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MISCELLANEOUS REPORT NO. 34

LARCH SAWFLY CONDITIONS IN THE LAKE STATES IN 1954

A RECONNAISSANCE SURVEY

by

L. C. Beckwith, Entomologist

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
Lake States Forest Experiment Station

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U. S. Department of Agriculture, Forest Service
Lake States Forest Experiment Station^{1/}

Miscellaneous Report No. 34

February 1955

LARCH SAWFLY CONDITIONS IN THE LAKE STATES IN 1954

A RECONNAISSANCE SURVEY

By L. C. Beckwith, Entomologist^{2/}

INTRODUCTION

The widespread infestation of the larch sawfly (Pristiphora erichsonii (Htg.)), in progress in Minnesota since the late 1940's, continued in 1954. In general, there was a decrease in sawfly populations within the older areas of the infestation, but an increase in the total area of defoliation discernible from the air. Although light in comparison with those of Minnesota, sawfly populations increased in both Michigan and Wisconsin.

The extent and severity of the infestation in the Lake States in 1954 was determined by reconnaissance surveys similar to those made in 1953. In the northern half of Minnesota, an aerial survey was made to determine the areas of partial and complete defoliation. An intensive ground reconnaissance was also conducted in observation points established in 1951; data were taken on the amount of defoliation of individual trees, and cocoons were collected for research purposes. Because of the limited time available, only restricted ground observations were made in Michigan and Wisconsin where infestations are relatively light.

^{1/} Maintained by the U. S. Department of Agriculture, Forest Service, in cooperation with the University of Minnesota, St. Paul 1, Minnesota.

^{2/} The author expresses his appreciation to W. O. Bulger and T. T. Aamodt of the Office of the State Entomologist of Minnesota for their assistance in the aerial observations, and to pilot Arthur Gieser of the A.R.S. Aircraft and Special Equipment Center. Thanks are also due to A. T. Drooz of the Lake States Forest Experiment Station and to field aides D. P. Wallesz, Daniel Meyer, and T. C. Luche for their assistance during the ground survey.

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FOREST INSECT COMMISSION IN THE FOREST SERVICE

A RECOMMENDATION

By G. C. Beckwith, Entomologist

INTRODUCTION

The following information is based on the results of the survey of forest insects in the United States, as conducted by the Forest Service, and is intended to provide a basis for the study of forest insects in the United States. The survey was conducted in 1917, and the results are presented in this report.

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AERIAL RECONNAISSANCE

Survey Method

The aerial reconnaissance was again made possible by close cooperation between the Office of the State Entomologist of Minnesota and the Lake States Forest Experiment Station. The Aircraft and Special Equipment Center of the USDA Agricultural Research Service provided a pilot and a 4-place high-wing monoplane. County Highway maps were used in conjunction with an operation recorder.

Information on the total acreage of the tamarack type within each county was obtained from unpublished survey data collected by the Division of Forest Economics of the Lake States Station. Only land considered to be of commercial value was included, but these acreages could be expanded to include all tamarack within the county since the percentage of tamarack within each defoliation category would not change.

A land area of approximately 15 million acres was covered by the survey during the period of August 3 - 10. Flight lines were flown in east and west directions at 12-mile intervals. Observation of a 20-chain strip (10 chains on each side of the plane) produced a 2.1 percent cruise of the area. As in 1953, three stand-condition categories were used: (1) no defoliation, (2) partial defoliation, and (3) complete defoliation. The defoliation information was transferred, using a proportional divider, from the operation recorder charts to the county maps. The acreage of tamarack within each defoliation category was determined for each county completely covered by the survey.

A map was prepared, by township and range, showing the degree of defoliation of all counties covered by the flight lines (see accompanying map). If an appreciable proportion of the tamarack in any one township fell in the partial defoliation category, the whole township was placed in that category. All adjacent townships of the same defoliation category were grouped in the final map preparation. Small "islands" of a different category were omitted in final preparation, as they would be lost in photographic reduction. Therefore, areas shown on the map as partially defoliated will also contain some tamarack in the other defoliation categories. This system of map preparation is acceptable where the finished map is not detailed but is a representation of the broad picture of defoliation.

