1975 FOREST PEST REPORT

MINNESOTA DEPARTMENT OF NATURAL RESOURCES 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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Spruce Budworm – Choristoneura fumiferana Clemens In 1975 the spruce budworm was again Minnesota's principal forest insect problem.

Recorded outbreaks of the spruce budworm have occurred periodically throughout the spruce-fir range of North America at least since the early 1800's. The budworm is a native insect which seriously defoliates balsam fir and to a lesser extent white spruce in Minnesota.

The present infestation period began in 1967 in northwestern St. Louis and southeastern Koochiching counties. Populations increased in subsequent years until all of the balsam fir type in the northeastern portion of Minnesota had received several years of annual defoliation. Some locations have had as many as seven consecutive annual defoliations. Generally, it takes four to five years of high budworm populations before widespread balsam fir mortality takes place. When white spruce is intermixed in a balsam fir forest, the budworm can also cause mortality to this species.

Large areas of fir have since been killed, especially on the Kabetogama Peninsula and in the Finland State Forest area. Presently the largest populations with the resulting serious defoliation are located in the area of the Cloquet Valley State Forest just north of Duluth.

For economic reasons, such as relatively low values involved, limited markets, and the probable need for repeated control operations, large area chemical control of this pest is not considered practical. Control efforts have mainly been through management techniques. However, on small areas, private landowners may consider it practical to control for aesthetic purposes.

Public and private recreational areas may justify control operations where aesthetics are important or where the expense of a cleanup effort due to budworm devastation may exceed the cost of control. Another consideration is the resulting wildfire hazard should areas of high mortality not be cleaned up.

Aerial Survey

A cooperative DNR-USFS State and Private Forestry aerial survey was carried out during the period of July 8-10. Aircraft were Cessna 180's based at International Falls and Ely. The purpose of the survey was to get an overall estimate of the area of defoliation. The area surveyed included all of Cook, Lake, St. Louis, and Itasca and part of Cass and Koochiching counties.

County road maps (½" per mile) with predetermined six or twelve mile flight strips were used for navigation. A similar map was used for plotting. Altitude was approximately 1000' above the ground.

Defoliation intensity was plotted in three categories: severe with probable mortality, moderate to heavy, and light categories.

As mentioned previously, results of the survey showed that the newest infestation zone was still moving to the southwest. The gross area of defoliation totals approximately 700,000 acres. Because of the very fragmented nature of northern Minnesota's timber types, only about 15% of this area is actually SB type. Of the type within the 700,000 gross acres, 475,000 has been moderately to heavily defoliated with much mortality resulting. The remainder has been lightly defoliated. There may be small pockets of heavily defoliated or dead trees in this zone.

Within the remainder of the area of the present outbreak there is much balsam which is dead and deteriorating due to past defoliation and other scattered areas where the budworm is active at the present time.

Ground Surveys

Ground surveys were not very extensive. Most involved limited followup checks of the aerial survey. One area showing light defoliation was detected during ground survey near Pennington in Beltrami county. This is outside of the area defoliated since 1967. Followup checks will be made in 1976 to determine the trend of this population.

Egg Mass Survey

In order to provide an indicator of potential trends in 1976, an egg mass survey was conducted in selected areas during the period of late July and early August. Because of a shortage of manpower this survey was very limited.

The results of this survey are tabulated below:

		No. Egg Per 15" Tw	Masses Sample
Section		1975	1974
21-T53-R14	Northeast Island Lake	6.3	0
10-T54-R12	Eastside Pequaywan Lake	6.4	
31-T55-R12	Bear Lake Campground	4.3	0
33-T54-R13	County Road #44	16.3	
36-T57-R11	Sullivan Lake Campground	5.3	.2
18-T55-R10	North of Christianson Lake	2.4	
11-T55-R13	East of Wolf Lake, #547	2.6	0
18-T54-R12	Northeast Smith Lake	7.6	
4-T54-R12	Near Buzz Lake	15.8	
2-T55-R5	North of White Face Reservoir	1.8	

*NOTE: One egg mass per 15" sample twig will ensure a carry-over of the population with normal mortality factors.

