983 in Region 3 with heavy defoliation occurring in Cass County in 134 31.

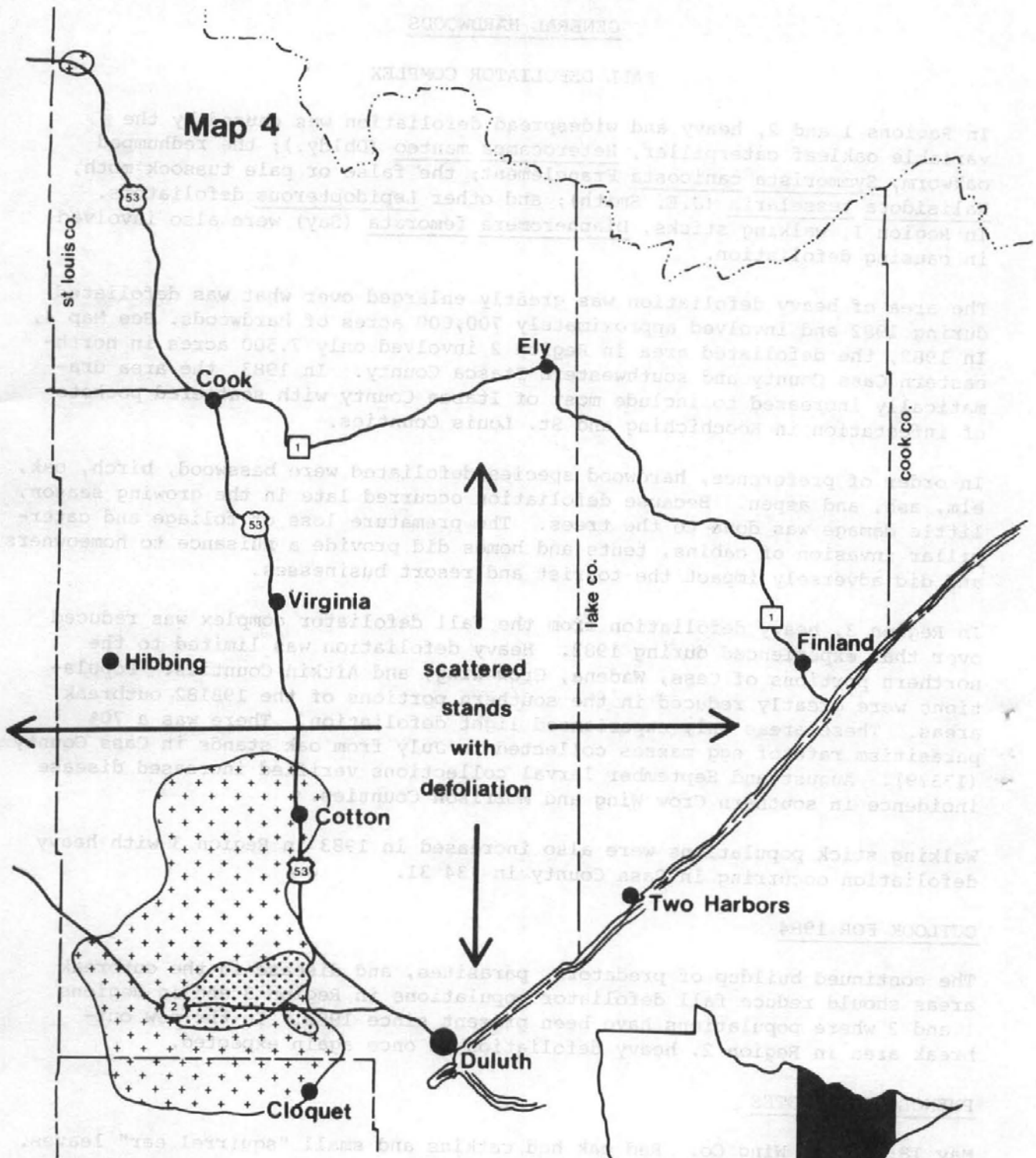
#### OUTLOOK FOR 1984

The continued buildup of predators, parasites, and disease in the outbreak areas should reduce fall defoliator populations in Region 3 and in Regions 1 and 2 where populations have been present since 1982. In the new outbreak area in Region 2, heavy defoliation is once again expected.



#### PHENOLOGICAL NOTES

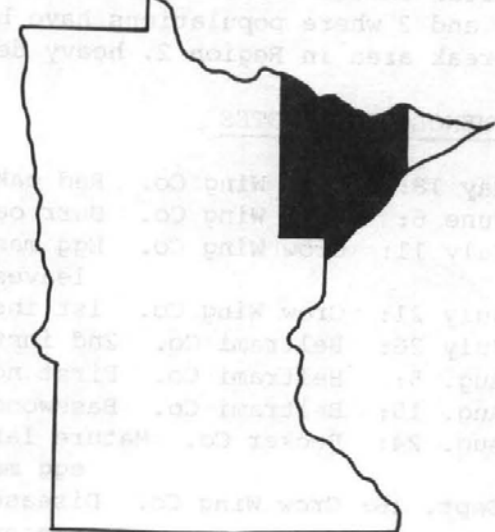
- May 18: Crow Wing Co. Red oak had catkins and small "squirrel ear" leaves.  
June 6: Crow Wing Co. Burr oak had catkins  
July 11: Crow Wing Co. Egg masses were present on undersides of burr oak leaves.  
July 21: Crow Wing Co. 1st instar larvae of redhumped oakworm  
July 26: Beltrami Co. 2nd instar larvae of variable oakleaf caterpillar  
Aug. 5: Beltrami Co. First noticeable defoliation  
Aug. 15: Beltrami Co. Basswood completely defoliated  
Aug. 24: Becker Co. Mature larvae of variable oakleaf caterpillars; new egg masses found  
Sept. 16: Crow Wing Co. Diseased mature variable oakleaf caterpillar larvae present

