

1976  
**FOREST PEST REPORT**

MINNESOTA  
**DEPARTMENT OF NATURAL RESOURCES**

9/1/76

The purpose of this report is to give Minnesota's forest land managers an overall view of the status of the state's more important forest pests.

It is the responsibility of the Forest Pest Unit to provide for diagnosis, survey, evaluation and if necessary, control of forest pests in Minnesota. This report is a brief summary of that activity.

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## INTRODUCTION

This report is a brief summary of happenings in forest insects and diseases for Minnesota during 1976. We hope that this information will provide managers of Minnesota's forest lands an overview of this very important drain on the resource.

The Forest Pest Unit is charged with the task of providing diagnosis, survey and evaluation information, pest management alternatives and, as needed, direct control of the forest pests on state, county and private forest lands in Minnesota. As additional resources become available to meet this task, we hope to better provide these services.

## DROUGHT AND FIRES

The extreme drought caused by rainfall deficits of up to 50% of normal rainfall patterns caused several problems in 1976. Water stress in trees caused increased mortality and decreased vigor in all forest areas. This resulting stress and potential buildups of insects and diseases will be more apparent in succeeding years. Premature leaf cast (in some cases as early as mid July) was obvious in many areas. The extreme weather also presented an unprecedented forest fire situation where 3375 fires burned over 155,000 acres of land. This resulted in all available manpower in the Forest Pest Unit staff being utilized in fire suppression activities.

## PERSONNEL

Two personnel changes have been made in forest pest work in the Division of Forestry in 1976.

James L. (Jim) Brooks accepted the Forest Pest Supervisor position in June, 1976. He is responsible for planning the overall program activity. A native of West Virginia, Jim had served in several capacities over a thirteen year period with the Forest Pest Unit in that state.

Raymond B. (Ray) Hitchcock was appointed Section Supervisor for the Environmental Protection Section in August. This section is composed of the Forest Pest, Fire Management, and Environmental Studies units. Ray was most recently Fire Management Supervisor, but has held various positions in his twelve years service with the Division of Forestry.

## DUTCH ELM DISEASE

Dutch Elm Disease has now been confirmed in 69 of the 87 counties in Minnesota. Losses in the seven county metropolitan region are estimated to be about 10% for 1976. Losses in St. Paul approached 17,000 trees. Minneapolis losses were set at 6,000 trees. Losses in the rural and forested areas in the southern one-third of the state also reached 10% or more for the year. Proposals are being prepared for legislative consideration to spend large sums of state funds in a cost sharing program to assist local governments in sanitation and replanting programs.

Total program cost for the next two years are estimated to be as much as \$90,000,000.

Timber sales of elm timber have been arranged by DNR foresters wherever possible. In addition, diseased elm have been removed from administrative sites including a large removal effort of diseased trees at Fort Snelling State Park. In this area, nearly 1,000 trees have been disposed of to date and the remaining 500 are scheduled to be disposed of by early spring, 1977.

A biennial budget request of more than \$1,000,000 has been made for sanitation and replanting work on DNR administered sites having an adverse impact on nearby control programs or where the trees pose a safety hazard to users of the sites.

## OAK WILT

Overall, this disease remained static during 1976. More than 4,000 trees were marked for removal in the Metro Region. Some infection sites in farm woodlots and other forest areas become more than ten acres in size with occasional centers approaching thirty acres. Losses of this nature are devastating in agricultural areas where these woodlots serve as the principal wildlife cover.

## JACK PINE GALL RUST

Globose swellings, due to gall rust, have been found on the stems of some jack pine seedlings in the General Andrews Nursery, Willow River, Minnesota. Numerous galls have also been found in the jack pine stands near the nursery. These galls are usually caused by eastern gall rust (*Cronartium quercuum*), but there is a possibility that western gall rust (*Peridermium harknessii*) is causing some of the galls.

Western gall rust does not seriously affect jack pine, but it severely damages Scots pine. Shipment of nursery stock around the state that is infected with this rust would extend its range and endanger Scots pine Christmas tree plantations. This rust does not require an alternate host, thus spread through stands depends only on the availability of hard pines.