Predictions for 1976 Season

It can be concluded that populations of the budworm will continue to expand to very high levels in 1976 throughout the SB type within the Cloquet Valley State Forest. Areas of relatively high economic or aesthetic value should be analyzed for control operations adjacent to SB type. In other areas, numbers of budworm will undoubtedly decline in general, with some pockets of heavy defoliation continuing.



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Reinspection of 1974 Control Operation

In order to determine the amount of reinfestation from surrounding infested type which can be expected when spraying, a survey of larval populations within selected blocks of the 1974 control operation in the Finland State Forest (see 1974 annual report) was conducted, collection methods were identical with those used in that project.

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Location	Pre-Spray	Post-Spray	1975
Block #1	136	34	131
Block #3	307	131	223
Block #7	55	10	67
Block #8	50	10	37
Control Blocks			
Isabella-Osier Lake	279	342	160
Heffelfinger Trail	21	7	45

In analyzing this data, it must be concluded that reinvasion is a critical limiting factor when conducting small area control operations where the spray block is located within a larger area of infestation.

Factors which must be considered are:

- Spraying may not reduce populations within the spray block to the point where they cannot contribute to the very quick rebuilding of devasting numbers.
- Climatic conditions may contribute to large scale dispersal of first instar larvae or moths.
- Within reinvaded areas, foliage only is protected, buds may be mined in both the year of spraying and the succeeding year.

Jack Pine Budworm - Choristoneura pinus Freeman

Extensive ground surveys for jack pine budworm showed that populations remained low throughout the state again as they have since the collapse in 1969.

With so much budworm susceptible jack pine becoming available throughout the pineries of the state, conditions are becoming favorable for a new outbreak which should be expected during the next few years.

Miscellaneous Problems

Injuries due to vagaries of climate have been reported from widely scattered portions of the state. Problems due to drought were reported from western and northwestern Minnesota, various conifers on southerly exposures of rock outcrops showed "firing." Drought was the obvious suspect.

Injury due to flooding from various causes occurred in June in many northern areas.

Defoliation, twig, and trunk damage due to winddriven hail was observed in Cass, Koochiching, and Roseau counties.

In Cass county, damage to plantation white pine occurred when herbicides were being used to control competing brush while second flushes of growth were being put on by the trees. This phenomena, called lammas growth and prolepsis, is due to climatic or genetic factors causing a second flush of growth during an abnormal growing season.

Injury due to attacks by animals was widely reported. Rabbit and mice girdling of scotch pine and Colorado blue spruce caused considerable mortality in St. Louis and Carlton counties. Mountain ash and apple were also attacked.

Finally, a severe wind and ice storm was responsible for much breakage of conifers in several areas in the state. Approximately 500 acres of 35 year old jack pine was extensively damaged in the Sand Dunes State Forest. Similar Norway pine mixed with the jack pine was not affected.

Pine Tussock Moth – Dasychira plagiata Walker

Population levels of the pine tussock moth in jack pine have been at very low levels since 1971 when moderate defoliation occurred in the General Andrews State Forest. Continuing larval and trend indicating egg mass surveys showed that populations should remain low. Dropcloth sampling levels of one larvae per sample or less were common.

Larch Sawfly - Pristiphora erichsonii Hartig

The larch sawfly is a native insect which has caused a great deal of loss due to both mortality and growth reduction in tamarack timber in the past. It was first recorded in North America in the 1880's and in Minnesota in 1908 after it had apparently been present for 2-3 years and had caused considerable damage.

During the period 1910-1926, one billion board feet were killed.

In recent years, populations have been at low ebb. Localized moderate to heavy populations were detected in Section 28-155-26 in Koochiching county, near the junction of State Highway 200 and U.S. 2 in Aitkin county, and in spotty locations in southern St. Louis county and northeast of Lake Winnibigoshish in Itasca county.

There appeared to be a slight increase in defoliation in central St. Louis county. Spruce budworm was found on tamarack east of Hoyt Lakes, indicating the decline of balsam in this area.

An area north of Sand Lake on Lake county highway #2, was defoliated by either the larch sawfly or possibly spruce budworm.

A general aerial survey of the Grygla and Waskish areas resulted in no defoliation being detected.