Map 4

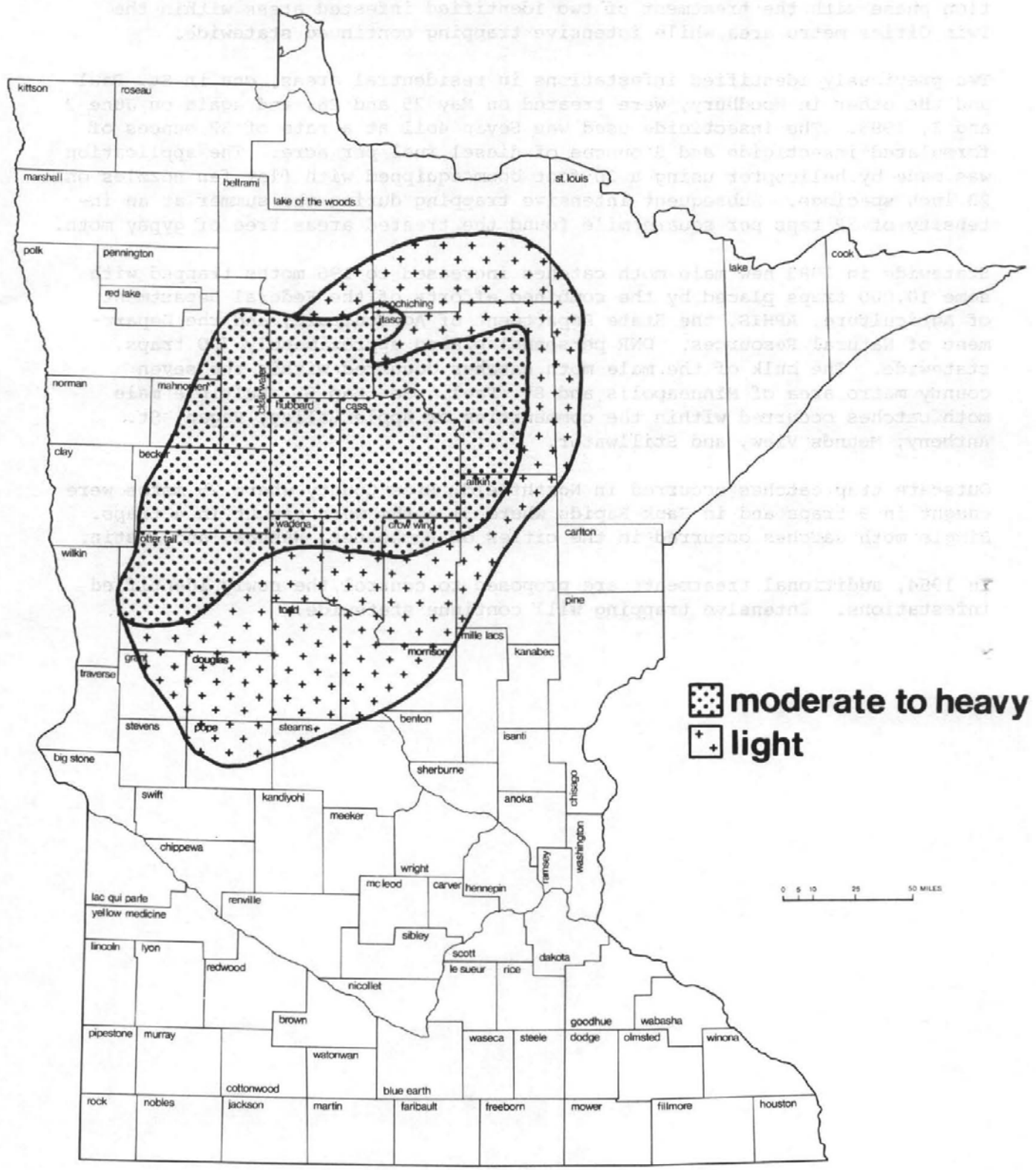


**FOREST TENT CATERPILLAR  
Defoliation 1983**

-  heavy
-  light to moderate



# Map 5 FALL DEFOLIATOR COMPLEX DEFOLIATION - 1983



GYPSY MOTH Lymantria dispar (Linnaeus)

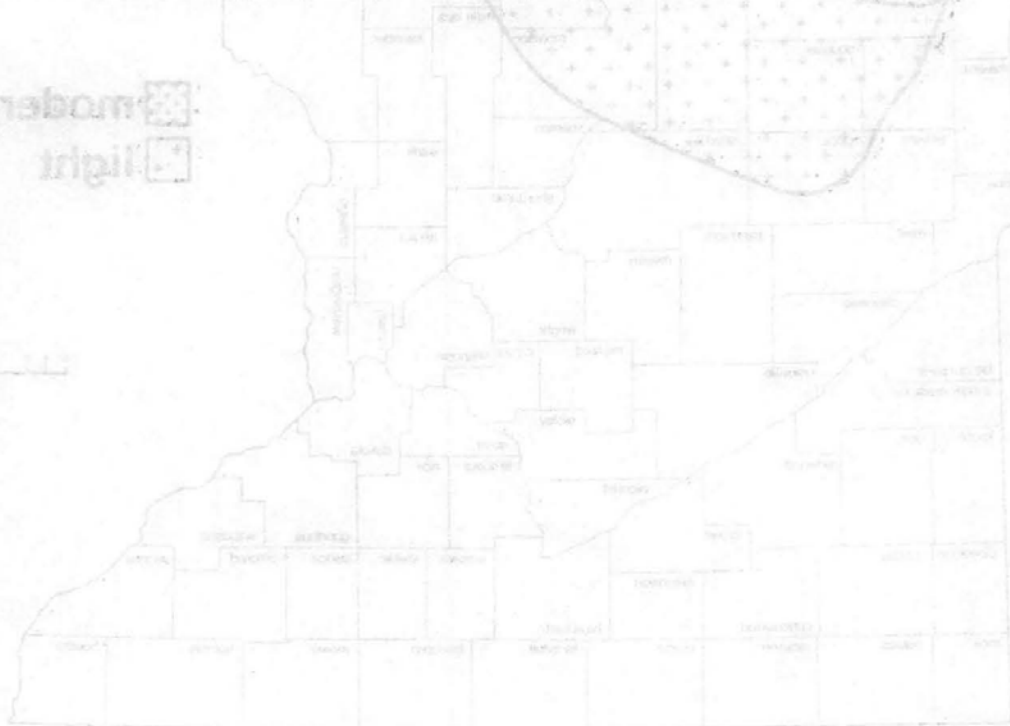
In 1983, the gypsy moth program in Minnesota entered the temporary eradication phase with the treatment of two identified infested areas within the Twin Cities metro area while intensive trapping continued statewide.

Two previously identified infestations in residential areas, one in St. Paul and the other in Woodbury, were treated on May 25 and 26, and again on June 2 and 3, 1983. The insecticide used was Sevin 4oil at a rate of 32 ounces of formulated insecticide and 8 ounces of diesel fuel per acre. The application was made by helicopter using a 20 foot boom equipped with flat fan nozzles on 20 inch spacings. Subsequent intensive trapping during the summer at an intensity of 32 taps per square mile found the treated areas free of gypsy moth.

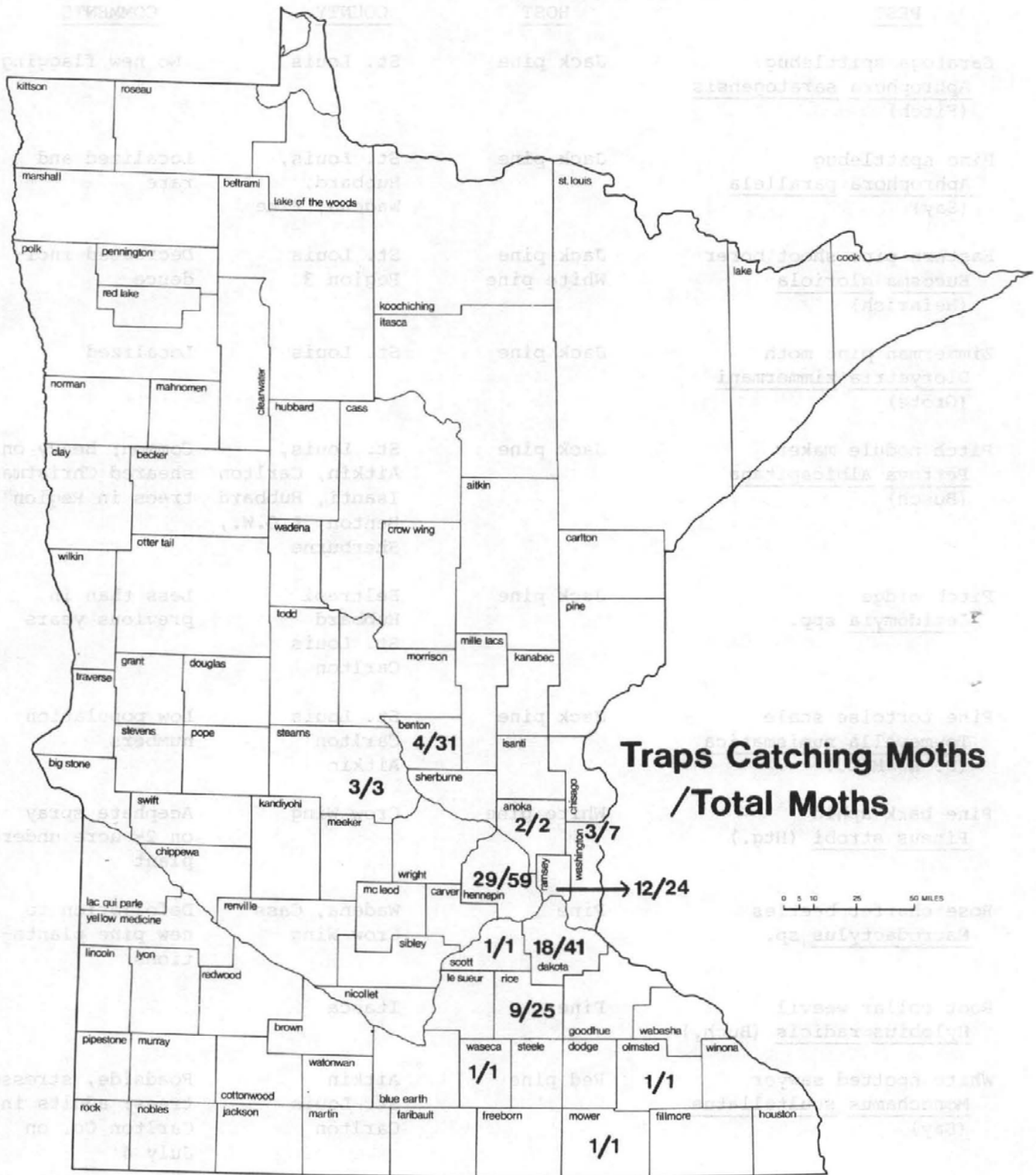
Statewide in 1983 new male moth catches increased to 196 moths trapped with some 10,000 traps placed by the combined efforts of the Federal Department of Agriculture, APHIS, the State Department of Agriculture, and the Department of Natural Resources. DNR personnel placed approximately 700 traps, statewide. The bulk of the male moth catches occurred within the seven county metro area of Minneapolis and St. Paul. See Map 5. Multiple male moth catches occurred within the communities of Apple Valley, Eagan, St. Anthony, Mounds View, and Stillwater.

