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Frequency of Forest Spraying in New Brunswick

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Frequency of Forest Spraying in New Brunswick.—

In forest spraying against the spruce budworm (*Choristoneura fumiferana* [Clem.]), the insecticides used in recent years are not regarded as persistent from year to year. However, McNeil and McLeod (pp. 203–215 in Proc. Symp. Fenitrothion NRCC 16078, 1977) found bioassay evidence that fenitrothion or a toxic derivative was still present in jack pine foliage more than 1 yr later. Whether or not insecticide residues persist from 1 yr to the next, environmental perturbations may. Courtemanch and Gibbs (Can. Entomol. 112:271–276, 1980) found, for example, that streams in areas of Maine sprayed operationally with carbaryl had lower populations of stoneflies (*Plecoptera*) 1 yr after treatment than did streams in untreated areas.

It is important to know the history of recent spraying and the chances of respraying. Persistence of pesticide residues and persistence of pesticide effects are our reasons for addressing the question of respray frequency.

To this end, we searched spray records of spruce budworm egg-mass sampling stations, of which there were as many as 1196 in New Brunswick (Table 1). The information is a computer file of data collected under direction of the Maritimes Forest Research Centre with resources provided increasingly over the years by Forest Protection Ltd. We searched the data that were complete for the years 1952–1978. For each year (Y1) we determined the proportion of sprayed sampling stations first resprayed the following year (Y2), 2 yr later (Y3), and 3 yr later (Y4) (Table 2). We also determined the proportions first resprayed in any one of the next 3 yr (Y2, Y3, or Y4) and those sprayed in both of the next 2 yr (Y2 and Y3) (Table 2). The last data available were for 1978, thus there are missing respray data for 1976 and later. We assumed that 1200 stations would uniformly represent the forest area, that fewer stations meant that areas known to harbor negligible populations were not sampled in those years, and that stations were fixed from year to year. The last two assumptions were least sound in