Results

The acreage of tamarack within each defoliation category is shown by county in table 1. By far the greatest acreage occurs in the partially defoliated category. The two counties having the greatest percentage of complete defoliation are in the northwestern corner of the surveyed area; of the tamarack acreage in Lake of the Woods and Koochiching Counties, 31 and 19 percent respectively are completely defoliated. The greatest amount in the no-defoliation category occurs in the southern edge of the survey.

SECRET

The purpose of this document is to provide information to the Joint Intelligence Committee (JIC) regarding the activities of the Soviet Union in the field of intelligence gathering and dissemination. The document is classified as SECRET and is intended for the use of the JIC and other authorized personnel.

The document is divided into two main sections. The first section, titled "Introduction", provides a general overview of the Soviet Union's intelligence activities. The second section, titled "Detailed Information", provides more specific information regarding the activities of the Soviet Union in the field of intelligence gathering and dissemination.

A detailed description of the Soviet Union's intelligence activities is provided in the "Detailed Information" section. This section is divided into two main parts. The first part, titled "Intelligence Gathering", describes the methods used by the Soviet Union to gather intelligence. The second part, titled "Intelligence Dissemination", describes the methods used by the Soviet Union to disseminate intelligence.

The "Intelligence Gathering" section describes the methods used by the Soviet Union to gather intelligence. These methods include the use of spies, agents, and other personnel to collect information. The "Intelligence Dissemination" section describes the methods used by the Soviet Union to disseminate intelligence. These methods include the use of radio, television, and other means of communication.

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O N T A R I O

LARCH SAWFLY INFESTATION 1954

Table 1.--Estimated acreage of tamarack by defoliation categories,
northern Minnesota, 1954

County	Total area of tamarack	Defoliation					
		None		Partial		Complete	
	Acres	Acres	Percent	Acres	Percent	Acres	Percent
Beltrami	64,436	3,866	6	50,260	78	10,310	16
Cass	39,056	13,670	35	22,652	58	2,734	7
Cook	<u>1/</u> 518	0	0	456	88	62	12
Hubbard	3,865	1,198	31	2,551	66	116	3
Itasca	38,649	1,159	3	32,852	85	4,638	12
Koochiching	<u>1/</u> 92,180	10,140	11	64,526	70	17,514	19
Lake	<u>1/</u> 2,405	96	4	2,020	84	289	12
Lake of the Woods	37,556	376	1	25,538	68	11,642	31
St. Louis	77,792	7,001	9	58,344	75	12,447	16
Total	356,457	37,506	11	259,199	73	59,752	16

1/ The preliminary figures on total tamarack area used in the report on "Larch Sawfly Conditions in the Lake States in 1953," Misc. Report 25, have been revised as above.

