1974
FOREST PEST REPORT

MINNESOTA
DEPARTMENT OF NATURAL RESOURCES

INDEX

1974 FOREST PEST REPORT

Spruce Budworm-Choristoneura fumiferana (Clemens)

Spruce Budworm continued as Minnesota's number one forest pest in 1974. The aerial survey which is carried out annually showed the infestation to be moving generally south and west into the Cloquet Valley State Forest area. Hopefully, this will terminate the generally circular progression which began in 1967 near International Falls and progressed east and south into the Arrowhead Region. This area encompasses a large portion of the spruce-fir cover type of Minnesota.

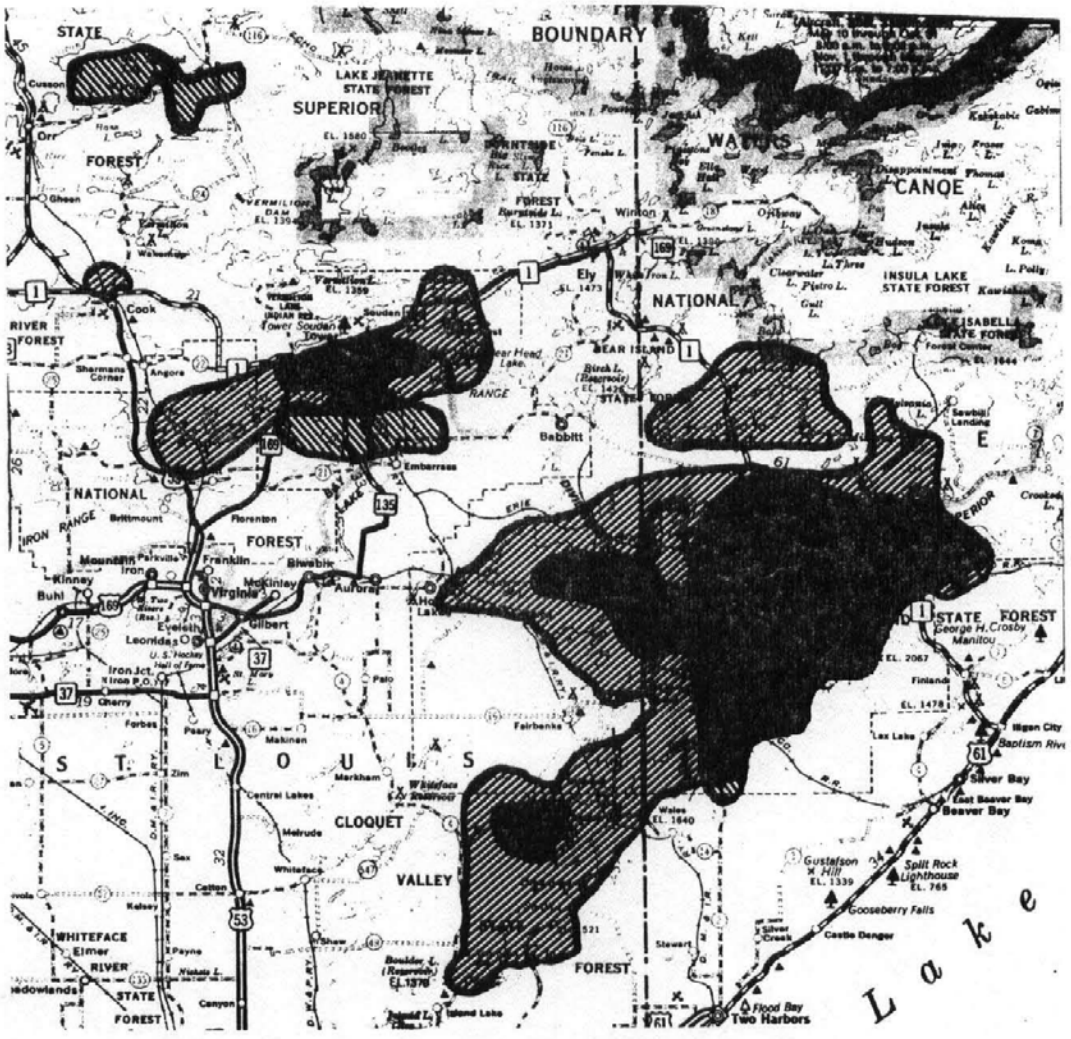
Aerial Survey

The general aerial survey for Spruce Budworm was flown on July 22-26, 1974. It was a cooperative survey with both U.S.F.S, State and Private Forestry, and Minnesota Department of Natural Resources personnel participating.