Outstate trap catches occurred in Northfield, Rice County where 25 moths were caught in 9 traps and in Sauk Rapids where 31 moths were caught in 4 traps. Single moth catches occurred in the cities of Rochester, Waseca, and Austin.

In 1984, additional treatments are proposed to control the newly identified infestations. Intensive trapping will continue statewide.







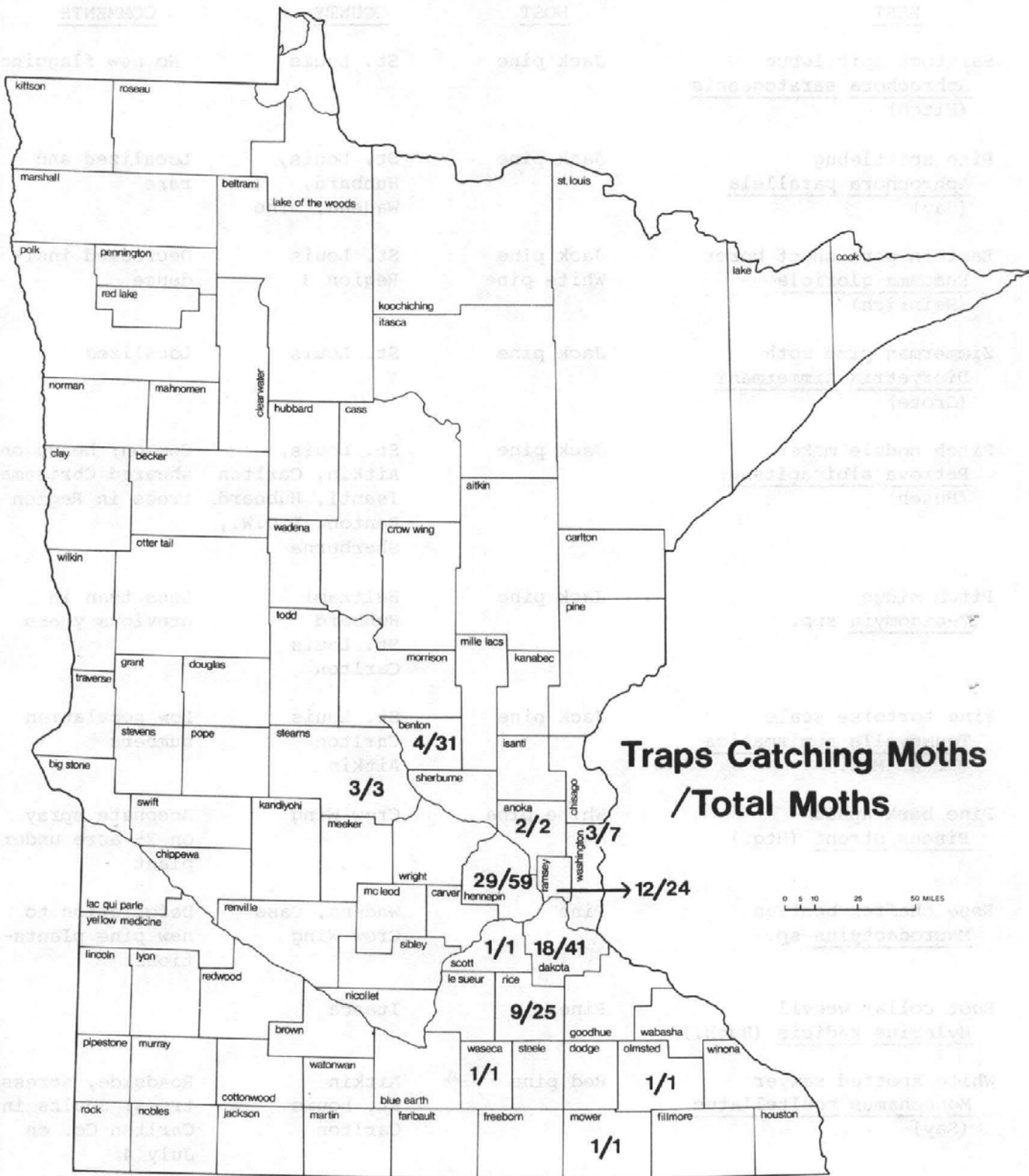
MINOR and INCIDENTAL INSECT PESTS

Map 8

<u>PEST</u>	<u>HOST</u>	<u>COUNTY</u>	<u>COMMENTS</u>
Saratoga spittlebug <u>Aphrophora saratogensis</u> (Fitch)	Jack pine	St. Louis	No new flagging
Pine spittlebug <u>Aphrophora parallela</u> (Say)	Jack pine	St. Louis, Hubbard, Wadena, Pine	Localized and rare
Eastern pine shoot borer <u>Eucosma gloriola</u> (Heinrich)	Jack pine White pine	St. Louis Region 3	Decreased incidence
Zimmerman pine moth <u>Dioryetria zimmermani</u> (Grote)	Jack pine	St. Louis	Localized
Pitch nodule maker <u>Petrova albicapitana</u> (Busch)	Jack pine	St. Louis, Aitkin, Carlton Isanti, Hubbard Benton, L.O.W., Sherburne	Common; heavy on sheared Christmas trees in Region 3
Pitch midge <u>Cecidomyia</u> spp.	Jack pine	Beltrami Hubbard St. Louis Carlton	Less than in previous years
Pine tortoise scale <u>Toumeyella numismatica</u> (P. & McD.)	Jack pine	St. Louis Carlton Aitkin	Low population numbers
Pine bark aphid <u>Pineus strobi</u> (Htg.)	White pine	Crow Wing	Acephate spray on 2½ acre under-plant
Rose chaffer beetles <u>Macroductylus</u> sp.	Pine	Wadena, Cass Crow Wing	Defoliation to new pine plantations
Root collar weevil <u>Hylobius radialis</u> (Buch.)	Pine	Itasca	
White spotted sawyer <u>Monoctonus scultellatus</u> (Say)	Red pine	Aitkin St. Louis Carlton	Roadside, stressed trees; adults in Carlton Co. on July 4
Flatheaded borers (Larval stage)	Red pine	Itasca	Stagnant RP