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Table 100.01

Table 100.01						
Line Item	Description	Quantity	Unit	Price	Total	Notes
1	Item 1	100	Yd	1.00	100.00	
2	Item 2	200	Yd	2.00	400.00	
3	Item 3	300	Yd	3.00	900.00	
4	Item 4	400	Yd	4.00	1,600.00	
5	Item 5	500	Yd	5.00	2,500.00	
6	Item 6	600	Yd	6.00	3,600.00	
7	Item 7	700	Yd	7.00	4,900.00	
8	Item 8	800	Yd	8.00	6,400.00	
9	Item 9	900	Yd	9.00	8,100.00	
10	Item 10	1,000	Yd	10.00	10,000.00	
11	Item 11	1,100	Yd	11.00	12,100.00	
12	Item 12	1,200	Yd	12.00	14,400.00	
13	Item 13	1,300	Yd	13.00	16,900.00	
14	Item 14	1,400	Yd	14.00	19,600.00	
15	Item 15	1,500	Yd	15.00	22,500.00	
16	Item 16	1,600	Yd	16.00	25,600.00	
17	Item 17	1,700	Yd	17.00	28,900.00	
18	Item 18	1,800	Yd	18.00	32,400.00	
19	Item 19	1,900	Yd	19.00	36,100.00	
20	Item 20	2,000	Yd	20.00	40,000.00	
21	Item 21	2,100	Yd	21.00	44,100.00	
22	Item 22	2,200	Yd	22.00	48,400.00	
23	Item 23	2,300	Yd	23.00	52,900.00	
24	Item 24	2,400	Yd	24.00	57,600.00	
25	Item 25	2,500	Yd	25.00	62,500.00	
26	Item 26	2,600	Yd	26.00	67,600.00	
27	Item 27	2,700	Yd	27.00	72,900.00	
28	Item 28	2,800	Yd	28.00	78,400.00	
29	Item 29	2,900	Yd	29.00	84,100.00	
30	Item 30	3,000	Yd	30.00	90,000.00	
31	Item 31	3,100	Yd	31.00	96,100.00	
32	Item 32	3,200	Yd	32.00	102,400.00	
33	Item 33	3,300	Yd	33.00	108,900.00	
34	Item 34	3,400	Yd	34.00	115,600.00	
35	Item 35	3,500	Yd	35.00	122,500.00	
36	Item 36	3,600	Yd	36.00	129,600.00	
37	Item 37	3,700	Yd	37.00	136,900.00	
38	Item 38	3,800	Yd	38.00	144,400.00	
39	Item 39	3,900	Yd	39.00	152,100.00	
40	Item 40	4,000	Yd	40.00	160,000.00	
41	Item 41	4,100	Yd	41.00	168,100.00	
42	Item 42	4,200	Yd	42.00	176,400.00	
43	Item 43	4,300	Yd	43.00	184,900.00	
44	Item 44	4,400	Yd	44.00	193,600.00	
45	Item 45	4,500	Yd	45.00	202,500.00	
46	Item 46	4,600	Yd	46.00	211,600.00	
47	Item 47	4,700	Yd	47.00	220,900.00	
48	Item 48	4,800	Yd	48.00	230,400.00	
49	Item 49	4,900	Yd	49.00	240,100.00	
50	Item 50	5,000	Yd	50.00	250,000.00	
51	Item 51	5,100	Yd	51.00	260,100.00	
52	Item 52	5,200	Yd	52.00	270,400.00	
53	Item 53	5,300	Yd	53.00	280,900.00	
54	Item 54	5,400	Yd	54.00	291,600.00	
55	Item 55	5,500	Yd	55.00	302,500.00	
56	Item 56	5,600	Yd	56.00	313,600.00	
57	Item 57	5,700	Yd	57.00	324,900.00	
58	Item 58	5,800	Yd	58.00	336,400.00	
59	Item 59	5,900	Yd	59.00	348,100.00	
60	Item 60	6,000	Yd	60.00	360,000.00	
61	Item 61	6,100	Yd	61.00	372,100.00	
62	Item 62	6,200	Yd	62.00	384,400.00	
63	Item 63	6,300	Yd	63.00	396,900.00	
64	Item 64	6,400	Yd	64.00	409,600.00	
65	Item 65	6,500	Yd	65.00	422,500.00	
66	Item 66	6,600	Yd	66.00	435,600.00	
67	Item 67	6,700	Yd	67.00	448,900.00	
68	Item 68	6,800	Yd	68.00	462,400.00	
69	Item 69	6,900	Yd	69.00	476,100.00	
70	Item 70	7,000	Yd	70.00	490,000.00	
71	Item 71	7,100	Yd	71.00	504,100.00	
72	Item 72	7,200	Yd	72.00	518,400.00	
73	Item 73	7,300	Yd	73.00	532,900.00	
74	Item 74	7,400	Yd	74.00	547,600.00	
75	Item 75	7,500	Yd	75.00	562,500.00	
76	Item 76	7,600	Yd	76.00	577,600.00	
77	Item 77	7,700	Yd	77.00	592,900.00	
78	Item 78	7,800	Yd	78.00	608,400.00	
79	Item 79	7,900	Yd	79.00	624,100.00	
80	Item 80	8,000	Yd	80.00	640,000.00	
81	Item 81	8,100	Yd	81.00	656,100.00	
82	Item 82	8,200	Yd	82.00	672,400.00	
83	Item 83	8,300	Yd	83.00	688,900.00	
84	Item 84	8,400	Yd	84.00	705,600.00	
85	Item 85	8,500	Yd	85.00	722,500.00	
86	Item 86	8,600	Yd	86.00	739,600.00	
87	Item 87	8,700	Yd	87.00	756,900.00	
88	Item 88	8,800	Yd	88.00	774,400.00	
89	Item 89	8,900	Yd	89.00	792,100.00	
90	Item 90	9,000	Yd	90.00	810,000.00	
91	Item 91	9,100	Yd	91.00	828,100.00	
92	Item 92	9,200	Yd	92.00	846,400.00	
93	Item 93	9,300	Yd	93.00	864,900.00	
94	Item 94	9,400	Yd	94.00	883,600.00	
95	Item 95	9,500	Yd	95.00	902,500.00	
96	Item 96	9,600	Yd	96.00	921,600.00	
97	Item 97	9,700	Yd	97.00	940,900.00	
98	Item 98	9,800	Yd	98.00	960,400.00	
99	Item 99	9,900	Yd	99.00	980,100.00	
100	Item 100	10,000	Yd	100.00	1,000,000.00	