This year a survey was conducted to identify the species of rust that was causing the galls in the nursery. Spores were collected from 15 galls and cultured. All of the galls resulted from eastern gall rust infections. Therefore, there does not seem to be any danger of spreading western gall rust through the shipment of planting stock out of this nursery.

## BUTTERNUT DECLINE

A decline of butternut has been noted in Minnesota for several years. The symptoms of this decline include extensive trunk and branch cankering and resulting die-back of the crown. Trees usually die after several years of progressive deterioration. This decline is caused by an unidentified fungus.

A survey was conducted this year to determine the

range of this problem. Samples of butternuts that appeared to be affected by this decline were collected. These were then sent to the USFS State and Private Forestry in St. Paul for laboratory tests to confirm the presence of the pathogen.

The decline was found in six counties in southeastern Minnesota (See Figure 1). It probably also exists outside of this area throughout the butternut range. Future surveys will more precisely map the extent of this disease.

Black walnut is closely related to the butternut but the decline was never found on this species. In several cases healthy black walnut trees were found growing beside severely infected butternut trees. Therefore, it was concluded that this disease is not a threat to the more valuable black walnut resource.

#### WHITE PINE BLISTER RUST, *Cronartium ribicola*

A two year study on the effectiveness of pruning to control white pine blister rust was completed this year. Pruning was not found to have a significant effect on the blister rust mortality rate. This result may be misleading, though. A longer range project is needed to properly evaluate this control method.

Another study was completed this year on the annual growth rate of white pine blister rust cankers. The cankers were found to advance along a branch toward the trunk at an average annual rate of 1.5 inches. The growth rate for individual cankers was extremely variable, ranging from 0 to 4 inches per year.

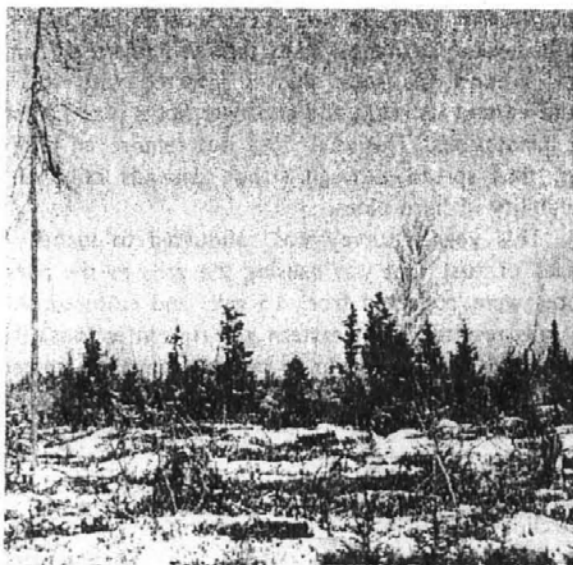
#### DWARF MISTLETOE, *Arceuthobium pusillum*

This year \$18,000 in forest development monies has been allocated for the control of dwarf mistletoe. The money is being used to remove all residual spruce from selected black spruce stands that were harvested within the last five years. This should greatly reduce the numbers of infected residual trees, which are the major source of new infections.

Practical limits had to be put on the minimum size tree to be cut. Thus all trees five or more feet in height are cut. This eliminates almost all of the infected residual stems. Most importantly it eliminates all of the taller trees. Mistletoe infections occurring high up in residual trees can disperse the seed a long distance and infect a great deal of the young regeneration.

Controlled burning will also kill the residual trees in a clear cut. Burning can only be used effectively in a limited number of stands, though. There are two major reasons for this. First, in many black spruce stands, brush or grass take over the site following burns. The competition this vegetation gives the spruce causes more damage than a number of mistletoe infections would. Secondly, logging methods have changed quite a bit recently. Many loggers now skid tree length and limb the trees by machine. This does not leave slash scattered over the site to support a uniform burn.