Six mile flight lines were laid out prior to the survey on county highway maps (1/2" mile scale) which were assembled for the purpose. The survey was flown at a height of 1000 feet above the ground with a navigator assuring that course lines were adhered to.

Two observers recorded estimated extent of defoliation on another map prepared for the purpose. Defoliation was sketch-mapped in three categories: (1) Heavy defoliation and much dead timber; (2) Moderate to heavy present defoliation; and (3) Light to Moderate defoliation. Results of the 1974 survey compared to that of 1973 are shown on the map.

Total defoliation area (gross) was approximately 750,000 acres in 1974.



1973 ▧ 1974 ▨ 1973 & 1974 ▩

Ground Survey

Ground surveys were very limited due to lack of personnel. No ground checks of aerial survey results were made except those which were incidentally recorded as part of the egg mass survey.

Egg Mass Survey

The egg mass survey was conducted from July 31-August 20th. The objective of this survey was to provide an indication of 1975 trends. Samples are taken from the mid-crown of the sample trees. Three 15-inch samples are taken per dominant or codominant tree and there were three trees per sample plot. Again because of the lack of manpower a large enough number of samples could not be taken. These samples, however,

did indicate that it is quite probable that the area of heaviest defoliation in 1975 will be in the Cloquet Valley State Forest near the Boulder and Island Lake Reservoirs.

#Plot	Description	#Egg Masses Per 15" Twig	Comments
1	27-52-14	.1 (2 eggs)	No Feeding
2	27-52-14	.3 (Few eggs)	Full Foliage
3	21-52-12	0	No Feeding
4	8-52-14	0	No Feeding
5	15-52-15	0	No Feeding
6	22-53-14	1.	Current Needle Defoliation only. Many pupal cases.
7	2-53-14	1.6	
8	23-55-14	.3	
9	31-55-12	1.0	
10	21-52-13	0	Full Foliage
11	33-53-13	0	
12	30-53-12	0	Light Feeding
13	35-53-12	.3	
14	11-55-13	.3	
15	5-57-8	0	Heffelfinger Trail Light current feeding.
16	31-59-8	.3	Moderate Defoliation
17	15-58-8	2.0	Moderate-Heavy Defoliation
18	16-58-8	0	
19	24-59-11	1.3	
20	35-59-7	0	Heavy Defoliation
21	33-59-7	0	Moderate Defoliation

Since one egg mass per 15-inch twig is usually sufficient to assure complete defoliation, as well as maintain the population level, it appears as if the general area of the Cloquet Valley State Forest has the potential for a general buildup of budworm populations and resultant defoliation.

CONTROL OPERATION - FINLAND STATE FOREST

An aerial spray project to control Spruce Budworm on 3500 acres of state land in the Finland State Forest was carried out in June, 1974. The Minnesota Department of Natural Resources was the primary agency with assistance furnished by the U.S. Forest Service, county, and

private forestry.

I. Background

The project was originated at a meeting of the Duluth area forestry personnel, Cloquet region personnel, and St. Paul staff on November 28 and 29, 1973. At this meeting the results of spruce budworm surveys, both aerial and ground were discussed in relation to the timber management plans for these areas.

Since the market for balsam fir is expected to develop rapidly during the next few years and since certain areas of marketable white spruce and fir were being devastated by the budworm, the decision to plan for a control operation was made.

The following criteria determined the tracts which were to be sprayed:

1. The timber must be of a size and volume per acre to make a practical logging operation.
2. The tract must be reasonably accessible for logging.
3. It must be scheduled for logging in the relatively near future.
4. It must be in danger of major volume loss if defoliation goes unchecked.
5. The site index must be at least medium for balsam fir or other species. Sites more suitable for other species will be converted after logging. This practice will also have a minor effect in breaking up the continuity of the balsam fir type.

The primary objective of the control operation would be to protect the tracts from major defoliation until the time when they can be logged.

After several more planning meetings, 12 localized blocks ranging from 40 to 640 acres in size were selected. (see map). Block #4 was later eliminated and two others were altered because of the sale of the timber. Total acreage was approximately 3500 acres including 200 foot buffer strips, when necessary, around each tract. Permission to spray the buffer strips was obtained when ownership was other than state. DNR Fisheries and U.S. Fish and Wildlife Service personnel were invited to monitor the spraying.