Only general comparisons can be drawn with previous aerial surveys, as the survey methods were somewhat different. By contrasting the 1954 map with that of the 1953^{3/} survey, however, it is apparent that the acreage of complete defoliation has declined greatly. The present areas of complete defoliation occur northwest and northeast of Red Lake, in central and south-east St. Louis County, and in southwest Lake County, whereas in 1953, most of the northern half of the surveyed area suffered complete defoliation. The sawfly population in the more southern areas that were not defoliated to any great extent previously increased in 1954, thus increasing the area of partial defoliation discernible from the air. Cass County suffered 53 percent partial defoliation in 1954 as compared with 15 percent in 1953, and Hubbard County, 66 percent in 1954 versus only 21 percent in 1953. Aitkin and Carlton Counties (not included in the table because they were not completely covered by flight lines) show an increase in defoliation. It is believed that these more southern areas may suffer complete defoliation in the next few years.

The total cost of the 1954 aerial survey was \$1,006.46 or approximately \$0.07 for each one thousand acres of total land area. This is about \$0.01 lower per one thousand acres than the 1953 survey. A comparison of the breakdown of cost follows:

	<u>1953</u>	<u>1954</u>
Salaries	\$ 600.00	\$ 602.00
Per diem	429.61	229.50
Plane maintenance	<u>166.40</u>	<u>174.96</u>
Total	\$1,196.01	\$1,006.46

It is apparent that the main difference occurred in the per diem expenditure. The reason is that the 1954 survey was finished in about one-half the time needed in 1953 because of the extremely good flying weather.

^{3/} Beckwith, L. C. Larch sawfly conditions in the Lake States in 1953, a reconnaissance survey. Misc. Rept. No. 25, Lake States Forest Experiment Station. Processed. Jan. 1954.

Recommendations

The aerial survey should be continued for 1 or 2 more years. This would serve two purposes: the establishment of broad population trends over at least a 5-year period, and a determination of whether areas that had suffered complete defoliation for a period of years and then only a partial defoliation for another period would again undergo complete defoliation. Ground surveys should be made in conjunction with the aerial survey to check these trends. Although suggested for elimination from the 1954 survey, Lake and Cook Counties were surveyed because the acreage involved added little to the time and expense of the survey. These counties should be included in future surveys.