# Map 6

# GYPSY MOTH TRAP CATCH - 1983



MINOR and INCIDENTAL INSECT PESTS

<u>PEST</u>	<u>HOST</u>	<u>COUNTY</u>	<u>COMMENTS</u>
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Rose chaffer beetles <u>Macroductylus</u> sp.	Pine	Wadena, Cass Crow Wing	Defoliation to new pine plantations
Root collar weevil <u>Hylobius radialis</u> (Buch.)	Pine	Itasca	
White spotted sawyer <u>Monochamus scultellatus</u> (Say)	Red pine	Aitkin St. Louis Carlton	Roadside, stressed trees; adults in Carlton Co. on July 4
Flatheaded borers (Larval stage)	Red pine	Itasca	Stagnant RP

Longhorn beetles and larvae <u>Monochamus</u> spp.	Pine: cut products	Statewide	Product degrade; infested during July & August
Spruce gall midge <u>Mayetiola piceae</u> (Felt)	Black spruce	Roseau	Light infestation in regeneration
Cooley spruce gall aphid <u>Adelges Cooleyi</u> (Gill)	Blue spruce	Carlton St. Louis	Common
Needle miner <u>Endothenia albolineana</u> (Kearf.)	Spruce	Crow Wing	Yard trees
Balsam twig aphid <u>Mindarus abietinus</u> (Koch)	Balsam fir	St. Louis Aitkin	Few noted
Balsam needle midge <u>Dasineura balsamicola</u> (Lint.)	Balsam Christ mas trees	Aitkin	Light
Spider mites <u>Oligonychus ununguis</u> (Jacobi)	Red cedar	Crow Wing Ottertail	Heavy infestation at Trout Lake Camp in Crow Wing Co.; commercial spray used
Spiny elm caterpillar <u>Nymphalis antiopa</u> (L.)	Aspen, willow	St. Louis Aitkin	Occasional defoliation
Poplar vagabond aphid <u>Mordwilckaja vagabunda</u> (Walsh)	Aspen	Carlton St. Louis	Noted occasionally
Poplar borer <u>Saperda calcarata</u> (Say)	Aspen	St. Louis	Increased occurrence; some aspen stands with high population numbers and tree mortality; 316113 has 1 acre heavy infestation.
Poplarwillow borer <u>Cryptorhynchus lapathis</u> (L.)	Balsam poplar	St. Louis	Occasionally found at bases of trees. Adults found on August 25.
Bronze birch borer <u>Agrilus anxius</u> (Gory)	Birch	St. Louis Lake	Continued cause of top dieback; adults found July 27 and Aug. 5.

Fall webworm <u>Hyphantria cunea</u> (Drury)	Alder, birch chokecherry	Carlton St. Louis Cook, Lake, Houston, Winona, Fillmore	Common; 4th instar larvae on Aug. 10: St. Louis Co. Light to heavy throughout SE Mn.
Elm leaf miner <u>Fenusa ulmi</u> (Sunderall)	Slippery elm	Aitkin	Light defoliation
Elm leaf beetle <u>Pyrrhalta luteola</u>	Elm	Aitkin Beltrami Koochiching Crow Wing	Moderate defolia- tion
Imported willow leaf beetle <u>Plagioderus versicolora</u> (Larch.)	Willow	Olmsted, Mower	Heavy feeding in many locations.
Sawfly <u>Nematus salicisodoratus</u>	Willow	Todd Aitkin	Ditchbank bushes
Lacebugs <u>Corythuca</u> spp.	Burr Oak cherry, elm	Sherburne Pine, Aitkin	Widespread
Plant bugs <u>Tropidosteptes</u> sp.	Green ash	Crow Wing Cass	Urban trees
Crimson Eurenium mite <u>Eriophyes</u> sp.	Silver maple	Cass Crow Wing	Common on yard trees
Maple bladder leaf gall <u>Vasates quadripedes</u> (Shimer)	Maple	Crow Wing	Yard trees
Woolly aphid <u>Prociphilus tessellatus</u> (Fitch)	Maple	Crow Wing	Yard trees
<u>Calligrapha</u> spp.	Alder	Aitkin, Carlton	
<u>Cercropia</u> sp.	V. creeper cherry	Itasca	
Walnut caterpillar <u>Datana integerrima</u> (G. & R.)	Walnut	Southeastern Minnesota	Increasing over previous levels; extended hatch or possibly 2 gener- ations.
Oak bullet galls <u>Disholcaspis quercusmamma</u> (Walsh)	White oak	Wabasha Goodhue	Heavy damage in young oak planta- tions where some white oak was mixed in at planting.

PEST	HOST	COUNTY	COMMENT
Powder post beetles	Several M board feet of stored lumber	Olmsted	Fumigated with success.

During spring 1983, a pest was found in the spring of 1981. The pest was found in the spring of 1981. The pest was found in the spring of 1981. The pest was found in the spring of 1981.

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Further investigation revealed that in 1982 a half store and hit the stand. Impact damage was evident as well as a large amount of damage to the wood. The pest was found in the spring of 1981. The pest was found in the spring of 1981.

The occurrence of tip blight is not unusual. The disease was found on red pine in 1983. The pest was found in the spring of 1981. The pest was found in the spring of 1981.

TABLE 1. Occurrence of JACK PINE *Dactyloctenium aegyptium* (L.) Link. in a widespread area in central St. Louis County and near Hill City, Missouri. The pest was found in the spring of 1981. The pest was found in the spring of 1981.

Indication of current year and 1 and 2-year-old needles occurred in the fall of 1983. The pest was found in the spring of 1981. The pest was found in the spring of 1981.

Under current conditions, current year needles and some 1-year-old needles are also on the trees. The pest was found in the spring of 1981. The pest was found in the spring of 1981.

DISEASES

PINE, JACK, RED and WHITE

TIP BLIGHT (DIPLODIA) Sphaeropsis ellisii Sacc.

During aerial detection flights in the spring of 1983, an area of jack pine was discovered turning red. The stand is approximately 100 acres in size, is privately owned in several ownerships, and is located in Clearwater County, 614638. The stand is also located adjacent to the 1980 Ebro fire.

Diagnosis from the air was bark beetle damage because of the possibility of fire damage and because of the signs of logging in the stand. A ground inspection revealed trees of all sizes turning red, damage ranging from flagging branches to dead tops to tree mortality, resinsoaked wood along the margins of the red and green portions, and not a single bark beetle. Field diagnosis was tip blight, and microscopic examination and fungal isolations confirmed the presence of the Sphaeropsis fungus.

Further investigation revealed that in 1982 a hail storm had hit the stand. Impact cankers were evident as well as flagged shoots on balsam fir and white pine. The path of the storm was relatively narrow, less than 2 miles wide, and the length of the hail storm could be followed for approximately 30 miles. Sphaeropsis infected jack pine and flagged balsam fir outlined the trail of the storm. The damage ended in 1614135, Hubbard County, where an area of stateowned red pine plantations and natural jack pine were severely infected with Sphaeropsis ellisii.

The occurrence of tip blight is not unusual. The disease was found on red pine in Itasca County during 1983. But, Sphaeropsis has not been observed causing this magnitude of damage since the drought years of 197677. There must have been ample Sphaeropsis inoculum present in the pine stands, and the wounding by the hail created infection courts and enough tree stress for this fungus to become a major damaging agent.

TARSPOT NEEDLECAST OF JACK PINE Davisomycella ampla (Dav.) Dark

Jack pine in a widespread area in central St. Louis County and near Hill City, Aitkin County, were partially defoliated by Davisomycella infection. Heavy needlecast was documented on 9% of the jack pine in the Virginia District, St. Louis County. The remaining trees were slightly affected if at all. In any one location, 0 to 40% of the trees had needlecast.

Infection of current year and 1 and 2yearold needles occurred in the fall of '82. By early June, 1983, the fruiting bodies were mature. The infected needles were orange colored at this time and then they faded to straw color before being prematurely shed. Needles were shed all summer long. This particular disease is different from the typical needlecasts in that the fruiting bodies mature when the needles are still on the trees.

Under normal conditions, current year needles and some 1yearold needles remain on the tree; so mortality isn't expected in a single growing season.