Continuing surveys for the parasites introduced as part of a cooperative University of Minnesota-DNR project showed that these parasites are now established in Koochiching, Lake of the Woods, Beltrami, and Itasca counties and are suspected to be established in St. Louis county. These parasites are the Bavarian strain of *Mesoleius tenthredinis* (Morley) and *Olesicampe benefactor* (Hinz).

Introduced Pine Sawfly - Diprion similis Hartig

As has been the case for the last several years, the introduced pine sawfly has been responsible for varying degrees of defoliation of white pine and jack pine in widely scattered locations. The greatest damage is usually due to the second generation which occurs in August and September.

Continued low to moderate populations caused some damage in areas of east central Minnesota heavily defoliated in 1974. Defoliation in 1974 contributed to some mortality and dieback of large mature white pine. Drought may also have been a contributing factor. Field checks seemed to indicate that even heavily defoliated vigorous trees will recover with satisfactory conditions.

Monitoring throughout the summer in this area showed moderate populations building, but very high numbers of predators (Pentatomids) were present reducing the numbers of sawfly larvae considerably.

A cooperative (University of Minnesota) survey of the parasite complex associated with infestations located in stands of white pine throughout the northern portion of the state was conducted in the hope that introductions would help to reduce outbreaks where introduced parasites were present in low numbers. This survey proved unproductive as the parasites which exert the greatest influence on the sawfly are located throughout the surveyed area. A complete report of this project will be submitted by University of Minnesota researchers.

Reports of other infestations of introduced pine sawfly are tabulated below:

Crow Wing, Cass and Morrison counties - scattered populations low to moderate. Near Brainerd, high counts of first generation larvae were found on jack pine.

Aitkin county - large numbers near Lake Wilkins in central part of the county.

Beltrami county - low to moderate populations.

Clearwater county - low to moderate populations.

Ottertail county - moderate to high numbers near Perham.

St. Louis county - low populations near Sand Point Lake.

Yellow-headed Spruce Sawfly – Pikonema alaskensis Rohwer

Reports of damage due to infestations of the yellow-headed spruce sawfly were numerous again in 1975. Damage is primarily to roadside and plantation white spruce older than 3 years of age. It ranges from light to very heavy with scattered mortality which results from 3-4 years of annual moderate to heavy defoliation.

A number of plantations were sprayed with Mala-

thion. Occasional reports of defoliation of black and Colorado blue spruce have been submitted. Infestations were reported in the following locations:

County	Description	
Beltrami	24-148-31	up to 50% defoliation of small white spruce
Beltrami	33-147-32	½ of white spruce up to 6' in height defoliated up to 90%, Colorado blue spruce lightly defoliated
Cass	Hwy.200 W. of Remer	roadside plantings of white spruce heavily defoliated
Carlton	2-49-19	low populations
Carlton	20-46-20	moderate populations, sprayed in 1972 and 1973
Carlton	13-48-19	population low
Carlton	10-49-19	no population
St. Louis	11-50-17	5-6 year history of heavy defoliation with some current mortality
St. Louis	3-51-21	no population
Itasca	30-54-23	heavy defoliation and mortality
Aitkin	Hwy. 65 S. of Jacobson	light and scattered defoliation
Aitkin	Junction Hwy. 65 and 210	moderate-heavy defoliation
Lake	26 & 35-58-8	no populations - previous light popu- lations
Cook	17-62-4E	no population history
St. Louis	33-60-21	plantation 10 acres of heavy defolia- tion, projected for spraying in 1976
Itasca	23-60-23	scattered defoliation
Cass	17-143-28	plantation 20 acres moderate to heavy defoliation, projected for spray- ing 1976
Itasca	26-55-26	plantation 20 acres moderate to heavy defoliation, projected for spray- ing 1976
St. Louis	18-60-22	light defoliation, sprayed 1973
St. Louis	33-63-20	none

Many of these areas will be infested again in 1976. Overall populations appear to be reduced in the northeastern part of the state (Lake and Cook counties).

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A University of Minnesota project involving the introduction of parasites to control this native pest was continued this summer with the support of the Charles K. Blandin Foundation.

