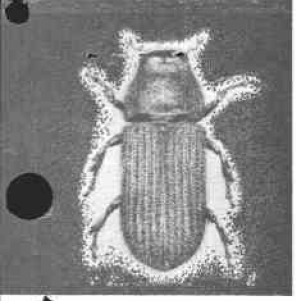
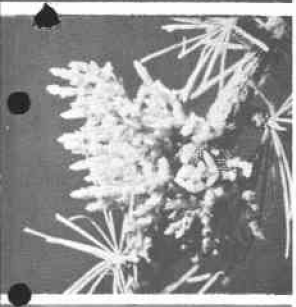
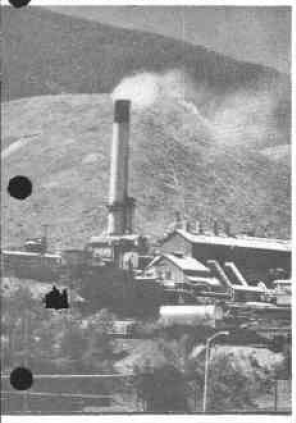


FOREST ENVIRONMENTAL PROTECTION

USDA • FOREST SERVICE • NORTHERN REGION
State & Private Forestry • Missoula, MT 59801

Report No. 75-9

5200
April 1975

IMPACT OF EGG VIABILITY, EGG PARASITISM, AND VIRUS ON 1975 DOUGLAS-FIR TUSSOCK MOTH DEFOLIATION POTENTIAL IN THE LOWER FLATHEAD VALLEY, MONTANA

by

Scott Tunnock

ABSTRACT

Evaluation of Douglas-fir tussock moth, *Orgyia pseudotsugata*, egg masses collected from an outbreak area in the lower Flathead Valley indicated that overall egg viability was relatively high, egg parasitism was low, and virus infestation averaged 7.1 percent northwest of Polson, 17.9 percent south of St. Ignatius, and 57.0 percent west of Ravalli. In the three areas, a total of 2,240 acres may be visibly defoliated in 1975, and light defoliation may be scattered over an additional 5,600 acres. The outbreak is expected to decline due to natural causes by the end of 1975.

INTRODUCTION

Defoliation by Douglas-fir tussock moth, *Orgyia pseudotsugata* McD., was detected in the lower Flathead Valley northwest of Polson, south of St. Ignatius, and west of Ravalli during 1974. An egg mass density survey was made in September to determine potential defoliation in 1975. From these data, it was predicted significant defoliation may occur on 2,880 acres of Douglas-fir, *Pseudotsuga menziesii* (Mirb.) Franco (Tunnock, et. al. 1974). As part of this survey, new egg masses were collected to assess effects of egg viability, egg parasitism, and virus infection on defoliation potential.

METHODS

When present, five new egg masses were collected from each sample plot and stored in a cooler at 35°F. until the end of January 1975. At this time, each egg mass was placed in a Petri dish and incubated at 78°F. and 30 percent relative humidity until egg hatch--usually 14 days. From 25 to 30 larvae per egg mass were then placed in a Petri dish containing artificial media and incubator-reared for 14 days at which time each dish was examined for dead larvae. Each dead larva was smeared on a slide and examined under a compound microscope for presence of virus polyhedra. Percentage of larvae killed by virus was computed for each plot. Original dishes with the remaining larvae and parasites were set aside so counts of nonviable eggs, total eggs per mass, and total parasites could be made.

A partial life table (Table 1) was prepared from the above data to determine estimated larvae (viable eggs) per 1,000 square inches of foliage on each plot. The virus level and estimated larval density per 1,000 square inches of foliage were used in a key (Tunnock and Livingston, 1974) which established if an area qualified for treatment (high risk).