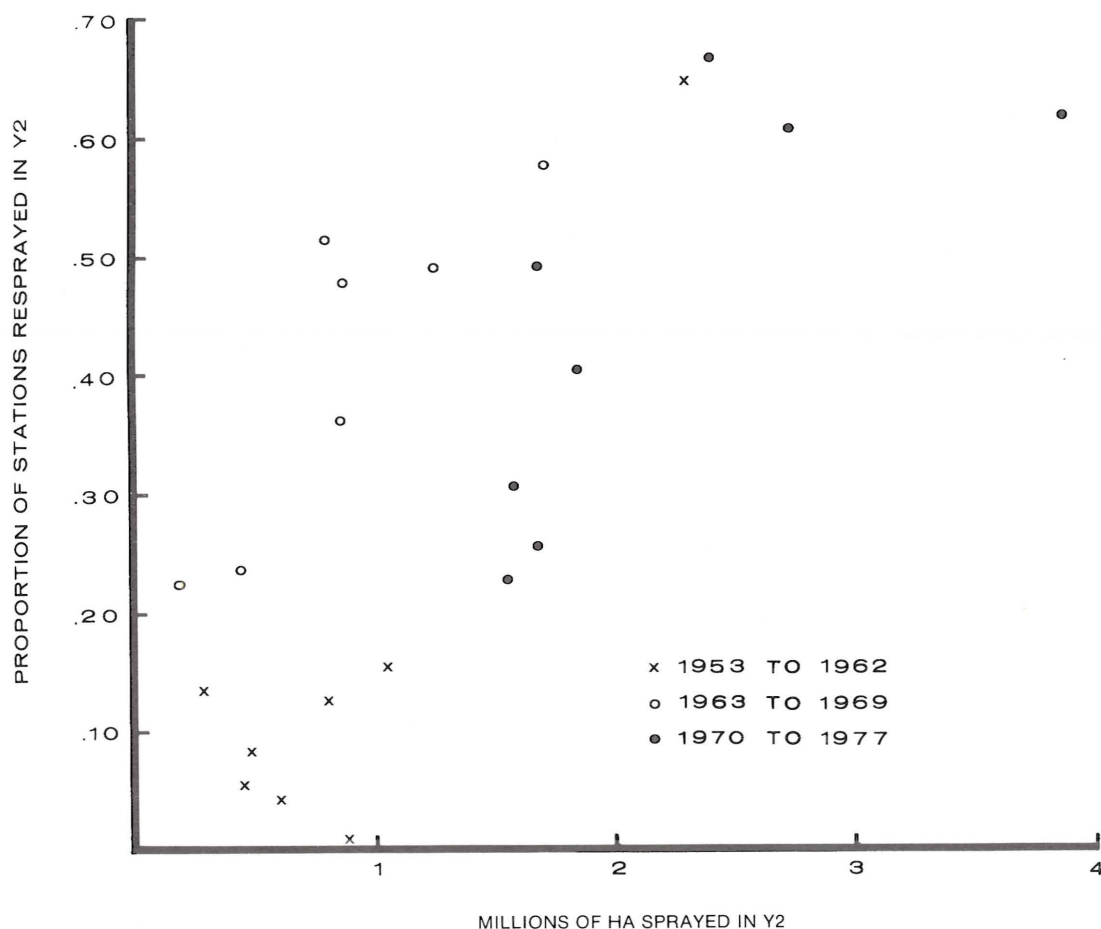


Figure 1. Proportion of stations sprayed (in Y1) and resprayed the following year (Y2) as a function of area sprayed in Y2.

the earlier years. Relocation of sampling stations, more frequent in the earlier years, biases respray data downward.

In 1975, the most recent year for which complete respray information is available, 511 egg-mass sampling stations were sprayed, 61.1% of these were first resprayed in 1976 (i.e., sprayed 2 or more successive yr), 5.1% were first resprayed in 1977, 4.7% were first resprayed in 1978, 70.8% were first resprayed in 1976, 1977, or 1978, and 14.3% were resprayed in both 1976 and 1977 (i.e., sprayed 3 or more successive yr). A higher incidence of respray

TABLE 1

Numbers of spruce budworm egg-mass sampling stations in New Brunswick (higher numbers in some reports include Forest Insect and Disease Survey collections, not part of the sampling scheme)

Yr	Stations	Yr	Stations	Yr	Stations
1952	97	1961	1002	1970	1117
1953	332	1962	884	1971	1038
1954	402	1963	956	1972	1024
1955	313	1964	987	1973	1008
1956	292	1965	1029	1974	996
1957	622	1966	1114	1975	1068
1958	643	1967	1043	1976	1059
1959	755	1968	1149	1977	1111
1960	966	1969	1015	1978	1196

TABLE 2

Proportion (%) of spruce budworm egg-mass sampling stations sprayed and resprayed in successive years

Yr (Y1)	Stations sprayed	First resprayed				Resprayed next 2 yr (Y2 + Y3)
		Y2	Y3	Y4	Y2 or Y3 or Y4	
1952	75	0	0	0	0	0
1953	145	8.3	9.0	17.2	34.5	1.4
1954	56	5.4	7.1	30.4	42.9	0
1955	55	12.7	38.2	27.3	78.2	3.6
1956	114	64.9	5.3	0	70.2	4.4
1957	207	15.5	0	3.9	19.3	0
1958	145	0	12.4	28.3	40.7	0
1959	0	0	0	0	0	0
1960	125	0.8	4.0	10.4	15.2	0
1961	242	4.1	15.3	24.0	43.4	1.2
1962	174	13.8	28.2	6.9	48.9	9.2
1963	117	51.3	11.1	7.7	70.1	28.2
1964	328	47.9	16.2	4.6	68.6	18.9
1965	328	36.3	15.9	3.7	55.8	12.5
1966	281	23.8	2.8	30.2	56.9	6.0
1967	198	22.2	33.8	4.0	60.1	14.1
1968	100	49.0	7.0	1.0	57.0	46.0
1969	387	57.9	20.9	0.8	79.6	43.4
1970	411	66.9	5.6	1.7	74.2	29.4
1971	547	40.2	18.3	6.9	65.4	18.5
1972	318	49.1	13.5	18.2	80.8	13.5
1973	359	30.4	36.5	12.8	79.7	21.7
1974	291	60.8	21.0	1.0	82.8	42.6
1975	511	61.1	5.1	4.7	70.8	14.3
1976	610	25.6	13.1	—	—	5.4
1977	270	22.6	—	—	—	—
1978	242	—	—	—	—	—