II. Preparations for the Project

Because this was to be a federal - state cooperative project, it was necessary to fulfill the requirement for a detailed environmental impact statement. The EIS was to determine the benefits of the operation compared to the alternatives and the possible after effects.

St. Paul and Duluth area staff proceeded to acquire necessary equipment and materials for the project: 390 gallons of w Chemical Corporation's Zectran CF-24 (Mexacarbate) insecticide were ordered. Zectran was chosen because it is the only dependable insecticide registered for use on the spruce budworm. 529 gallons of deodorized kerosene (APCO 467) was ordered from Worum Chemical of St. Paul for use as a carrier. This was to be picked up by the aerial contractor before reporting for the control operation.

The aerial spraying contract was awarded to Ranger Aviation of Jordan, Minnesota on a bid of $.97 per acre.

Other materials and equipment arranged for were: pole pruners, spray sensitive cards, data cards and plastic collection bags provided by the USFS. Plastic flagging and bamboo poles (ordered by DNR Northern Service Center) to be used for boundary marking.

III. Boundary Marking

In order to control spraying limits, district personnel marked each spray block with white plastic flagging attached to 20' bamboo poles. The flags were placed in the tops of prominent trees approximately every 1/4 mile on the perimeter of each spray block. This was a very exhausting and time consuming portion of the project. In future operations, alternative methods of marking should be considered in order to reduce the cost of this phase.

IV. Timing Checks - Plot Layout

A. Larval development checks were made every 2-3 days by personnel of the St. Paul staff and/or USFS. This began on June 1st. In addition, pre-spray and post-spray sample plots were laid out by these personnel.

Timing checks were made in locations scattered throughout the spray areas. Spraying was to be carried out when the larvae were predominantly in the 4th instar. Contracting called for the spray operator to be given a five (5) day notice. This requirement led to the decision to notify the operator when larvae began entering the 4th instar. Instar determination was made by USFS personnel using a calibrated binocular microscope to measure head capsule width. Developments proved that there was a considerable range of development of larvae which compounded judgement as to when to initiate spraying. If larvae were allowed to develop too far, the heavily defoliating 5th and 6th instars could get ahead of the spraying and do much damage. On the other hand, if spraying were initiated too early, many larvae would still be in overwintering hibernacula or mining buds and thus protected from the insecticide.

Variable weather conditions at this time of the year also compounded timing estimation. A period of cool weather could retard development and make spraying even more difficult to time.

B. Plotwork

A system of 12 blocks of sample plots were laid out prior to spraying, in order to determine the success of the spray operation. Each block of plots was made up of three sample plots with three trees being sampled per plot. From each tree four 15" twig samples were collected from midcrown of representative dominant or codominant balsam fir. Tree samples were collected by pole pruners with a cloth hoop attached. Numbers of larvae were counted for each sample plot. In the post spray sample, sample trees were doubled in order to ensure an adequate sample.

Pre-spray and post-spray counts were compared for percent kill for each block. A system of three sample blocks not to be sprayed were set up as check plots within the same general area.

C. Calibration of Spraying System

On June 13th, the contractor was asked to report for calibration on June 18th. Calibration took place in a gravel pit located along Lake County Highway #2 near Sand Lake in Lake County. The aircraft was calibrated with indispensable assistance of Mr. Charles Reimers, a Technical Representative from Dow Chemical. Dale Daak, a Regional Sales Representative also assisted in calibration. Both assisted in mixing the chemical later on. The equipment was adjusted in the following manner to deliver the desired particle size (125 microns MMD) at the desired rate per acre (1 quart per acre total chemical and carrier):

a. Twenty #8002 plus two #8003 (on boom ends) nozzles

b. Outside nozzles pointed 45° upward and forward, and center nozzles pointed to rear and 45° downward to get proper particle breakup ad judged on spraying droplet sensitive cards.

c. 28 psi pump pressure

d. Three gallons/min. delivery (timed and measured for one minute).

Some difficulty in judging particle size and swath width was encountered due to thermal updrafts arising from the gravel pit.

V. Spraying

The insecticide and carrier were mixed at the rate of 1.5 gallons carrier to one gallon insecticide and delivered at the rate of one quart per acre. This resulted in a rate of .15 lbs. actual insecticide per acre.