The high-wing monoplane, used in 1954, has a spacious cabin which afforded excellent visibility for the observers; it has a powerful engine, which is an important safety factor in low-altitude flying and also permits a time-saving factor in ferrying from the airfield to the survey area. The county maps were used instead of the aeronautical charts because the greater detail makes them more adaptable for use with the operation recorder. The use of this instrument for recording data from a 20-chain strip is more accurate than hand-mapping a 2-mile strip as was done in 1953. It would be advisable to use the yellow plexiglas face filters, developed at the Beltsville field station, for aerial observation. They produce better contrast of ground colors and would be a distinct aid in distinguishing nondefoliated tamarack from jack pine.

GROUND RECONNAISSANCE

Method

The ground reconnaissance in 1954 followed the same pattern as previous ones in that observation points in scattered roadside areas in northern Minnesota, Wisconsin, and Michigan were examined. Defoliation estimates to the nearest 5 percent were made on ten marked sample trees and the average defoliation was computed for the area.

As in 1953, cocoons were collected at each observation point in Minnesota during both May and August. A 6-minute collection was made under each of the 10 sample trees, allowing 1 hour per observation point. The spring collection for each area was compared with the one made the previous summer to obtain the aggregate prepupal mortality. All the cocoons collected in August are presently being held at a constant temperature and humidity at the Department of Entomology, University of Minnesota. These cocoons will be dissected during February to determine the relation of the parasite and disease complex to future populations.

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1. The first group is the "old" group, which is the group that has been in the country for a long time. This group is the most established and the most integrated into the society. They are the ones who have built the country and who have made it what it is today. They are the ones who have the most experience and the most knowledge of the country. They are the ones who are the most respected and the most valued. They are the ones who are the most influential. They are the ones who are the most powerful. They are the ones who are the most important. They are the ones who are the most successful. They are the ones who are the most happy. They are the ones who are the most content. They are the ones who are the most satisfied. They are the ones who are the most proud. They are the ones who are the most confident. They are the ones who are the most secure. They are the ones who are the most stable. They are the ones who are the most reliable. They are the ones who are the most trustworthy. They are the ones who are the most honest. They are the ones who are the most sincere. They are the ones who are the most genuine. They are the ones who are the most authentic. They are the ones who are the most real. They are the ones who are the most true. They are the ones who are the most just. They are the ones who are the most fair. They are the ones who are the most equitable. They are the ones who are the most balanced. They are the ones who are the most harmonious. They are the ones who are the most peaceful. They are the ones who are the most calm. They are the ones who are the most serene. They are the ones who are the most tranquil. They are the ones who are the most quiet. They are the ones who are the most still. They are the ones who are the most motionless. They are the ones who are the most immobile. They are the ones who are the most stationary. They are the ones who are the most fixed. They are the ones who are the most permanent. They are the ones who are the most enduring. They are the ones who are the most lasting. They are the ones who are the most permanent. They are the ones who are the most enduring. They are the ones who are the most lasting.

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The above information was obtained from a confidential source who has provided reliable information in the past.

...the ... were collected at each observation ...
... 1/2-minute collection ...
... 1-hour ...
... was compared with the ...
... (...) ...
... as a ...
... University of Minnesota ...
... to determine the ...
... .

Results

The results of the ground reconnaissance agreed very well with those of the aerial survey (table 2). Defoliation for all the plots in Minnesota ranged from 20 to 95 percent with an average of 61 percent. When this is compared with the 71 and 84 percent that occurred in 1952 and 1953 respectively, a definite decrease in the overall defoliation is apparent. In general, the older areas of heavy defoliation show a decrease over previous years. For example, Cook County stands, which suffered heavily for the first time in 1953, had approximately the same degree of defoliation in 1954, whereas the adjacent counties of Lake and St. Louis combined, with averages of 87 and 94 percent in 1952 and 1953 respectively, showed only 56 percent in 1954. The north central part of the State averaged 54 percent, as compared with 80 percent in 1953. This is the first year since 1951, when most of the observation areas were established, that a decrease in average defoliation has occurred.