Balsam Fir Sawfly - Neodiprion abietis Harris

This insect, which was first found in Minnesota in 1971, increased in 1975. Observations of defoliation were made in Aitkin, Itasca, Cass, and northern St. Louis counties. Highest populations (up to 50 colonies per tree) occurred near Hay Lake in northeastern Aitkin county.

Since reports from Canada indicates that this insect may approach the spruce budworm in severity of attack, more intensive sampling for distribution and amount of damage will be carried out in 1976.

Aspen Problems

Aspen problems generally remained at low levels again in 1975. Aerial and ground surveys of areas of aspen which have been attacked by forest insects on recent years showed these areas to be relatively "clean" in 1975. The last year with extensive areas of defoliation was 1972 when the Large Aspen Tortrix *Choristoneura conflictana* (Walker) heavily defoliated over 1 million acres in Cook, Lake, and St. Louis counties and lightly defoliated areas in Koochiching, Lake of the Woods, Beltrami, Itasca and Carlton counties. 1971 was the last year of defoliation by the Forest Tent Caterpillar *Milacosoma disstria* (Hubner).

1975 Observations

An aerial survey of Itasca, Cass, and St. Louis counties revealed that the cover type had a thinned, ragged appearance in a sizeable portion of central St. Louis county. The area extended from Pelican and Nett Lakes to north of Hibbing to U.S. Highway 53 near Virginia. The Large Aspen Tortrix was suspected until ground checks showed that a number of pests were involved. Perhaps this can be partially attributed to past defoliation by the Tortrix reducing the vigor of the trees making them more susceptible to attack by pests which normally are not primary pests. Leaf Beetle larvae (Chrysomela sp.) were responsible for skeletonizing. Large numbers of the Aspen Blotch Miner Lithocolletis tremuloidiella (Braun) were observed on some larger aspen between Sturgeon Lake and Lake Leander in west central St. Louis county. Other insects found in this general area of aspen which may be contributing to this "unthrifty" look are various leaf miners, leaf rollers and tiers, and wood borers.

In other parts of the state the Forest Tent Caterpillar and Eastern Tent Caterpillar, *Malacosoma americanum* (Fabricius) are at a low level in Beltrami county; a slight increase in populations was detected across central St. Louis county. Little increase was reported in the eastern Koochiching county area. Eastern Tent Caterpillars were common on chokecherry and juneberry in Carlton county.

Except for limited and scattered areas of moderate to heavy defoliation in the southeast Koochiching, northeast ltasca and adjacent St. Louis counties, the Large Aspen Tortrix remained at low levels throughout northern Minnesota as determined from both an aerial survey conducted in conjunction with that for spruce budworm and ground surveys.

Egg mass surveys showed that populations of Large Aspen Tortrix within the survey area will undoubtedly remain at a low level.

County

Carlton	T48N R17W S10	No egg masses noted	No defoliation
	T49N R17W S29	No egg masses noted	No defoliation
	T47N R17W S26	No egg masses noted	No defoliation
	T46N R17W S21	No egg masses noted	No defoliation
	T47N R19W S34	No egg masses noted	No defoliation
Cook	T62N R 4E S6	No egg masses noted	No defoliation
	T58N R 5W S1	No egg masses noted	No defoliation
Lake	T56N R 7W S3	No egg masses noted	No defoliation
St. Louis	T51N R10W S3	No egg masses noted	No defoliation
	T51N R14W S29	No egg masses noted	No defoliation

Only occasional extruded pupal shells were observed in these checks of 1971-72 high population areas, where usually pupal shells far outnumber the observed egg masses thus indicating a continued low cycle for 1976 in the sampled area.

Poplar Borer Saperda calcarata (Say) was reported to be a common and chronic problem wherever aspen of poor vigor was to be found.

In areas where populations had been high in previous years such as in Beltrami county and near Hill City in Aitkin county, the Aspen Leaf Tier *Enargia decolor* was not to be found.

Walnut Plantation Problems

Several insects have been causing various problems in walnut plantations throughout the range of the species in the central United States. One of these, a case bearer, *Acrobasis* sp., has been found in plantations in southeastern Minnesota. This insect can be responsible for damage ranging from minor defoliation to very severe terminal shoot boring.