RESULTS

Sample plots northwest of Polson (Figure 1) contained very little egg parasitism (0 to 1.1 percent). Two species of egg parasites emerged and were sent to the U.S. National Museum for identification. Nonviable eggs ranged from 0.9 to 38.1 percent and virused larvae ranged from 0 to 35.4 percent (Table 1). Average virus infection for this area was 7.1 percent. Twelve of 41 quarter-section plots (Figure 1) were rated "high risk" (less than 30 percent virus or over 20 larvae per 1,000 square inches of foliage) (Table 1). This means that significant defoliation may occur on 1,920 acres in 1975 and light defoliation may be scattered over an additional 4,640 acres.

South of St. Ignatius only five quarter-sections contained new egg masses (Figure 2). Two were rated "high risk" (320 acres). Nonviable eggs ranged from 7.6 to 17.9 percent. Egg parasitism was very low, the highest being 0.9 percent. Virus infected larvae ranged from 0 to 38.7 percent and averaged 17.9 percent (Table 1).

West of Ravalli three quarter-sections contained new egg masses (Figure 2). Very little defoliation is predicted for this area in 1975 because of high virus levels which ranged from 53.3 to 61.7 percent and averaged 57.0 percent (Table 1).

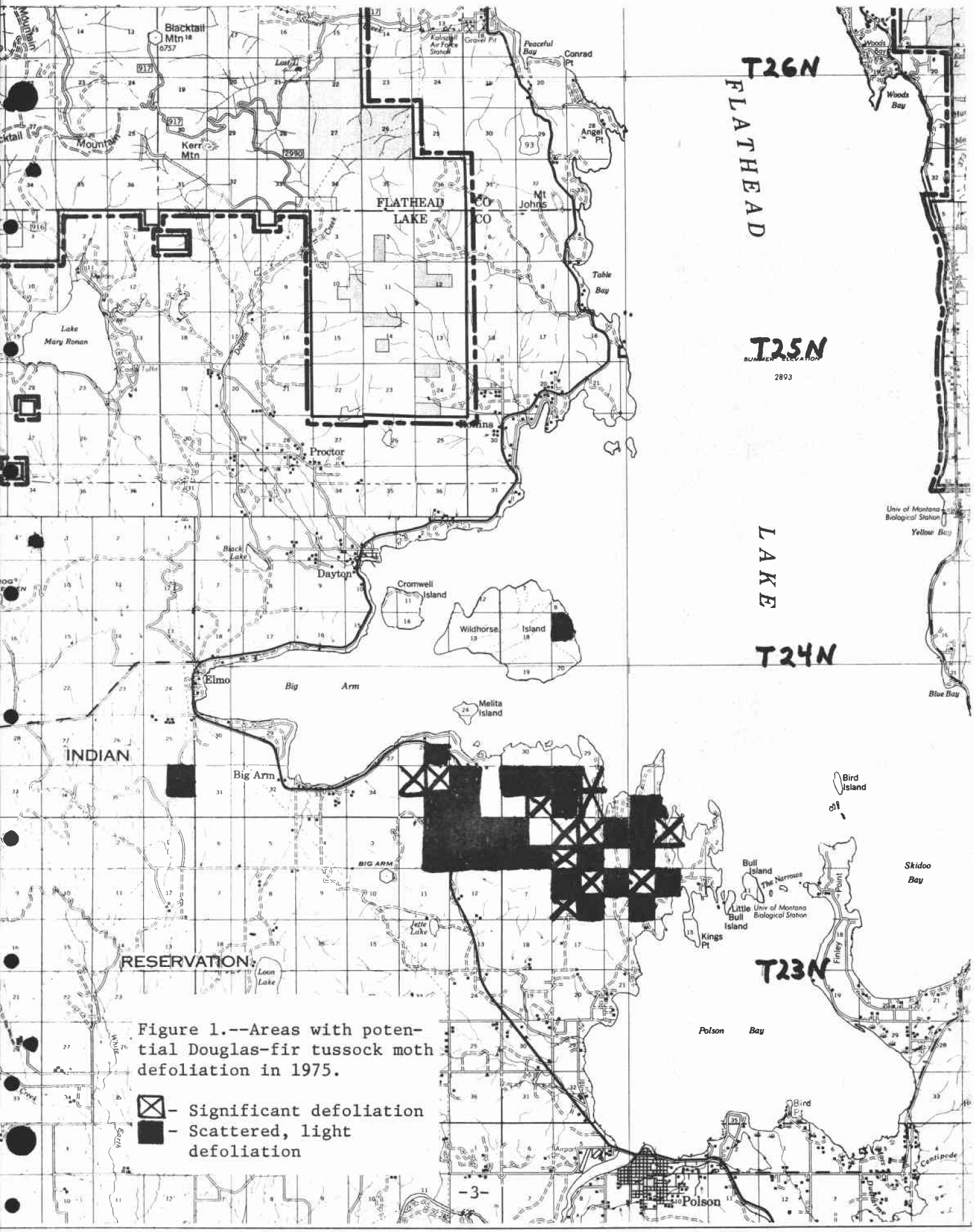

Figure 1.--Areas with potential Douglas-fir tussock moth defoliation in 1975.