Because of these two major problems and many lesser ones, few black spruce stands have been burned for the purpose of controlling mistletoe. Doing a very thorough job of clear-cutting is, at the present time, the



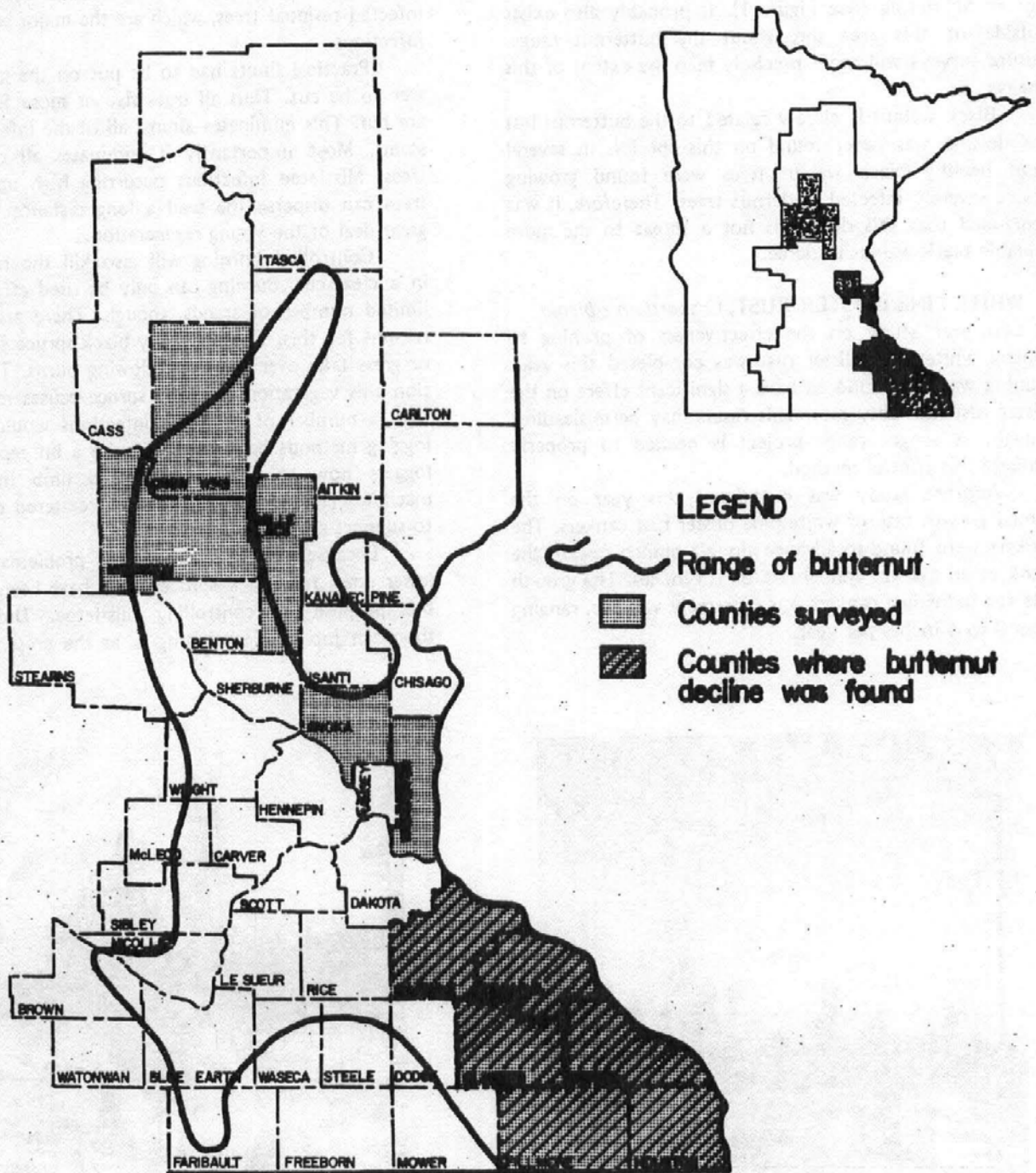
Pocket of advanced reproduction left after harvesting. These black spruce are infected with mistletoe.