However, in conjunction with the jack pine budworm outbreak, top kill was expected in 1984 on trees affected by both pests. Severe defoliation and top kill were noted in scattered pockets in the outbreak area in the Virginia District.

Evidence of this needlecast were also found during budworm surveys in Crow Wing and Pine Counties.

#### OUTLOOK FOR 1984

Cool and moist weather conditions occurring during the fall of 1983 were favorable for infection. Disease incidence and severity may increase in 1984, especially in areas where the disease is already present.

#### PHYSIOLOGICAL NEEDLE DROOP IN RED PINE

Plantation survival checks have found several young red pine plantations with physiological needle droop. Jack pine on the same sites are not affected. Red pine on 220 acres in Koochiching County (615525), Itasca County (356223 and 266223), and St. Louis County (165618 and 366022) were damaged in 1982. Damage was also noted in the Beltrami Island State Forest, Roseau County, in young red pine plantations.

Plantations are affected during July and August. Young trees growing in low areas, on droughty soils, with heavy competition or with Jrooting are most severely affected. These sites have limited water availability on hot, sunny and windy days when transpiration is rapid. In a period as short as a few hours, needle tissue under the sheath can collapse due to lack of sufficient water. The needle droops and dies.

The severity of needle droop symptoms on red pines varies. Damage is greatest on the shoots towards the tops of the seedlings, but lower branches can also be affected. Current year needles droop downward with a sharp bend occurring within the needle sheath. The needles remain green for awhile, gradually fade to brown over winter, and are retained into the next summer. In many instances, the buds remain viable and will expand next year. On severely damaged shoots, buds may not expand. If only the terminal bud is killed, side branches or new buds will usually take over. If, however, many buds are damaged, very small trees may die in one year.

In a plantation near Zim, Mn. (165618), droop symptoms were observed in 1982. In 1983, affected trees were checked for recovery by establishing a 1/10th acre plot. Of 48 red pine on the plot, 2 died due to Armillaria infection, 1 leader was dead, and the remaining leaders were live and growing. In a plantation in the Virginia District (135716), most of the red pine with needle droop from 1982 did not recover. In an area of about 1 acre, terminal buds and most lateral buds were killed. The surviving buds were killed by a late frost on June 10th this year. Volunteer jack pine were unaffected by drought and by frost.

GALL RUSTS OF JACK PINE Cronartium coleosporoides  
(Diet. & Holw.) Arth.  
Endocronartium harknessii  
(J.P. Moore) T. Hirat.

A survey was made of jack pine galls in windbreak trees at the General Andrews and Badoura State Nurseries. Galls were found to be of both species. Collections were made on May 18th and on May 20th.

Two stands, 10 to 20 acres in size, in Region 3 had heavy gall incidence and were scheduled for partial cutting during the winter of 1983-84. In Todd County, a private plantation was scheduled to be selectively thinned to maintain wildlife cover in the form of large-crowned trees free from galls on the main stems. Row thinning would have left many galled stems susceptible to snow and wind damage. Harvesting is also planned in the Rock Lake Forest Camp-ground area, 1713430, Cass County, in an area that was established to test the rust resistance of different Lake States jack pine. The final reading in the study was made in 1983.

A field check of bare root jack pine stock grown in the General Andrews Nursery was conducted on a federal plantation in the Walker district. The stock had been sprayed with Ferbam during the '81 growing season and then lifted, sorted for culls, and shipped for planting in the spring of '82. Deer browse was widespread in the plantation but less than 1% of the planted stock had galls.

PINE NEEDLE RUST Coleosporium spp.

Field reports of rust incidence were greatly reduced in 1983. Crow Wing County plantations that were heavily infested in 1982 were rechecked in early summer of 1983. No mortality was detected.

WHITE PINE BLISTER RUST Cronartium ribicola Fisch.

Two pruning studies were established in 1971 and 1972. One study is in an understory natural white pine stand in 714132, Hubbard County, and the other study was established in an open-grown plantation, 113430, Cass County. Both study areas have been inspected approximately every two years. Inspections record canker incidence in both pruned and unpruned areas. Both pruning studies were inspected in 1983. Preliminary evidence confirmed that pruned areas and understory stands have less cankers. An overstory seems to have a greater influence on canker incidence than does pruning.

Five thousand white pine seedlings were obtained from the U.S. Forest Service in Rhinelander, Wisconsin. The seedlings were progeny of a known blister rust resistant parent that was open pollinated. These seedlings were outplanted in each of the 3 northern Regions in blister rust hazard zones 2, 3, and 4.

SPRUCE, BLACK WHITE, and BLUE

DWARF MISTLETOE Arceuthobium pusillum Pk.

This disease is caused by a tiny parasitic seed plant and is the most destructive pest of black spruce. Dwarf mistletoe causes decline in tree vigor,

stimulates the formation of witches' brooms, and ultimately leads to tree mortality.

In 1983, Phase II inventory surveyed 125,000 acres of black spruce in Region 2. Fortyfour percent of the black spruce type was infected by dwarf mistletoe.

#### RHIZOSPHAERA NEEDLECAST Rhizosphaera kalkhoffii Bud.

This needlecast disease has been a common problem on blue spruce ornamental and windbreak trees. Diseased specimens were received and/or field inspections were made in Beltrami, Hubbard, Ottertail, St. Louis, Carlton, Cass, Crow Wing, Kanabec, Pine, and Morrison Counties.

In 1983, Rhizosphaera needlecast was first observed on white spruce in Beltrami County. Infected trees were growing on private property within 1/2 mile of an infected blue spruce windbreak. The white spruce were natural trees growing around a home, and all sizes of trees were infected, although infections were pretty much confined to the lower portions of the trees. This disease must have been present on the white spruce for some time as evidenced by branch mortality.

#### ASPEN

#### ASPEN STEM DISEASES Hypoxylon mammatum (Wahl.) Mill Phellinus tremulae (Bond.) Bond & Boriss

The primary volume losses of bigtooth and trembling aspen are caused by Hypoxylon and/or Phellinus infections. Hypoxylon mammatum causes branch and stem cankers that predispose stems to breakage and infection by decay-causing organisms. Phellinus tremulae causes internal decay known as white trunk rot.

In 1983, Phase II inventory from Region 2 showed that 72% or 33,100 acres of the aspen type has either one or both of these two diseases.

#### ELM

#### DUTCH ELM DISEASE Ceratocystis ulmi (Buism.) C.Mor.

This disease continued to be very common and widespread. The mild winter of 198283 resulted in an increased population of the native elm bark beetle, Hylurgopinus rufipes (Eighh.), and more Dutch elm disease infections. Branch and top dieback were common in Carlton, St. Louis, Aitkin, Hubbard, Clearwater, Beltrami, and Cass Counties. Field requests were handled in new DED areas in Aitkin, Cass, Crow Wing and Wadena Counties. Technical assistance was provided to the City of Blackduck as the City Council struggled to write and then enforce a diseasecontrol ordinance.

#### OUTLOOK FOR 1984

The severe cold period in December of 1983 and again in January of 1984 should lower beetle population levels in 1984. This should result in a temporary reduction of disease incidence in 1984. However, the word "temporary" must be emphasized; as beetle populations rebuild, disease incidence will once again be common.

OAK

OAK WILT *Ceratocystis fugacearum* (Brety) Hunt

Aerial detection of oak wilt disease was conducted in August of 1983 over several state forest land holdings, all state parks in southeast and metro areas, and over the Carlos Avery Wildlife Management Area.

Oak wilt was detected and ground checked in O'Brien, Lake Louise, and Nerstrand State Parks, and in Carlos Avery Wildlife Management Area. Various control operations were examined and were proposed in all locations.

Oak wilt detection on private lands east of Rochester resulted in a landowner meeting where information about the disease was presented and control recommendations made.

In Carlos Avery, established oak wilt control project study areas were examined for effectiveness of herbicide barriers previously placed. Much sprouting was noted in all treatments. These study plots will be examined in detail in 1984.