Spraying began on the evening of June 18th. Chemical was mixed in the helicopter tanks after pumping carrier from the tanker and insecticide from the shipping drums. Spraying began at first light in the morning, terminated when wind conditions became unfavorable, began again late in the afternoon when the wind died down and terminated at dark. Duluth weather bureau predictions were checked each morning at 3:30 a.m. as a basis of whether to leave the motel to continue the project.

Spraying limitations were:

1. Temperature not over 76°
2. Wind not over 6 mph (actually worked out to about 4 mph as judged by hand windspeed meter when the pilot noticed drift and voluntarily terminated spraying).

3. No moisture on foliage.

Actual spraying weather turned out to be all that could be asked for since each day (June 18-21) we were able to do some spraying. A spray chart follows:

SPRAY OPERATIONS CHART

Date	Spray Block # (1)	Acres Sprayed (2)	Remarks
6/18 p.m.	Calbration in gravel pit		(See Text)
6/18 p.m.	8 & 9	300	Slight winds, warm
6/19 a.m.	10	196	Began spraying 5 a.m. Duluth temp. 51° a.m.
6/19 a.m.	12	140	
6/19 a.m.	2	105	
6/19 a.m.	11 (3)	400	Terminated spraying at 9:45 a.m. when wind began to increase.
6/19 a.m.	1 (4)	410	Could not spray until late due to wind.
	moved to next heliport		
6/20 a.m.	1		Completed Block #1 wind began to pickup early.
	moved to next heliport		
6/20 p.m.	3 & 5	293	Sprayed Block #5 during a wind shift with no wind. Temp. 76° F.
	Terminated spraying early as chemical pump on tanker broke down. Transported to Silver Bay for repair and moved to next heliport.		
6/21 a.m.	6 & 7	1200	Began spraying slightly after 5 a.m. excellent conditions, began to get slightly windy (gusts) at end of project.

1. Spray Block #4 eliminated due to sale of timber.
2. Spray Block acreage - Buffer strips are in addition to this figure and vary considerably.

3. Block #11 moved (see map) due to sale of timber. (averaged reduced).

4. Block #1, acreage increased to compensate for elimination of Block #4 and reduction of Block #11.

Project Analysis

Overall control resulted in an 88+% budworm population reduction with plots ranging from 79-99+% kill. Control plot populations remained high although variable. The reduction in population was also borne out by later egg mass surveys in and adjacent to the spray areas.

There are some considerations which might have resulted in a higher rate of budworm kill:

Temperature may have to be more closely monitored during future operations if it is a factor in the dispersal of insecticide. After completing the spraying of blocks #3 and #5, the pilot thought that some of the chemical might have been rising due to thermal inversion. The temperature at this time was 76° F. However, block #5 was sprayed immediately after #3. This block showed a much higher percentage of kill.

Pilot experience may also be a factor in the success of the operation. Although it was a contract requirement, it turned out that although the pilot had a great deal of spraying experience, he did not have experience spraying under forest conditions. It should be noted that the final blocks sprayed had the highest rate of control. However, this could be a result of more favorable spraying conditions. Overall, the pilot was very conscientious and was obviously doing the best job possible.

A cost reducing factor which has already been mentioned is to

develop a more efficient method of marking spray block boundaries. Techniques such as spraying trees from a helicopter or shooting lines with a bow and arrow are possible considerations.