- Significant defoliation
- Scattered, light defoliation

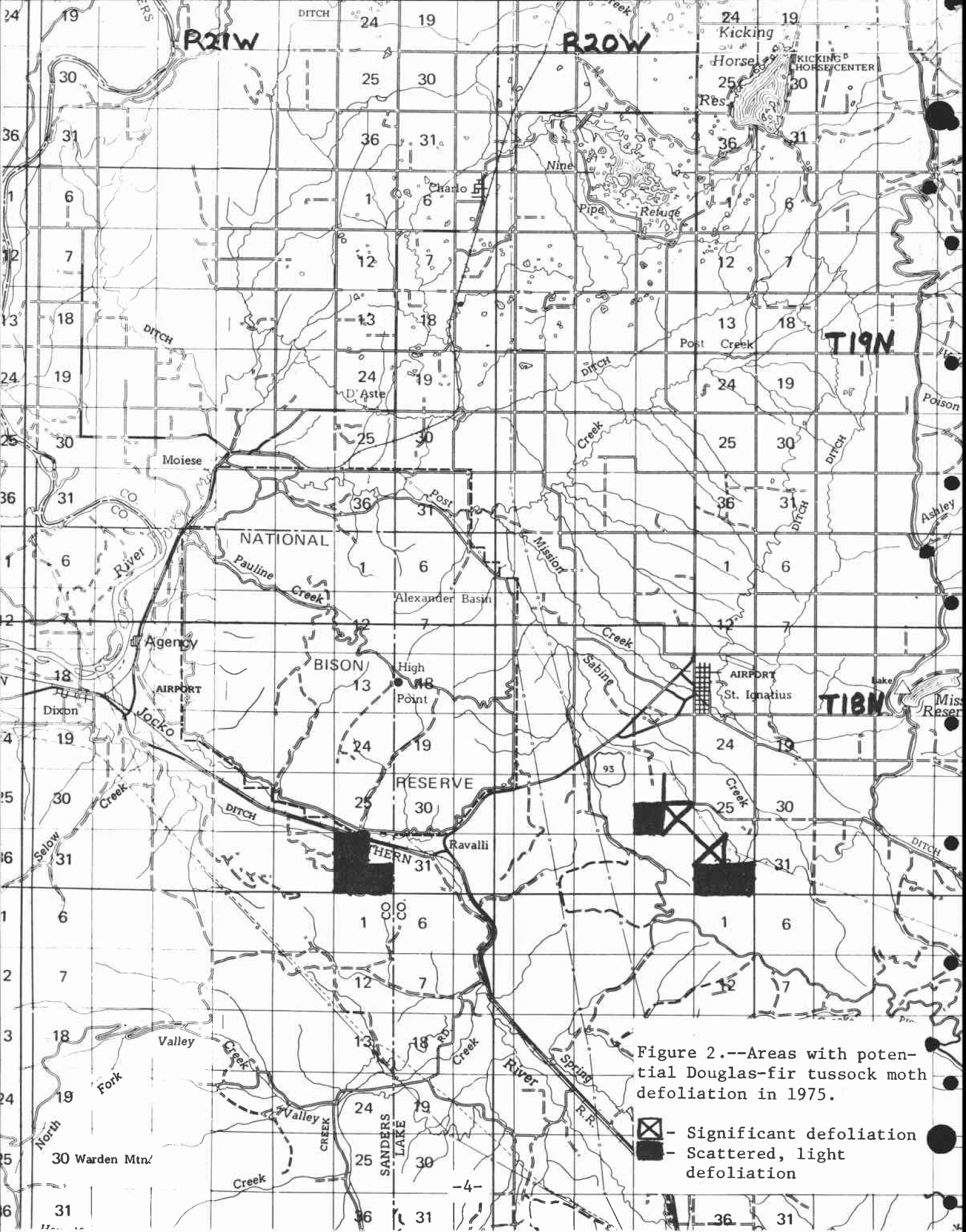

Figure 2.--Areas with potential Douglas-fir tussock moth defoliation in 1975.

- Significant defoliation
- Scattered, light defoliation

Table 1.--Data from Douglas-fir tussock moth egg masses collected from lower Flathead Valley and hatched in the laboratory during winter 1975.

(1) Plot location			(2) New egg masses/ 1000 sq. inches foliage	(3) Mean number eggs/ mass	(4) (2X3) Eggs/ 1000 sq. inches	(5) Percent non-viable eggs	(6) Percent egg para-sitism	(7) Est. larval density/ 1000 sq. inches at egg hatch	(8) Percent virus	(9) Estimated larvae/ 1000 sq. in. after virus	(10) Risk* (high or low)
T.	R.	Sec									
						NORTH OF POLSON					
23N	20W	3NW	0.28	183.6	51.4	6.7	0	48.0	0.6	47.7	HIGH
		4NW	.05	167.5	8.4	14.6	0	7.2	11.7	6.4	LOW
		4NE	.06	122.0	7.3	11.2	0	6.5	1.1	6.4	LOW
		4SE	.54	129.8	70.1	7.4	0	64.9	31.3	44.6	LOW
		5NW	.15	180.8	27.1	6.1	0	25.5	8.7	23.3	HIGH
		5NE	.17	170.0	28.9	13.0	0.2	25.1	5.3	22.8	HIGH