In an isolated Aitkin County (34923) infection pocket, no new foliar symptoms were evident in 1983. Infections were evident and widespread in parts of Wright, Stearns, Sherburne, Isanti, and Anoka Counties. Aerial surveys conducted during the season of visible oak wilt symptoms produced varying results due to the extensive crown damage and blow down from July windstorms.

In August and September, followup evaluations were made in private stands marked by foresters in 1982 and then treated by the owners using directed cuts and herbicides (Tordon RTU.) Three of the 5 sites were not completed. One of the two completed sites was reinfested from an adjacent woodlot and powerline rightofway. On the other completed site, 70% of the control line held for this year. Sections that did not hold were remarked for treatment during the winter of 1983/84. Followup evaluations will again be made in 1984.

On state lands in Region 3, information flyers on oak wilt will be included with any state firewood permits occurring in oak wilt infested areas.

OUTLOOK FOR 1984

Oak wilt will continue to spread in infested southern counties of Region 3. An abundance of wind damaged trees in these areas will increase the potential for overland spread. Homeowner attempts at control will continue, but a unified neighborhood effort is needed to remove hazard trees annually, create and maintain barrier lines, and force control of rightofway infections.

## BLACK WALNUT

### SHOOT DIEBACK Phyllosticta sp.

In 1983, only minor amounts of shoot dieback were detected in southeastern Minnesota walnut plantations. In two polesize walnut plantation in Wabasha County (2911011) and in Fillmore County (210310), shoot dieback had progressed to the point of causing tree mortality. In a Wabasha County plantation (1811012) where 50 dead and dying trees were removed during 1982, no new mortality occurred during 1983. The disease has only been found on alluvial sites.

It is likely that conditions favorable for disease development did not occur in southeastern Minnesota during 1983. In northeast Iowa on the Yellow River State Forest, new infections and tree mortality occurred in one of their previously infected plantations. The USFS conducted studies in these plantations to help determine what environmental conditions favor rapid disease development.

### OUTLOOK FOR 1984

Continued occurrence at minor levels is expected.

### FUSARIUM STEM CANKER Fusarium sp.

In 1980, a plantation in Fillmore County was found where more than 50% of the trees had main stem cankers. In the spring of 1980, permanent plots were established in this plantation to follow canker progress and evaluate canker impact. Onetenth acre plots were established, and open stem cankers were recorded. Average canker length was 14 inches, and canker width was 1.2 inches. In 1983, these plots were revisited. Comparison results are as follows:

<u>Plot #</u>	<u>Total # of Trees</u>	<u>Percent of Trees with Open Cankers</u>	
		<u>1980</u>	<u>1983</u>
1	51	62	17
2	28	50	14
3	46	46	17

This plantation currently is 13 years old, the trees average 4 inches DBH, and average 20 feet in height. In the 3 growing seasons since establishing the plots, the existing cankers were being closed over rapidly. However, there is evidence of new canker formations. Also, there is evidence on 14 trees/plot that perennial canker growth on existing canker margins is expanding. Whether or not the trees will be able to eventually heal over the cankers is not now predictable, but in any case, stem defects will remain, thereby reducing merchantable volume at harvest.

In a Wabasha County plantation, Fusarium sp. was isolated from canker samples collected in 1983. The cankers in this plantation were initiated at sites of dead, unpruned branches. However, the incidence of this type of canker was low. Pruning when branches are still alive and during the late winter will avoid canker development.

OUTLOOK FOR 1984

Continued occurrence of new Fusarium cankers on polesized trees is expected, but occurrence should be minor.

TERMINAL SHOOT LOSS FROST Acrobasis demotella Grote

Late spring frosts and A. demotella play a major role in damaging walnut buds and shoots resulting in multiple stem deformities in slow growing plantations. In the spring of 1983, field studies were made in two young plantations; one in Wabasha and one in Fillmore Counties. The Fillmore County site did not escape the last of the late spring frosts that occurred on May 15, 1983. As a result, 3040% of the newly elongated terminal shoots were killed. The Wabasha County site escaped all late spring frosts, but lost 3040% of terminal shoots to the walnut tip moth, A. dometella. In the Wabasha County site, control of the tip moth on treated trees was successful with one late spring application of Orthene. Increased growth through weed control should reduce the effects of annual stem deformities. Therefore, control is not recommended.

OUTLOOK FOR 1984

Expect frost and walnut tip moth injury each spring.

ZONATE LEAF SPOT Grovesinia pyramidalis M. Cline, Crane, S. Cline

In 1983, this leaf spot disease was found for the first time in Minnesota in a private plantation in Wabasha County (1811012). The plantation was 13 years old, and the trees were severely defoliated by this disease. Defoliation occurred in late July and early August. This disease had been reported previously in Illinois, West Virginia, and Ohio. In 1982, it was found in Iowa. The findings in Iowa and Minnesota significantly extend the range of this disease westward and northward.

Year	1983	1982	Total % of Trees	Plot #
	17	83	31	1
	14	50	38	2
	17	48	46	3

This plantation currently is 13 years old, the trees average 4 inches DBH, and average 10 feet in height. In the 3 growing seasons since establishing the plot, the existing cankers were being closed over rapidly. However, there is evidence of new canker formation. Also, there is evidence of a transition from perennial canker growth to existing canker margins is expanding. Whether or not the trees will be able to eventually heal over the cankers is not now predictable, but in any case, stem defects will remain, thereby reducing merchantable volume of harvest.

In a Wabasha County plantation, Fusarium sp. was isolated from canker samples collected in 1983. The cankers in this plantation were isolated on sites of 600, 800, and 1000 polesized trees. However, the incidence of this type of canker was low during winter when branches are still alive and during the late winter when new can development.

MINOR and INCIDENTAL DISEASES AND OTHER PESTS

PEST	HOST	COUNTY	COMMENTS
Shoot blight <u>Sirococcus strobilinus</u> Preuss	Red pine	Cook	Light infection in one plantation.
Dothistroma Needlecast <u>Dothistroma pini</u> Hulb.	Austrian pine	Olmsted	8 year old shelterbelt, moderately infected
Root and butt root <u>Armillariella mellea</u> (Vahlies Fr.) Karst	Red pine White pine Oak	St. Louis Crow Wing Cass, Pine Roseau, L.O.W.	Spotty plantation damage and yard tree mortality
Jrooting	Red pine	St. Louis	Stunted trees; may show needle droop.
Porcupine	Red/white pines	Aitkin Carlton	Top kill and beetle buildup
Winter drying	Red pine, white spruce, cedar, ash	Wadena Itasca Carlton	Exposed roadside trees
Herbicide damage	Conifers	Crow Wing Morrison Isanti	Roadsides
Needlecast <u>Lophodermium</u> sp.	White spruce	Carlton	
Cytospora canker <u>Cytospora kunzei</u> Sacc.	Blue and White spruces	Steele Crow Wing Todd	Moderate infections in a 20year old shelterbelt in Steele County; found on yard trees elsewhere.
Storage molds <u>Penicillium</u> spp. <u>Alternaria</u> sp. <u>Fusarium</u> sp.	White spruce	Cook	Nursery stock
Smothering <u>Thelephora terrestris</u> Ehr.	White spruce	Cook	On nursery stock; rare
Chlorosis	White spruce	Carlton	1 plantation; recovered
Herbicide injury	Spruce	Dodge	Overapplication of Simazine