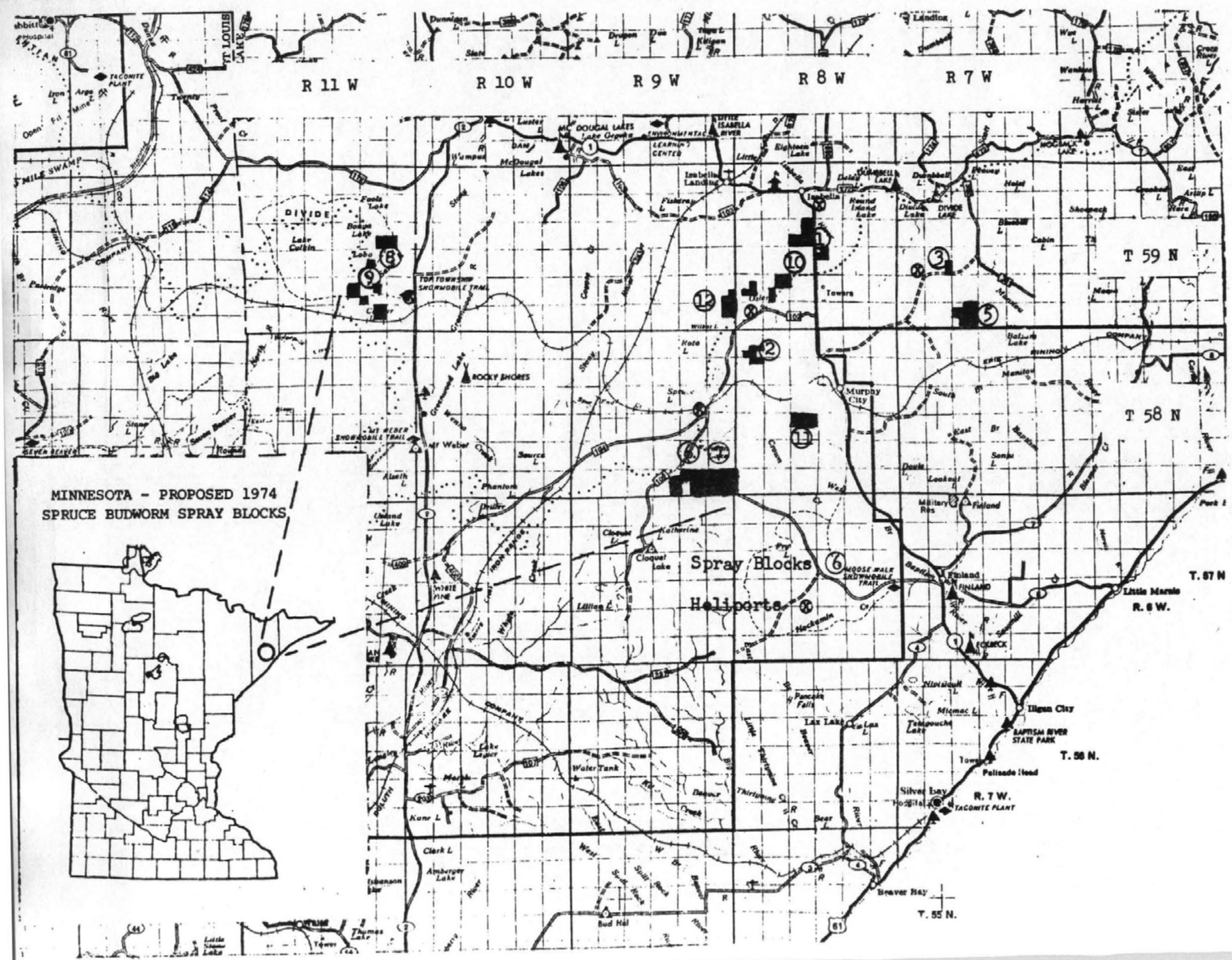
A tabulation of costs follows:

Insecticide and carrier	$6165.99
Contracting	3579.65
Expenses (lodging, food, & Mileage)	3407.65

It is not possible to determine total salary and indirect cost information.

In the final analysis, the success of this operation will depend on if the budworm populations within the spray blocks are suppressed long enough to enable the timber to be sold. The feasibility of spraying will be determined when comparisons of the value of the stumpage sold versus the total cost of spraying can be made.

APPENDIX


MINNESOTA - PROPOSED 1974
SPRUCE BUDWORM SPRAY BLOCKS
Spray Blocks
Heliports
R 11 W
R 10 W
R 9 W
R 8 W
R 7 W
T 59 N
T 58 N
T. 57 N
T. 56 N
T. 55 N
R. 6 W.
R. 7 W.
Isabella
Murphy City
Finland
Little Marais
Illgen City
Silver Bay
Beaver Bay
BAPTISM RIVER STATE PARK
TACONITE PLANT
ROCKY SHORES
DIVIDE
Cloquet Lake
Lax Lake

HEFFELFINGER TRAIL AREA

Block #6

plot #	tree #	Total Larvae/ tree (4 twigs) pre-spray	post-spray
1	1	38	0
	2	51	0
	3	48	0
	4		0
	5		0
	6		0
Total		137	0
2	1	10	0
	2	54	0
	3	12	0
	4		0
	5		0
	6		0
Total		76	0
3	1	12	0
	2	14	0
	3	14	0
	4		0
	5		0
	6		0
Total		40	0
Total All Plots		253	0
Avg./Twig		7.03	0
%Population Reduction		100	