Limited surveys of walnut plantations in southeastern Minnesota have shown all degrees of damage to be present.

The U.S. Forest Service is presently working out an intensive analysis of these pests and hopefully will develop practical control methods.

Gypsy Moth – Porthetria dispar Linnaeus

Gypsy moth is a widely distributed and destructive pest of a variety of species of trees in the eastern portion of the United States and Canada. Control operations have been carried out as far west as lower Michigan in recent years.

Seven moths were collected in surveys conducted in eastern Wisconsin in 1975. Infestations are not believed to be established in any of these locations as of this time, however, surveys in 1976 will follow up these reports.

In Minnesota, APHIS (The Animal and Plant Health Inspection Service) of the USDA coordinated the placement of 1300 traps by APHIS, Minnesota Department of Agriculture, National Campers and Hiker Association, and DNR personnel. These traps which attract gypsy moth adult males serve as a tool for detection of gypsy moth infestations. The traps were placed in locations such as campgrounds, picnic grounds, roadside parking areas, etc., where the insect may first have been carried in by travelers. In 1975, no moths were trapped in Minnesota.

NOTEWORTHY REPORTS OF OTHER PESTS

Pest	Host(s)	Location	Remarks
Bark Beetles	conifers	various	localized out- breaks on trees of poor vigor, etc.
Northern pine weevil	Red Pine	Koochiching County	
Oak & Elm Lace Bugs	Oaks & Elms	widespread in central and southern Minnesota	
Pine Tortoise scale	Jack Pine	various central Minnesota locations	non-economic, some growth loss
Pine Needle scale	Mugho Pine	scattered locations	
Spruce Gall Aphid	Spruces	NE Minnesota	non-economic
Spruce Needle Miner	Colorado Blue Spruce	various	very low popula- tions down from 1974
Zimmerman Pine Shoot Moth	Various conifers	various	low incidence
Pine Pitch Midge	Jack Pine	central Minnesota	widespread non-economic
Pitch Noduce Maker	Jack Pine	central Minnesota	
Pine Bark Aphid	Pines	various	
Pine Root Collar Weevil	Scotch Pine	widespread on dry, sand sites	can be important
Spider Mites	Spruces	widespread	
White Pine Weevil	White Pine	occasional	
Pine shoot moth	Pines	occasional	populations may be increasing
Pine Twig Midge	Jack Pine	various	
Sawyers	various	various	common in deca- dent trees or

Pest	Host(s)	Location	Remarks
Pine Spittle bugs	Red & Jack Pine	various	populations generally low
Hackberry Nipple Gall	Hackberry	southern and western Minnesota	widespread - no damage
Basswood Leaf Miner	Basswood	Koochiching County	
Ash Borer	Ash	various	common on poor vigor trees
Walking- stick	Oaks	north & west of Brainerd	defoliation not serious
Fall Defoliators	Hardwoods	central Minnesota	defoliation area down from 1974
Balsam Fir sawfly	Balsam Fir	various	heaviest defolia- tion, eastern Aitkin County, some defoliation may be blamed on spruce bud- worms
Jack Pine sawfly	Jack & Norway Pine	St. Louis County	low populations
Red-headed Pine sawfly	Jack Pine	various	populations gen- erally low, occa- sional roadside Jack Pine
Neodiprion maurus	Jack Pine	Roseau County	
Neodiprion virginiana	Jack Pine	NE Minnesota	sub-economic, on open-growth trees
Red Pine sawfly	Jack Pine	Brainerd	mortality on or- namentals, larvae 6mm long on June 12th
Spittle bugs	conifers	Cass County	low populations
Pine Chafers	Pines	Crow Wing County	low populations
Elm Leaf Miner	Elm	Aitkin, northern Carlton and southern St. Louis counties	some browning of leaves

DUTCH ELM DISEASE AND OAK WILT SURVEY

An aerial survey was conducted July 15 through 21, 1975, in southeastern Minnesota to determine the extent of Dutch elm disease and oak wilt. Two observers and a navigator, besides the pilot participated in the survey. The observers sketched in on 1:24,000 scale aerial photography all the areas of wilting or dead oaks and elms that they observed, as they flew along flight lines that were two miles apart.