<u>PEST</u>	<u>HOST</u>	<u>COUNTY</u>	<u>COMMENTS</u>
Arborvitae needle blight <u>Didymascella thujina</u> (Durand) Maire	White cedar	Pine Carlton	Yard hedges and ornamentals; 1, 2acre forest site
Anthracnose <u>Gloeosporium aridum</u> Ell. & Holw.	Ash	Carlton Todd, Cass Crow Wing	Spotty
Anthracnose <u>Gnomonia quercina</u> Kleb.	Oak	Todd, Cass Crow Wing SE Mn.	Light infec- tions in August on burr oak in SE Mn.
Anthracnose <u>Gloeosporium apocryptum</u> E. & E.	Maple	Olmsted, Winona, Wabasha, Fillmore, Houston	Moderate infec- tions on silver maple in July.
Tar spot <u>Rhytisma</u> sp.	Silver maple	Rice	Heavy infection in Nerstrand Woods State Park
Verticillium wilt <u>Verticillium alboatrum</u> Reinke & Berth.	Sugar maple	Olmsted Steele Fillmore	Isolated shade trees
Scorch	Maple	Itasca Carlton St. Louis	Premature brown- ing and leaf loss
Leafspot and canker <u>Septoria musiva</u> Pk.	Balm of Gilead	Cook St. Louis	Many showing mortality
Trunk rot <u>Fomes fomentarius</u> (L. ex Fr.) Kickx	Birch	St. Louis	
Birch leafspot <u>Gloeosporium</u> sp.	Birch	S. Beltrami	Common ornamental problem
Willow blight & black scab <u>Physalospora miyabeana</u> Fuku and <u>Fusicladium saliciperidum</u> (Allesch. & Tub.)	Willow	Itasca N. Aitkin St. Louis Carlton Lake	Continued mortality; surviving branches show "tufts of growth of tips
Black knot <u>Dibotryon morbosum</u> Prunus spp. (Schw.) Th. & Syd.		Beltrami Hubbard	Serviced requests for information, identification and control.



<u>PEST</u>	<u>HOST</u>	<u>COUNTY</u>	<u>COMMENTS</u>
Herbicide injury	Walnut	Fillmore	Incorrect application of 2,4D
Russian olive canker <u>Cucubitaria elongata</u> (Fr.) Grev.	Russian olive	Beltrami	Found fruiting on dead bark around cankers.

<u>Control</u>	<u>Symptoms/Severity</u>	<u>Treat (s)</u>	<u>Host (s)</u>
none	root collar lesions on trees along hed edges	tree and sand movement	Rising 30 red pine
avoid trees water during storage, careful	surface rotting and needle loss on out state stock 25% planting survival	attracts molds	white spruce
tree sprays of acetate and carbaryl reduce sap-suckers	cutworm fluorescence on new growth/some shoot necrosis/dense seed beds	sprays	10 red pine white pine
screening for traps and traps was positive	scattered pockets of mortality and tip dieback	unknown	white spruce
direct review of available material	spotty without beds due to not removal	sprays	white spruce
10% of nuts collected and for sowing trials - seed shift to new locations in 1984	10% of nuts collected for sowing were hollow and rotted	<u>Crucifera</u> and <u>Convolvulaceae</u> weevils	conifers
	widespread foliar symptoms	<u>Microbasidium</u> leaf blight	non-specific ( <u>Chrysomya</u> etc.)
	light	anthracnose	white

SPECIAL PROJECTS

NURSERY ACTIVITIES

Nursery pest management activities in Minnesota during 1983 included two cooperative projects with State and Private Forestry of the USFS. One project produced a pest management and pesticide safety training session for permanent employees of both nurseries. The other project evaluated foliar applications of triadimefon (Bayleton) for gall rust control. Minnesota also hosted the Northeastern Area Nurseryman's Conference. In 1984, Minnesota will cooperate with State and Private Forestry in conducting loss assessment and control projects for tip blight (Diplodia) in red pine nursery beds at the General Andrews Nursery.

Pest problems reported from the General Andrews and Badoura State Forest Nurseries in 1983 included:

<u>Host(s)</u>	<u>Agent(s)</u>	<u>Symptoms/Severity</u>	<u>Control</u>
Rising 20 red pine	heat and sand movement	root collar lesions on trees along bed edges.	none
white spruce	storage molds	surface molding and needle loss on out state stock 55% planting survival	avoid free water during storage/ aerate boxes
3 0 red pine white pine	aphids	cottony flocculence on new growth/some shoot necrosis/in dense seed beds	test sprays of acephate and carbaryl reduce populations
white spruce	unknown	scattered pockets of mortality and tip dieback	screening for grubs and mites was negative
walnut seedlings	squirrel	spotty walnut beds due to nut removal	direct/review of available animal repellants
acorns	<u>Curculio</u> and <u>Conotrachelus</u> weevils	70% of nuts collected for seeding were hollow and molded	flotation screening to secure viable seed
honeysuckle <u>(Lonicera talorica)</u>	<u>Herpobasidium</u> leaf blight	widespread foliar symptoms	shift to new fungicide in '84
Walnut	anthracnose	light	none

<u>Host (s)</u>	<u>Agent (s)</u>	<u>Symptoms/Severity</u>	<u>Control</u>
Windrow understory red pine	<u>Armillaria</u>	mushrooms and shoe strings at base of scattered dead pines	removal
larch/jack pine/ cedar	deer browse	cropped stems and stunting	fencing
Russian olive	unknown	root collar lesions and mortality	screening in '84

#### CONE INSECTS and DISEASES

In 1982, a study was initiated in the Cotton white spruce seed orchard to determine the extent of damage to the cones by insects and diseases. In 1983, this study continued even though the cone crop was very small. Only 186 cones were gathered throughout the entire seed orchard.

One aspect of the study was to monitor female cone development on 8 trees which had 2 or more cones per tree. In previous years, it appeared that female cones "disappeared" during the growing season. The objective of this study was to determine when the disappearance occurred and why cone numbers seem to lessen as the growing season progressed. The results of this monitoring are listed in Table 1. The result of the data seem to indicate that cones did not abort and were not lost due to insect feeding.

TABLE 1: Numbers of Female Cones

Date	<u>Tree and Cone Numbers</u>							
	#7182 C15R24	#7179 R15C31	#7182 R14C24	#4509 R7C18	#3767 R6C22	#3759 R4C18	#3767 R6C17	#5767 R7C34
6/7	31	27	14	4	31	17	22	36
6/16	31	27	14	4	33	17	18	37
6/22	30	26	13	4	33	17	18	37
7/1	31	27	12	4	33	17	18	37
7/10	31	27	12	4	32	17	18	37
8/2	31	27	12	4	32	17	18	37

Note: Discrepancies in weekly checks are likely due to counting errors.

During the monitoring process, insect and disease pests were also tabulated according to dates, and tree and cone numbers. The results of this tabulation are listed in Table 2.

TABLE 2: Insect and Disease Pests Found on Cones During Cone Monitoring

Date	Tree and Cone Numbers							
	#7182 C15R24	#7179 R15C31	#7182 R14C29	#4509 R7C18	#3767 R6C22	#3759 R4C18	#3767 R6C17	#5767 R7C34
6/7				SBW	SBW	Rust	SBW	
6/16	SBW	SBW		Rust	Rust SBW			
6/22	SBW			Rust	Rust SBW	Rust	Rust	
7/1					Rust	-		SBW
7/10						SBW		
8/2								

SBW = Spruce budworm Choristoneura fumiferana (Clemens)

RUST = Cone rust Chrysomyxa sp. (possibly pirolata)

The second aspect of the study included a macroscopic evaluation of the cones for insect and/or disease damage. To conduct this evaluation, 178 cones from the trees monitored for cone development plus 8 more cones from all the other tree rows were collected in August. Evaluations included both external cone inspection as well as cutting open the cones and looking at internal damage. When cones were found infected with rust, a severity rating was made. Severity rating was an estimate of the percentage of the external surface of the cone affected by the rust. See Table 4. A summary of the macroscopic evaluation results are found in Table 3.