Block #7

plot #	tree #	Total Larvae / tree (4 twigs) pre-spray	post-spray
1	1	9	0
	2	3	0
	3	8	0
	4		0
	5		1
	6		0
Total		20	1
2	1	1	0
	2	2	0
	3	12	4
	4		0
	5		0
	6		0
Total		15	4
3	1	7	2
	2	6	1
	3	7	2
	4		0
	5		0
	6		0
Total		20	5
Total All Plots		55	10
Avg./Twig		1.53	.14
%Population Reduction		90.9	

SAND LAKE AREA

Block #8

plot #	tree #	Total Larvae/ tree (4 twigs) pre-spray	post-spray
1	1	25	1
	2	14	1
	3	11	1
	4		3
	5		1
	6		3
Total		50	10
2	1	14	13
	2	7	13
	3	4	2
	4		7
	5		12
	6		4
Total		25	51
3	1	28	1
	2	28	0
	3	28	0
	4		1
	5		0
	6		1
Total		84	3
Total All Plots		159	64
Avg./Twig		4.42	.89
%Population Reduction		.79.9	

Block #9

plot #	tree #	Total Larvae/ tree (4 twigs) pre-spray	post-spray
1	1	40	0
	2	58	3
	3	63	1
	4		2
	5		2
	6		0
Total		161	8
2	1	77	1
	2	55	1
	3	76	1
	4		2
	5		6
	6		2
Total		208	13
3	1	91	0
	2	66	2
	3	63	5
	4		1
	5		0
	6		4
Total		220	12
Total All Plots		589	33
Avg./Twig		16.36	.46
%Population Reduction		97.2	

ISABELLA-OSIER LAKE AREA

Block #10 East

plot #	tree #	Total Larvae/ tree (4 twigs) pre-spray	post-spray
1	1	56	1
	2	66	5
	3	83	11
	4		13
	5		6
	6		30
Total		205	66
2	1	76	0
	2	85	0
	3	89	0
	4		0
	5		1
	6		0
Total		250	1
3	1	49	1
	2	56	0
	3	33	0
	4		0
	5		0
	6		1
Total		138	2
Total All Plots		593	69
Avg./Twig		16.47	.96
%Population Reduction		94.2	

Block #10 West

plot #	tree #	Total Larvae/ tree (4 twigs) pre-spray	post-spray
1	1	85	22
	2	52	46
	3	63	43
	4		23
	5		26
	6		11
Total		200	171
2	1	75	5
	2	72	6
	3	130	4
	4		22
	5		1
	6		1
Total		277	39
3	1	130	0
	2	121	0
	3	95	0
	4		0
	5		0
	6		0
Total		346	0
		823	210
		22.86	2.92
		87.2	

Block #12

plot #	tree #	Total Larvae/ tree (4 twigs) pre-spray	post-spray
1	1	24	7
	2	17	2
	3	20	6
	4		2
	5		2
	6		2
Total		61	21
2	1	19	1
	2	63*	2
	3	35	1
	4		2
	5		0
	6		0
Total		117	6
3	1	25	3
	2	16	18
	3	7	9
	4		6
	5		21
	6		4
Total		48	61
		226	88
		6.28	1.22
		80.5	

*White Spruce

ISABELLA-OSIER LAKE AREA

Block #1				Block #3				Block #5			
plot #	tree #	Total Larvae / tree (4 twigs) pre-spray	post-spray	plot #	tree #	Total Larvae / tree (4 twigs) pre-spray	post-spray	plot #	tree #	Total Larvae / tree (4 twigs) pre-spray	post-spray
	1	10	0		1	40	1		1	101	6
	2	5	0		2	35	0		2	78	0
1	3	13	11	1	3	18	1	1	3	72	0
	4		1		4		4		4		19
	5		1		5		0		5		1
	6		0		6		9		6		8
Total		28	13	Total		93	15	Total		251	34
	1	10	5		1	39	14		1	86	10
	2	16	3		2	38	11		2	67	9
2	3	19	1	2	3	47	5	2	3	53	13
	4		2		4		6		4		15
	5		4		5		10		5		25
	6		0		6		8		6		20
Total		45	15	Total		124	54	Total		206	92
	1	16	2		1	28	10		1	48	1
	2	34	1		2	27	16		2	29	3
3	3	13	1	3	3	35	10	3	3	46	3
	4		2		4		6		4		3
	5		0		5		14		5		1
	6		0		6		6		6		6
Total		63	6	Total		90	62	Total		123	17
Total All Plots		136	34			307	131			580	143
Avg./Twig		3.78	.47			8.53	1.82			16.11	1.99
%Population Reduction			87.5				78.7				87.7