		5SE	.03	132.3	3.9	14.9	0	3.3	1.1	3.3	LOW
		5SW	.19	150.7	28.6	4.1	0	27.4	3.3	26.5	HIGH
		6NW	.03	155.0	4.6	1.3	0	4.5	3.3	4.4	LOW
		6SE	.01	--	--	--	--	--	0	--	LOW
		6SW	.07	226.3	15.8	8.4	0	14.5	0	14.5	LOW
		8NW	.01	150.0	1.5	5.3	0	1.4	19.2	1.1	LOW
		8NE	.24	131.4	31.5	4.1	0	30.2	9.3	27.4	HIGH
		8SE	.15	120.7	18.1	6.1	0	17.0	35.4	11.0	LOW
		8SW	.17	141.6	24.1	6.8	0	22.5	1.3	22.2	HIGH
		9NW	.04	157.0	6.3	4.0	0	6.1	2.5	6.0	LOW
		9NE	.36	149.8	53.9	11.3	1.1	47.3	.6	47.0	HIGH
		9SE	.07	142.0	9.9	11.0	0	8.8	3.3	8.5	LOW
		10NW	.05	118.0	5.9	13.5	0	5.1	13.3	4.4	LOW
23N	21W	1NW	.11	149.6	16.4	.9	0	16.3	14.0	14.0	LOW
		1NE	.01	153.7	1.5	5.7	.8	1.4	.8	1.4	LOW
		1SE	.01	150.0	1.5	2.0	0	1.5	3.3	1.5	LOW
		1SW	.06	192.0	11.5	13.1	0	10.0	.6	9.9	LOW
		2NE	.02	98.0	1.9	22.4	0	1.5	0	1.5	LOW
		2SE	.06	112.0	6.7	38.1	0	4.2	2.2	4.1	LOW
24N	20W	17NW	.07	121.6	8.5	10.7	0	7.6	1.6	7.5	LOW
		31NW	.08	199.0	15.9	6.0	0	15.0	1.3	14.8	LOW
		31NE	.15	163.4	24.5	20.3	0	19.6	2.4	19.1	LOW
		31SE	.23	155.0	35.6	7.2	0	33.0	15.5	29.9	HIGH