TABLE 3: Insect and Disease Damage

Damage/Pest	No. of Cones	% of Total (186 cones)
Fir coneworm ( <u>Dioryctria abietivorella</u> (Grote))	37	20
Spruce budworm ( <u>Choristoneura fumiferana</u> (Clemens))	41	22
Cone rust <u>Chrysomyxa</u> sp. (possibly <u>pirolata</u> )	104	56
Aborted	2	1
No Damage	21	11

TABLE 4: Cone Rust Severity Rating Results

Severity (% of cone affected)	No. of Cones	% of Total Cones Affected by rust (104)
1	35	34
10	26	25
25	17	16
50 75	18	17
100	8	8

In addition to the insects found damaging cones, 2 insects were also found damaging the seeds. The spruce cone maggot, Hylemya (Lasiomma) anthracina (Zerny), and the spruce seed midge, Mayetiola carpophaga (Tripp) were found. The occurrence or percent of seeds affected was not determined.

The level of spruce budworm damage in 1983 and the occurrence of surrounding balsam fir stands which are infested with spruce budworm may necessitate chemical controls in 1984. SBW may continue to be a problem for this seed orchard because of the proximity of balsam fir brood trees. County lands to the south are being logged, but private ownerships to the east of the orchard may remain unharvested for many years. These private lands could provide an almost continual supply of spruce budworm.

Cone rust affected more cones than the other 2 insect pests combined. It is difficult, though, to assess impact of rust infections. Cones have to be dissected, and possibly viability checks will have to be made. Dissected cones showed internal rot and seed loss beyond that expected from external appearances and assessments. The high rust incidence encountered in 1983 does seem to indicate the need for more study to assess the impact of this disease.

If this cone rust disease is caused by C. pirolata, the alternate hosts for this rust fungi include Moneses spp. and Pyrola spp. These species are probably more commonly found growing under a sprucefir overstory than an aspen overstory. The harvesting of the sprucefir stand to the south and its conversion to aspen may help reduce disease incidence by reducing alternate host occurrence. However, the unharvested private ownerships to the east and west may not only affect the spruce budworm occurrence in the seed orchard, but they may also affect the rust incidence.

## JACK PINE BUDWORM PERMANENT PLOT ESTABLISHMENT

The Insect & Disease Unit decided to set up permanent plots in jack pine stands to study the effects of the jack pine budworm. The goals were:

- a) to assess timber loss during and after an outbreak,
- b) to develop a system to evaluate stand conditions,
- c) to determine what losses are acceptable and the threshold for intervention,
- d) to develop a statewide riskrating system, and
- e) to develop a predictive system for mortality resulting from different levels of defoliation.

The information needed to evaluate stand conditions before, during and after an outbreak are:

- a. Weather 2 years prior, during and after including rainfall, temperatures, soil moisture, date frost leaves the soil, and wind direction during moth dispersal
  - b. Soils data including type maps, water table depth, and productivity
  - c. Stand inventory based on prism plots: BA, volume, growth rate, site index, crown class, brush, presence of other pests, DBH, and presence of dead trees
  - d. Data during an outbreak, ocular estimate of defoliation, presence of male cones, annual topkill, and mortality.
- Based on a frequency distribution from soils, site index, and basal area information gathered on 57 preliminary plots, 16 permanent plots were established in the Virginia District. Private landowners were contacted prior to the field work.

Permanent plots will be established in other areas of Region 2 and in Region 1 and 3 in the next few years to get a statewide perspective on JPBW outbreaks.

JACK PINE BUDWORM INFESTATION: SCHEDULE OF ACTIVITIES

<u>Date</u>	<u>Item</u>	<u>Personnel</u>
July '82	Made initial ground detection of infestation	VA District
July 27, '82	Conducted aerial evaluation of defoliation	Reg. I&D
August '82	Notified Hibbing Area and St. Paul	Reg. I&D
August '82	Conducted egg mass survey and made predictions for 1983	I&D Unit VA District
Fall '82	Developed map of JP type and ownership overlay	VA District
Winter '82/'83	Gathered stand data from 57 plots	VA District I&D Unit
Mar. 31, '82	Developed control and management guidelines	Reg. I&D
May '83	Notified St. Louis Co. and Superior Nat. For.	Reg. I&D
AprilMay	Notified individually 40 private forest landowners	VA District Hibbing PFM
May 12June 10	Monitored development of early larval stages	Reg. I&D
May 20	Discovered JP needlecast	Reg. I&D
May 20	Posted pest alerts throughout area	VA District
May 30	Made 2 news releases	Reg. I&D
MayJune	Followed development of needlecast	Reg. I&D
June 2, 9	Had discussions with Area and District Foresters	Reg. I&D
June 14	Collected larval and age data	I&D Unit
June 15	Discussed possible effects of both JPBW and needlecast disease occurring on the same tree; discussed possible controls	I&D Unit Hibbing Area VA District
MidJune	Contacted 40 forestry landowners by letter	Reg. I&D
MidJune	Contacted residential landowners by a. letter, or by b. personal delivery along Manney Shopper route	Reg. I&D VA District
June 22	Conducted an open house at the VA District and included information on registered pesticides and applicators, and on bark beetle identification and control	I&D Unit VA District Hibbing PFM

JACK PINE BUDWORM INVESTIGATION: SCHEDULE OF ACTIVITIES

<u>Date</u>	<u>Item</u>	<u>Personnel</u>
June 23, 24	Conducted 4th instar larvae survey	Reg. I&D
July 14	Conducted an aerial survey of all JP types in Region 2 with emphasis on the outbreak area	Reg. I&D Reg. Soils
July 7, 18	Collected 950 pupae and reared parasites	Reg. I&D
Early August	Conducted egg mass survey on 28 plots for 1984 predictions	Reg. I&D
Summer/fall	Made soil maps of infestation area	Reg. Soils
September 19	Developed permanent plot system	I&D Unit Reg. Soils VA District
Oct. 24, 25	Established 16 permanent plots	I&D Unit Reg. Soils VA District
	Monitored development of early larval stages	Reg. I&D
	Discovered JP headcast	Reg. I&D
	Posted post alerts throughout area	VA District
	Made 2 news releases	Reg. I&D
	Followed development of headcast	Reg. I&D
	Had discussions with Area and District Foresters	Reg. I&D
	Collected larval and egg data	I&D Unit
	Discussed possible effects of both JPBW and headcast disease occurring on the same tree; discussed possible controls	I&D Unit VA District
	Contacted 40 forestry landowners by letter	Reg. I&D
	Contacted residential landowners by letter, or by personal delivery along Mammy Shopper route	Reg. I&D VA District
	Conducted an open house at the VA District and included information on registered pesticides and applicators, and on bark beetle identification and control	I&D Unit VA District Hipping RW



WEED CONTROL IN BLACK WALNUT PLANTATIONS

In the spring of 1982, weed control plots were placed in several upland walnut plantations in Region 5. A summary of the 1982 results were reported in the 1982 Forest Insect & Disease Report.

In the spring of 1983, the plots were not retreated allowing grass invasion by midseason. Two of the plantations were remeasured with the results listed in Table 1.

TABLE 1: Height growth response following a spring 1982 weed control application in two upland established walnut plantations.

<u>Location</u>	<u>Age</u>	<u>Treatment</u>	(A) <u>Prev. Years'</u> <u>Average Annual</u> <u>Height Growth</u>	1982	1983	Percent Inc.	
				<u>Av. Ht.</u> <u>Growth</u>	<u>Av. Ht.</u> <u>Growth</u>	<u>Over (A)</u> <u>1982</u>	<u>1983</u>
Fillmore Co. 41038	14	Broadcast	.75'	1.50'	1.90'	100	153
		Control	.82'	.70'	1.00'	14	22
Winona Co. 71059	13	Circular	.79'	1.60'	1.57'	103	99
		Spot 710' Control	.79'	.80'	1.07'	1	35

The excellent height growth response initiated with the spring 1982 release continued through the 1983 growing season. This response, however, is expected to diminish during the 1984 growing season as the invading grasses become established. Release may again be necessary before the 1985 growing season in order to maintain the present growth rate.

The diameter growth response was not consistent between the two sites. The Fillmore county plantation showed an excellent response with over a 100% increase in growth rate while the Winona County site showed little difference between the treated and control plots in 1983.

These plots will continue to be monitored.