ISABELLA-OSIER LAKE CHECK				HEFFELFINGER TRAIL CHECK				SAND LAKE CHECK			
ot	tree #	Total Larvae/ tree (4 twigs) pre-spray	post-spray	plot #	tree #	Total Larvae/ tree (4 twigs) pre-spray	post-spray	plot #	tree #	Total Larvae/ tree (4 twigs) pre-spray	post-spray
	1	29	61		1	16	6		1	25	43
	2	30	42		2	7	6		2	24	32
	3	30	20	1	3	5	3	1	3	33	31
Total		89	123	Total		28	15			82	106
	1	21	30		1	3	1		1	13	19
	2	65	30		2	7	0		2	28	34
	3	36	30	2	3	5	1	2	3	23	3
Total		122	90			15	2			64	56
	1	20	27		1	7	3		1	17	8
	2	29	32		2	5	1		2	9	15
	3	19	70	3	3	9	3	3	3	26	4
Total		68	129			21	7			52	27
. All Plots		279	342			64	24			198	189
'Twig		7.75	9.5			1.78	.67			5.5	5.25
ılation luction		+ 22.58				62.4				4.5	

Large Aspen Tortrix-Choristoneura conflictana (Walker)

Populations of the Large Aspen Tortrix have declined to the point where defoliation is virtually undetectable from the air except for scattered areas where damage is very light. These areas were noticed during the spruce budworm aerial survey, but were not mapped.

Introduced Pine Sawfly-Diprion similis (Hartig)

Except for local situations, the Introduced Pine Sawfly remained at very low levels throughout Minnesota.

Very high fall generations with resulting severe defoliation were reported on white pine east of North Branch and on jack pine near Brainerd. Populations reaching levels such as these can be expected to decline drastically as disease, parasites, and predators which are always present increase their effects on the population accordingly. A parasite release program which may eventually help to control outbreaks of this pest is being contemplated to begin in 1975.

Balsam Fir Sawfly-Neodiprion abietis (Harris)

This sawfly was first noted in Minnesota by Ray Dolan near Finland in 1971. It was not detected again until 1974 when it was again found by Dolan in Carlton county. Subsequent surveys led to discovery of occasional populations in Aitkin, Itasca, and S. St. Louis counties as well as in Lake county. In all cases, the host species has been balsam fir.

While the above infestations have been of minor consequence, records from the northeastern U.S. and Canada indicate that this pest can compete with the spruce budworm in severity of attack on balsam fir.

Yellow-Headed Spruce Sawfly-Pikonema alaskensis (Rohwer)

The Yellow-Headed Spruce Sawfly variably damaged white spruce in widely scattered locations throughout the northern portion of the state. Damage was confined mainly to plantation and roadside trees. Minor amounts of mortality are becoming evident primarily on private plantations in Aitkin and Itasca counties. Several state plantations in Itasca county may need to have suppression operations carried out in June 1975.

Larch Sawfly-Pristiphora erichsonii (Hartig)

Populations were again generally low in 1974 maintaining the trend noted during 1972-73 surveys. An exception was in the area of Sec. 12-52-22 in Aitkin county where some mortality and top kill were found in areas of previous heavy defoliation.

The cooperative DNR-University of Minnesota Parasite Release Project continued wiht research showing that both the Bavarian strain of the parasite Mesoleius tenthredinis (Morley) and Olesicampe benefactor (Hinz) were established in all sixteen plots located throughout the tamarack type in northern Minnesota. It is hoped that further work will show that the parasite will reduce populations so that endemic or lower populations will be maintained for longer periods of time as they have in Canada. As this work is carried on, further releases will be made in new locations further increasing the rate of spread of the parasite.

Eastern Dwarf Mistletoe-Arceuthobium pusillum (Peck)

A program which ideally would result in a method of controlling Dwarf Mistletoe being integrated into the basic Black Spruce timber management procedure is in very tentative stages. It is a cooperative University of Minnesota-DNR project involving the thorough analysis, slash distribution, and prescribed burning of a mistletoe infected stand. Two or three 40+ acres stands with mistletoe infection centers will be involved.