pulp piles

TABLE 1

ACRES OF FORESTS WITH OAK WILT OR DUTCH ELM DISEASE IN SOUTHEASTERN MINNESOTA

		Cou	unty			
Winona	Wabasha	Olmstead	Houston	Goodhue	Fillmore	
100	32	44	100	13	34	% of county [*] surveyed
118,400	21,497	23,400	133,800	9,380	30,400	forested acres* surveyed
10,580	1,885	4,075	8,325	1,755	9,140	total diseased acres observed during survey
9	9	17	6	19	30	% of forested area diseased
4	9	8	1	10	10	% of forested area w/oak wilt
2	1	4	4	6	10	% of forested area w/Dutch elm disease
3	5	5	1	3	10	% of forested area w/Dutch elm and oak wilt

*Calculated from data in Minnesota Soil and Water Conservation Needs Inventory, Aug. 1971.

An average of eight percent of the forested lands were found to have oak wilt or Dutch elm disease. Table One shows the acres of forest land with these two diseases in each county surveyed. Figure One shows the area covered by the survey.

It was concluded that Dutch elm disease and oak wilt are doing significant damage to the forests in southeastern Minnesota. Thus this situation warrants further study. A survey is planned for 1976 that will accurately measure the numbers of trees and volume lost to these two diseases. Then an appropriate course of action will be formulated to deal with these diseases.

Dutch Elm Disease - Ceratocystis ulmi

Dutch elm disease is continuing to spread throughout the state. Areas reporting their first confirmed case of Dutch elm disease include Warroad, Grand Rapids, Bigfork, Littlefork, Osakis, Dennison, Starbuck, Danube, Hancock, and Lake Andrew Township.

The elm timber in Minnesota should be harvested as fast as possible, before it becomes diseased and dies. Unfortunately, the supply of American elm (Ulmus americana), which comprises 90 percent of the elm resource*, far exceeds the demand. Medium and low grades of elm are difficult to sell and in many parts of the state there is no market for American elm. The markets for red elm (Ulmus rubra) and rock elm (Ulmus thomasii) are good. There is a greater demand for these species because they have less defects and more desirable wood characteristics than American elm.

The recently enacted Shade Tree Disease Control Act (Minnesota Statutes, Chapter 18.023) states that Dutch elm disease and oak wilt shall be controlled on lands adjacent to or within a shade tree disease control area. It also states that, "In accordance with the rules and regulations adopted by the Commissioner of Agriculture, and reasonable notice of inspection having been given to the owner of the real property on which such diseased shade trees are located within the period of time as may be established by the Commissioner." This act, depending on how it is interpreted, could have quite an impact on forest land owners. There is not now an economically feasible way to control Dutch elm disease on forest lands in Minnesota.

Oak Wilt - Ceratacystis fagacearum

The public's awareness of this disease has increased in the last few years. This has resulted in many more reports of the disease. The actual incidence of oak wilt seems to be either increasing slowly or remaining constant.

The desirability of attempting to control oak wilt in rural areas and the methods to be used will be studied over the next few years.

Eastern Dwarf Mistletoe - Arceuthobium pusillum

Dwarf mistletoe is the most damaging pest of Minnesota's black spruce forests. Fortunately, it is a pest that can be readily located and probably economically controlled.

The Minnesota DNR is cooperating with the University of Minnesota in developing prescriptions for controlled burns that would eradicate or reduce the amount of mistletoe in a stand. There is also a cooperative project with the University in developing aerial photographic techniques for locating mistletoe infections.

^{*}Kaufert, F. H. 1975. Minnesota's Native Wild Elms. Univ. of Minn. Agr. Exp. Station, Misc. Report 131.



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The Forest Pest Unit has mainly concerned itself with the severity and extent of the problem. Preliminary surveys were conducted this year to gain information that would be needed to plan more intensive future surveys. The surveys planned for 1976 will be designed to accurately measure the economic impact and the rate of spread of mistletoe. This information will then be used to determine the level of effort that should be put into mistletoe control.