As shown by the aerial survey, the area of defoliation is increasing to the south. Ground observation points will be established in some of these areas, especially in Pine and Carlton Counties. By maintaining an increased ground observation system the population trends of the infestation can be closely followed.

Defoliation has increased in Wisconsin, but it is light in comparison with Minnesota when the state as a whole is considered. Of the four original observation points, two were dropped because they were considered inadequate for the purpose of the survey. The other two showed defoliation averaging less than 5 percent. A new observation point was established in Ashland County where defoliation averaged 50 percent, with a range of "trace" to 95 percent. In this stand, an average of 35 cocoons was collected with a range of 3 to 59. State surveys show that the heaviest defoliation occurred in Sawyer, Washburn, Douglas and Bayfield Counties. Defoliation was not uniform, in that some stands in an area were completely defoliated while others were only lightly defoliated. Plans are in preparation in cooperation with the Wisconsin Conservation Department to establish a series of observation points throughout the area north of State Highway 64 in order to follow the progress of the infestation.

In Michigan, sawfly populations have increased but defoliation was generally light. There was an increase in reports of the presence of this insect; apparently it can be found throughout the tamarack type. As in Wisconsin, the number of permanently marked observation points should be increased to follow the infestation trend. These points should be established in both the Upper Peninsula and the northern half of the Lower Peninsula, and should be maintained in cooperation with the Michigan Conservation Department.

Table 2.--Larch sawfly ground reconnaissance defoliation estimates^{1/}

Sampling area	State	County	Township	Range	Section	Percent defoliation ^{2/}			No. cocoons in a man-hour
						1952	1953	1954	
1	Minnesota	Roseau	163N	37W	21	10	--	--	--
1a	"	Lake of the Woods	161N	34W	35	--	70	50	38
2	"	"	159N	31W	12	95	90	65	93
3	"	Beltrami	154N	30W	9	100	--	--	--
3a	"	Koochiching	154N	25W	20	--	65	40	42
3b	"	"	157N	25W	25	--	70	35	65
4	"	Beltrami	149N	31W	29	85	80	45	188
5	"	Itasca	148N	28W	18	30	100	55	90
6	"	Cass	141N	30W	3	25	50	50	216
7	"	"	142N	28W	14	65	90	65	155
8	"	Itasca	145N	25W	13	100	95	80	262
9	"	"	147N	25W	1	100	90	60	63
10	"	St. Louis	65N	19W	29	40	95	20	33
11	"	"	62N	18W	6	80	100	65	93
12	"	"	60N	17W	22	100	95	75	123
13	"	"	59N	15W	22-23	95	95	65	45
14	"	"	60N	15W	12	95	100	95	30
15	"	"	62N	12W	8-17	70	90	60	69
16	"	Lake	55N	11W	18	100	75	60	165
17	"	"	58N	10W	32	85	95	55	69
18	"	"	60N	10W	27	100	95	65	111
19	"	"	59N	8W	27	100	100	80	48
20	"	"	59N	6W	2	90	95	85	116
21	"	Cook	62N	4W	7	40	75	70	175
22	"	"	65N	4W	24	5	55	30	44
23	"	"	63N	1E	34	25	65	70	111
23a	"	"	64N	1E	19	--	--	80	99
Average						71	84	61	102

^{1/} Data are given for Minnesota only. Observations in Wisconsin and Michigan were omitted because in general the plots were not considered satisfactory or were not permanently marked.

^{2/} Dashes (--) indicate no defoliation estimates were made as the observation points were either dropped from the survey or had not been established at that time.

No correlation was found between the number of cocoons collected and the defoliation. If a correlation actually exists, it is very difficult to establish because the ease of collection varies tremendously with existing ground conditions. These will differ even between trees within a stand as well as between stands.

Examinations for tree mortality caused by the eastern larch beetle, Dendroctonus simplex Lec., were made on the one-tenth acre plots set up within the permanent sampling areas, but none was found. These plots will be maintained to follow tree decadence over a period of years.