Another tentative program involves aerial photography systems to detect mistletoe infection centers. Several photographic techniques will be tried to determine which will most effectively show new infection centers, which may be a limited to areas as small as one-tenth of an acre. Periodic flights with follow-up control may help to reduce mistletoe as one of the state's most important forest pests.

Red Pine Shoot Blight-Sirococcus strobilinus (Pruess)

This disease, also known as "deerskin droop" or simply "needle droop" has been found on red pine in several locations in north central Minnesota. It is characterized by a drooping and dying of current season growth with deterioration of the buds also. The disease can be very damaging on understory trees where the overstory is heavily affected. Open plantation infestations have not been found in Minnesota. Control measures have not been worked out as of this time.

A problem demonstrating similar symptoms of droop without bud deterioration is very widespread in the state in the same species. In this case, several species of mites are suspected of being involved. It may also be a physiological problem. As the terminal bud is not affected, no permanent damage is expected.

Pine Tussock Moth-Dasychira plagiata (Walker)

Populations of the Pine Tussock Moth which have been a problem on jack pine in the General Andrews State Forest area and also in the Mission Township area of Crow Wing county were very low during 1974.

The pest is not expected to be a problem in 1975.

Fall Defoliator Complex

The oranged-striped oakworm (Anisota senatoria J.E. Smith) was at high levels in isolated locations in Morrison county and in Wright county. The Morrison county infestation was privately sprayed with Sevimol in early August. Populations were reduced by about 80%, however, remnant populations still caused sporadic heavy defoliation.

The variable oak leaf caterpillar (Heterocampa manteo Doubleday) remained at low levels.

Other species of this complex; the red-humped oakworm, the yellow-necked caterpillar, the orange-humped mapleworm, etc. which have been present in high numbers in recent years were not reported.

Walnut Plantation Problem

A shoot dieback of Black Walnut was detected in many plantations in southeastern Minnesota.

Preliminary investigations into the causal agent indicates that the problem may be due to a relatively unknown pest known as the Pecan Leaf Casebearer.

An intensive survey of plantations is planned for 1975 in order to determine the extent and damage due to this pest.

Plantation Disease Survey

A project involving the inspection of conifer plantations throughout the state was initiated in August 1973. Diseases surveyed for were: Lophodermium pinastri (Pine Needle Cast), Scleroderris lagerbergii (Scleroderris Canker), Sirococcus strobilinus (Red Pine Shoot Blight), Rhizosphaeria kalkhofrii (Spruce Needle Cast), and Schirrhia acicola (Brown Spot Needle Blight). Other problems were noted as they were encountered. Unfortunately, the survey was not completed to our satisfaction due to circumstances beyond our control.

A total of 83 plantations were inspected in 1974. Of these, 42 were state and 41 were privately owned.

Counties where the diseases were encountered are listed below:

Lophodermium pinastri - Aitkin, Anoka, Dakota, Hubbard, Isanti, Koochiching, Ottertail, Pine, St. Louis, and Sherburne.

Rhizosphaeria kalkhoffii - Benton, Chisago, Dakota, Fillmore, Hubbard, Jackson, Isanti, Ottertail, Sherburne, Sibley, Wadena, and Washington.

Sirococcus strobilinus - Aitkin, Itasca, St. Louis

Scirrhia acicola - Dakota

	Where Noted	Comments
Balsam Fir Needle Browning	various	needle browning, twig feeding damage
Red-Headed Pine Sawfly	roadside open-grown	defoliation
Salt damage	very common	needle browning near highways, especially on roadway side of tree
Herbicide damage	common	
Mountain Ash Sawfly	common ornamental problem	
Bronze Birch Borer	Ornamental trees	common in stressed birch
Mites	various locations (ornamentals)	several different species cause galls of different types on hardwoods and needle browning in conifers.
White Pine Weevil	various locations	found in Blue Spruce, Jack Pine, and White Spruce
Pine Needle Scale	Cloquet	in May ho pine plantings
Pine Root Collar Weevil	Many locations	Common in Scotch pine on light soils
Pine Tortoise Scale	Willow River Campground at Gen. Andrews State Forest	Potential outbreak population in young regeneration area

MISCELLANEOUS PROBLEMS CON'T.

	Where Noted	Comments
Lammas Growth and Prolepsis	Wealthwood State Forest	a deformation of terminal and/or lateral buds due to climatic factors. Of minor importance