Scattered residual black spruce left after harvesting. Many of these trees are infected with mistletoe.

FIGURE 1

# RANGE OF BUTTERNUT DECLINE IN MINNESOTA, 1976



only practical method of control in the vast majority of black spruce stands in this state.

The Forest Pest Unit is investigating the practicality of requiring all black spruce taller than five feet to be cut on timber sales. This constraint would be part of the sale agreement. It is felt that loggers could do this with little extra effort and expense.

Future work will involve finding a treatment procedure for controlling mistletoe in young or unmerchantable stands.

### MYCORRHIZAE

The relationship between pine feeder roots and mycorrhizal fungi is very beneficial. The mycorrhizal relationship results in an increase of the surface area of the root system through enlargement of the feeder roots, longevity of the feeder roots, and growth of the mycelium into the soil. Mycorrhizal fungi increase the lifespan and the extent of the feeder roots by stimulating the root's physiological processes.

Mycorrhizae also aid in the release of minerals from bound inorganic and organic soil fractions. This along with the translocation of these nutrients through the mycelium to the tree makes more nutrients available.

Experiences with the southern pines show that mycorrhizae dramatically increase the growth rate and survival of the seedlings. This appears to be true in Minnesota as well. There is a strong possibility that nursery stock with the proper amount of mycorrhizae could be out planted a year earlier than is done now. This would result in lower costs, faster production, and greater flexibility in planning.

A survey was begun this year to determine the percentage of the feeder roots that are mycorrhizal on the red pine seedlings in the General Andrews Nursery, Willow River, Minnesota. The survey is not yet complete, but the preliminary results are as follows:

**TABLE 1**  
**PERCENTAGE OF MYCORRHIZAL FEEDER ROOTS**  
**ON RED PINE AT THE**  
**GENERAL ANDREWS NURSERY, 1976**

<u>Age of Seedlings</u>	<u>Percent of Roots Infected with Mycorrhizae</u>
1 - 0	13
2 - 0	27
3 - 0	46

The amount of mycorrhizae on the red pine at the General Andrews Nursery compares very favorably with other nurseries in the Lake States. In other nurseries the percentage of infected feeder roots on 3 - 0 red pine seedlings has ranged from 12 to 34 percent.

The U.S. Forest Service is now developing ways to

increase the incidence of mycorrhizae on red pine nursery stock. If it is determined that our nursery stock does not have a sufficient quantity of mycorrhizae, we will be able to correct the situation by using the methods being developed by the USFS.

### OTHER NOTEWORTHY DISEASES

#### *Anthracnose*

Common on walnut.

#### *Chrysomyxa sp.*

Spruce needle rust - Very low incidence of this disease.

#### *Coleosporium asterum*

Red pine needle rust - Low incidence of this disease.

#### *Cytospora Kunzei var. piceae*

Cytospora canker - This is a common problem on ornamental blue spruce.

#### *Diplodia pinea*

Diplodia tip blight - Low levels of this disease were reported in the northeastern part of the state along the Canadian border. The incidence of this disease was much reduced from last year.

#### *Lophodermium pinastri*

Lophodermium needle cast - Low levels of this disease were observed statewide.

#### *Rhizosphaera kalkhoffii*

Rhizosphaera needle cast - Low levels of this disease were reported in widely scattered locations.

#### Shelterbelt Problem

No data this year except for mouse damage on Norway poplar.

### YELLOW-HEADED SPRUCE SAWFLY -

#### *Pikonema alaskensis*

Young white spruce plantations and roadside plantings throughout the northern portion of the state have been sporadically attacked by the yellow-headed spruce sawfly over the past few years. The same is true for 1976. Most plantings throughout the area had low populations which will need to be watched closely for population increases necessitating control.

It was necessary to spray plantations in Jacobson, Side Lake, Grand Rapids, and Deer River districts with Malathion to control populations which had built up over the past few years. A number of these and other plantations are scheduled for early checks in 1977 to determine whether treatment will be necessary.