*Risk of defoliation is "high" on plot if estimated larval density exceeds 20 larvae per 1,000 sq. in. of foliage or if virus levels are less than 30 percent in class III or IV areas or less than 50 percent in class I or II areas.

Table 1.--Data from Douglas-fir tussock moth egg masses collected from lower Flathead Valley and hatched in the laboratory during winter 1975. (Cont'd)

(1) Plot location			(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
T.	R.	Sec	New egg masses 1000 sq. inches foliage	Mean number eggs/ mass	(2X3) Eggs/ 1000 sq. inches	Percent non-viable eggs	Percent egg para-sitism	Est. larval density/ 1000 sq. inches at egg hatch	Percent virus	Estimated larvae/ 1000 sq. in. after virus	Risk* (high or low)
		32NW	.04	179.5	7.2	5.9	0	6.8	10.0	6.1	LOW
		32NE & SE	.17	157.6	26.8	7.4	0	24.9	7.8	23.0	HIGH
		32SW	.08	158.7	12.7	9.1	0	11.6	14.7	9.9	LOW
		33SE	.05	116.7	5.8	12.6	.6	5.1	4.8	4.9	LOW
24N	21W	26SE	.04	187.0	7.4	6.1	0	7.0	3.3	6.8	LOW
		35NW	.12	172.4	20.7	2.3	0	20.2	.7	20.1	HIGH
		35NE	.69	153.4	105.8	9.6	.6	95.7	1.5	94.3	HIGH
		1/35SE	.02	--	--	--	--	--	--	--	LOW
		36NW & SW	.03	--	--	--	--	--	--	--	LOW
24N	22W	36NE	2/--	133.0	--	13.5	0	--	20.0	--	LOW
						SOUTH OF ST. IGNATIUS					
18N	20W	26SE	.68	163.0	110.8	15.9	0	93.2	2.9	90.5	HIGH
		26SW	.01	130.1	1.3	5.9	0	1.2	38.7	.7	LOW
		36NW	.52	109.8	57.1	7.6	0	52.8	2.0	51.7	HIGH
		36SE	.05	223.0	11.1	17.9	0	9.2	0	9.2	LOW
		36SW	.08	131.7	10.5	11.6	.9	9.2	38.3	5.7	LOW
						WEST OF RAVALLI					
18N	21W	36NW	.52	117.2	60.9	31.7	0	41.6	53.3	19.4	LOW
		36SE	.02	95.7	1.9	22.4	.8	1.5	61.7	.6	LOW
		36SW	.09	--	--	--	--	--	--	--	LOW

1/ Single egg mass collected which did not hatch.

2/ Formal plot was not sampled, but one new egg mass was found in area.

DISCUSSION AND CONCLUSIONS

It is predicted that natural mortality factors will decimate tussock moth populations in the lower Flathead Valley during 1975. Five one-quarter sections (T. 23 N., R. 20 W., Sec. 3 NW; T. 23 N., R. 20 W., Sec. 9 NE; T. 24 N., R. 21 W., Sec. 35 NE; T. 18 N., R. 20 W., Sec. 26 SE; and T. 18 N., R. 20 W., Sec. 36 NW) contain enough larval populations and low enough virus levels to cause potential heavy defoliation in 1975 before declining. These areas will be reexamined prior to egg hatch to define infestation perimeters, obtain additional data on levels of naturally occurring virus, and evaluate their use as sites for a pilot control project of virus against the tussock moth.

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