The mistletoe surveys done during 1975 indicate that infected regeneration is being left after logging operations in mistletoe infected stands. The impact that these infections will have over the next rotation could be significant. If mistletoe does spread at a rate of two to seven feet per year, as is reported in the literature, the impact will be great. Perhaps any money that is invested in the regeneration of these infected stands will be wasted unless mistletoe is controlled.

American Chestnut Dieback

A cankering and dieback of American chestnut (Castanea dentata) was found on the White Water Wildlife Area in Winona county. The trees affected had died back and resprouted several times in the past few years. All of the trees involved were concentrated in four locations. Two of the areas were plantations less than half an acre in size. One location was a row of approximately ten trees planted for ornamental purposes. At the last location a few chestnuts were planted in a hardwood stand. In all cases the trees averaged two to four inches in D.B.H. and they were 100 percent affected by the dieback.

The dieback was caused by a rapidly developing canker that girdled and killed the saplings. These cankers were similar to those caused by the chestnut blight fungus *(Endothia parasitica)*. It was determined that chestnut blight was not the cause of the cankers, though, because no fruiting bodies were found nor could they be induced to grow on cankered wood placed in a moist chamber. Three attempts were made to isolate E. *parasitica* from the cankers and all of them produced negative results. Only wood decay fungi could be isolated.

The cause of this dieback is not known, but it is probably due to a particular seed source being planted too far north. This seed source may not have been adapted to Minnesota conditions so that it was vulnerable to attack from normally innocuous organisms.

At first it was thought that these plantations possibly had chestnut blight so they were destroyed in order to protect the remaining American chestnut shade trees and plantations in Minnesota, Wisconsin, and Iowa. All of the trees were cut and the stumps were treated with 2,4,D. Then the tops were burned.

This problem is not known to exist on American chestnut in any other part of Minnesota.

TABLE 2

1975 SURVEY OF BLACK SPRUCE STANDS KNOWN TO HAVE DWARF MISTLETOE INFECTIONS WHEN LOGGED

Location	% of Reproduction Infected	Remarks
Sec. 16, T. 155, R. 26	5%	Cut about 20 years ago; mistletoe infected trees were left standing after cut.
NWSW Sec. 26, T. 158, R. 26	not determined	Heavy mortality and reproduction infection.
NENE Sec. 32, T. 68, R. 26	29%	Cut 1973-75; area was cut in a number of 1-6 acre patches.
SENE & NESE Sec. 10, T. 159, R. 27	1%	Cut 1962-63; an effort was made to fell all spruce when the stand was cut, in order to control mistletoe.
Sec. 11, T. 159, R. 27	5%	Cut about 10 years ago.
Sec. 23, T. 158, R. 27	about 1 infected tree	Cut about 10 years ago.

OTHER NOTEWORTHY DISEASES

Organism and Disease

Anthracnose

Birch Dieback

Chrysomyxa sp. spruce needle rust

Coleosporium sp. red pine needle rust

Cronartium ribicola white pine blister rust

Dothiorella ulmi Dothiorella wilt

Fusarium sp. Fusarium canker

Gall Rust

Maple Dieback

Physiological Needle Drop

Rhizosphaera kalkhoffii Rhizaspaera Needle Cast

Siroccus Strobilinus Red Pine Shoot Blight

Venturia tremulae Aspen Twig Blight

Host(s)

Butternut, Walnut White Birch

Oak, Maple,

White, Black & Colorado Spruce

Red Pine

White Pine

Elm

Robusta poplar

Jack & Scotch Pine

Maple

Red Pine

Colorado Spruce

Red Pine

Aspen Regeneration

Location

Widespread

Virginia Aitkin, Carlton & Koochiching counties

Cass, Pine, Carlton & Aitkin counties

Widespread

Wabasha county

Redwood county

Widespread

SE Minnesota

Jay Cooke Park Area

Roseau, Hubbard & Pine counties

Cutfoot Sioux exp. Forest, Fondulac Forest, Tower

Widespread

Remarks

Common

Cause unknown Scattered light infections

Scattered light infections

Status unchanged, only very light infection noted around Alexandria

One tree infected

Severe damage to one windbreak

Common

Probably due to drought

Scattered & localized

Common

Light understory infection

Less common than in 1974