A University of Minnesota project sponsored by Blandin Paper Corporation continued with parasites of the sawfly being collected in Maine and Nova Scotia for release next year.

### PINE TUSSOCK MOTH - *Dasychira plagiata*

Populations of pine tussock moth were again very low as they have been since 1971. No larvae were picked up in

general surveys of jack pine areas throughout the state. One larvae was collected in a more intensive survey carried out within an area of previous high population levels in the General Andrews State Forest near Willow River. This insect has a past history of cycles of high population every 10 to 20 years in susceptible stands. The droughty conditions in 1976 may trigger a population buildup in 1977. This may make necessary large scale control efforts in 1978.

**LARCH SAWFLY — *Pristiphora erichsonii***

Populations of larch sawfly were low in general although heavy defoliation was noted locally in Cotton, Grand Rapids, and Aitkin districts.

**SPRUCE BUDWORM — *Choristoneura fumiferana***

The spruce budworm expanded its area of infestation (again) in 1976 to the southeast and west of that of 1975.

The gross acreage involved now totals about 1.2 million acres as opposed to the approximately 700,000 acres affected in 1975. Populations are expected to increase in the most recently affected areas.

In 1976, several state-owned recreation areas were sprayed in an attempt to limit losses of fir in high use areas. Bearhead Lake State Park, Finland, Eckbeck, and Sullivan Lake State Forest Campgrounds were sprayed with Thuricide 16B<sup>R</sup> in mid-June. Thuricide whose active material is a bacterium (*Bacillus thuringiensis*) is actually found in the environment at concentrations much lower than those applied. There are no known adverse environmental effects.

Two quarts of material in ten gallons water per acre was applied using a mist blower.

Constant problems with the spray unit along with a great deal of rain led to inconsistencies in population reductions ranging from 77-98% in six plots distributed throughout the spray block within the state park.

**SPRAY PROJECT ANALYSIS**

**Bearhead Lake State Park**

<u>Tree #</u>	<u>Pre-Spray</u>		<u>Post Spray</u>	<u>Egg Masses/15" Twig</u>
<b>LARVAL COUNTS</b>				
15" Twig Sample — 3/Tree				
A-1	48	48	2	
A-2	39	39	2	
A-3	66	66	0	
Total	153		4	
Average/15" Twig	17		.4	.7
A-4	39		2	
A-5	39		2	
A-6	42		1	
Total	120		5	
Average/15" Twig	13		.6	.1
A-7	12		1	
A-8	18		4	
A-9	30		5	
Total	60		10	
Average/15" Twig	7		1.1	.5
B-1	24		3	
B-2	12		3	
B-3	15		6	
Total	51		12	
Average/15" Twig	6		1.3	.2
B-4	54		16	
B-5	63		6	
B-6	21		4	
Total	138		26	
Average/15" Twig	15		3	.1



**SPRAY PROJECT ANALYSIS**

**Bearhead Lake State Park**

<u>Tree #</u>	<u>Pre-Spray</u>	<u>Post Spray</u>	<u>Egg Masses/15" Twig</u>
Control SE ¼ 25-62-14		Control Plot Population Reduction 50%	
B-7	24	6	
B-8	33	4	
B-9	33	2	
Total	90	12	
Average/15" Twig	10	1.3	.1

<u>Tree #</u>	<u>Pre-Spray</u>	<u>Post Spray</u>	<u>Egg Masses/15" Twig</u>
Control SE ¼ 25-62-14		Control Plot Population Reduction 50%	
C-1	18	18	
C-2	6	5	
C-3	15	1	
Total	39	24	
Average/15" Twig	5	2.5	1.3

**Finland State Forest  
Sullivan Lake Campground**

Total Larvae/15" Twig - 3 Twigs/Tree - Overall Population Reduction - 98%

<u>Plot #</u>	<u>Tree #</u>	<u>Pre-Spray</u>	<u>Post Spray</u>
1	1	50	0
	2	66	0
	3	39	0
	Total	165	0
	Average/15" Twig	17	0
2	1	66	1
	2	36	0
	3	20	2
	Total	122	3
	Average/15" Twig	14	.3
3	1	74	1
	2	66	4
	3	42	1
	Total	182	6
	Average/15" Twig	20	.7
Control	1	63	27
	2	35	26
	3	54	23
	Total	152	76
	Average/15" Twig	17	8

# SPRUCE BUDWORM DEFOLIATION 1976

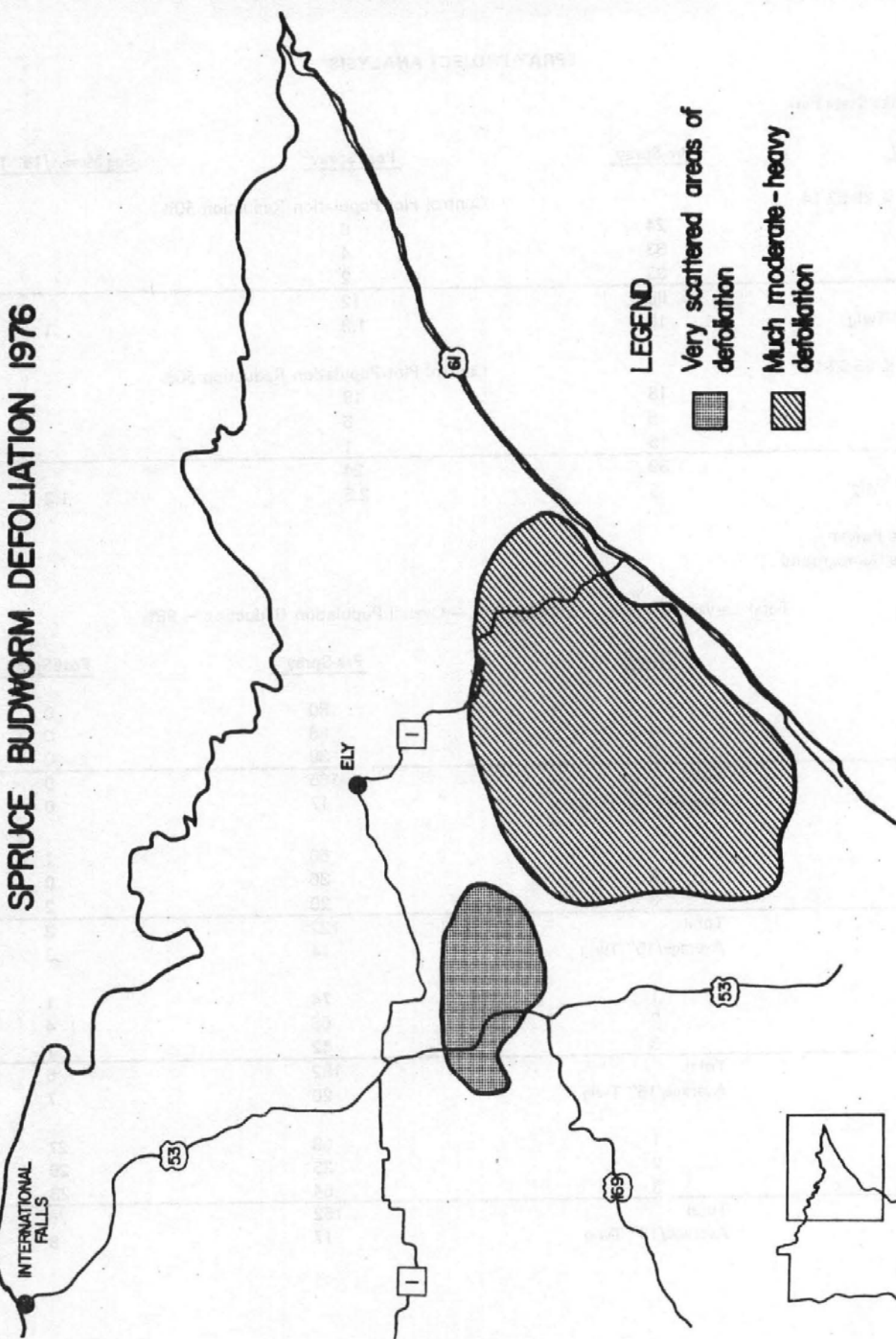
INTERNATIONAL FALLS

ELY

## LEGEND

Very scattered areas of defoliation

Much moderate - heavy defoliation



#### FOREST TENT CATERPILLAR — *Malacosoma disstria*

Light populations continue in central St. Louis and adjacent Itasca counties. In some areas cocoons were heavily parasitized. It may be that some defoliation previously attributed to the large aspen tortrix may actually be due to defoliation by forest tent caterpillar. Closer populations monitoring in 1977 should clarify this question.

#### JACK PINE BUDWORM — *Choristoneura pinus*

For the first time since the population collapse in 1969, jack pine budworm defoliated significant areas of jack pine in Minnesota. Moderate populations were found in two widely scattered locations (See map): 1) near Warroad; and 2) west of Brainerd.

About 5,000 acres were moderately defoliated (up to 80% of old foliage) near Warroad and 2,500 moderately defoliated near Brainerd.

Surveys for egg masses to estimate 1977 potentials revealed that no egg masses were to be found. However, the presence of many empty pupal cases showed that moth emergence had occurred in reasonably large proportions. We have no explanation for this phenomenon. Larval surveys will be conducted in early 1977 in an attempt to estimate the population.

#### GYPSY MOTH — *Lymantria dispar*

A trapping effort with traps scattered throughout the wooded areas of the state resulted in one male moth being trapped near Minnetonka in Central Hennepin County.

In a very close investigation of the area, no egg masses were found. So it is presumed that the lone moth was a "hitchhiker".

Approximately 3,500 sex lure traps had been placed during the early summer by USDA, Minnesota Department of Agriculture, and DNR personnel, with help from the National Campers and Hikers Association.

The closest known infestation to Minnesota is near Appleton, Wisconsin, located in the southeastern part of that state.

#### BALSAM FIR SAWFLY — *Neodiprion abietis*

Populations of this insect which can approach spruce budworm in severity of attack appear to have leveled off in Carlton, Northern Aitkin, Southeastern Itasca, and the Southern portion of St. Louis Counties. The insect may be spreading into other parts of St. Louis and into Lake County.

#### INTRODUCED PINE SAWFLY — *Diprion similis*

Populations of this pest of white pine were down throughout the state in 1976, the only reported infestation being found on the Red Lake Indian Reservation, where 5,000 acres were defoliated.

#### MINOR AND MISCELLANEOUS PROBLEMS

- Red-headed pine sawfly — Some roadside infestations noted — none found during plantation inspections.
- Pine Spittlebug — Was found to be common in Scot's pine in northern Pine County.
- Eastern Tent Caterpillar — Very common with many inquiries concerning wild cherry and ornamentals.
- Pine Bark Aphid — Scattered heavy infestation on white pine.
- Birch Leaf Miner — Severe browning aggravated by the drought in many areas could lead to problems with Bronze Birch Borer. Fertilization and watering have been recommended.
- Mixed Jack Pine Sawflies — Moderate populations of various sawflies of jack pine found in scattered areas — none were serious.
- Elm Lacebugs — Were very common in the late summer (leading to concern for oak wilt and Dutch elm disease). Usually not serious except cause premature leaf drop.
- Zimmerman Pine Shoot Moth — Common in Region III.
- Pecan leaf casebearers were found in many Black Walnut plantations — Damage to shoots was not as severe as in past years. Another unknown pest was found seriously affecting the terminals in more slowly growing situations. Other minor pests on walnut were webworms, walnut caterpillars, mites and aphids.
- Other minor problems detected in various locations in the southeastern portion of the state were:
  - Various aphids on pines
  - White pine weevil very scattered
  - Tip moths of jack and red pine

# JACK PINE BUDWORM 1976