TABLE 3

Proportion (%) of forested area of New Brunswick sprayed and resprayed in successive years based on spruce budworm egg-mass sampling stations

Yr (Y1)	Area sprayed in Y1 (%)	First resprayed				Resprayed next 2 yr (Y2 + Y3)
		Y2	Y3	Y4	Y2 or Y3 or Y4	
1952	1.2	0	0	0	0	0
1953	12.1	1.0	1.1	2.1	4.2	0.2
1954	7.6	0.4	0.5	2.3	3.3	0
1955	7.5	1.0	2.9	2.0	5.9	0.3
1956	13.2	8.5	0.7	0	9.2	0.6
1957	37.9	5.9	0	1.5	7.4	0
1958	17.3	0	2.1	4.9	7.0	0
1959	0	0	0	0	0	0
1960	19.5	0.2	0.8	2.0	3.0	0
1961	14.6	0.6	2.2	3.5	6.3	0.2
1962	9.8	1.3	2.8	0.7	4.8	0.9
1963	4.5	2.3	0.5	0.3	3.1	1.3
1964	13.2	6.3	2.1	0.6	9.1	2.5
1965	14.1	5.1	2.2	0.5	7.9	1.8
1966	13.9	3.3	0.4	4.2	7.9	0.8
1967	6.9	1.5	2.3	0.3	4.2	1.0
1968	3.2	1.6	0.2	0	1.8	1.5
1969	20.6	11.9	4.3	0.2	16.4	9.0
1970	28.3	18.9	1.6	0.5	21.0	8.3
1971	39.5	15.9	7.2	2.7	25.9	7.3
1972	30.5	14.9	4.1	5.6	24.6	4.1
1973	27.8	8.4	10.1	3.6	22.1	6.0
1974	26.1	15.9	5.5	0.3	21.6	11.1
1975	45.2	27.6	2.3	2.1	32.0	6.5
1976	63.9	16.4	8.3	—	—	3.5
1977	27.7	6.3	—	—	—	—
1978	25.6	—	—	—	—	—

TABLE 4

Area sprayed and proportion (%) of total forested area (6 070 400 ha) in New Brunswick

Yr	Area (ha / 1000)	Proportion (%)
1952	75	1.2
1953	733	12.1
1954	482	7.6
1955	455	7.5
1956	799	13.2
1957	2 303	37.9
1958	1 051	17.3
1959	0	0
1960	1 182	19.5
1961	886	14.6
1962	593	9.8
1963	271	4.5
1964	801	13.2
1965	858	14.1
1966	845	13.9
1967	419	6.9
1968	195	3.2
1969	1 252	20.6
1970	1 715	28.3
1971	2 400	39.5
1972	1 848	30.5
1973	1 687	27.8
1974	1 582	26.1
1975	2 745	45.2
1976	3 882	63.9
1977	1 683	27.7
1978	1 554	25.6
1979	1 601	26.4

after 1962 is probably related to location of infestation and hazard, but may be partly artifact, because sampling stations were more likely to be moved before 1962, producing underestimates. Incidence of plot respray is a function of area sprayed in Y2 (Fig. 1), but the relationship has changed toward diminished incidence; the point groupings in the graph reflect differences in infestation location, size and uniformity, hazard to trees, and probably, differences in strategy and insecticide used. These statistics may be used to estimate the chances that a sprayed area will be resprayed in successive years. Any large departure from these odds could only come from drastic changes in budworm populations or in spray policy.

Another question of concern is the chance of any part of the forested area of New Brunswick being sprayed in successive or later years. We weighted the statistics by the area sprayed. The percentages in Table 2 were multiplied by the number of ha sprayed (Table 4) (2 744 600 ha in 1975) divided by 6 070 400 ha, the approximate forested area of New Brunswick. The resultant statistics (Table 3) show an abrupt rise in the proportion of the forested area, sprayed in 1969 and later, that was resprayed in the next 2 yr. This rise is attributable to an increase in the area infested and an increase in the area sprayed, but the switch from DDT to less persistent organophosphate and carbamate insecticides probably contributed to a greater need to respray. On the other

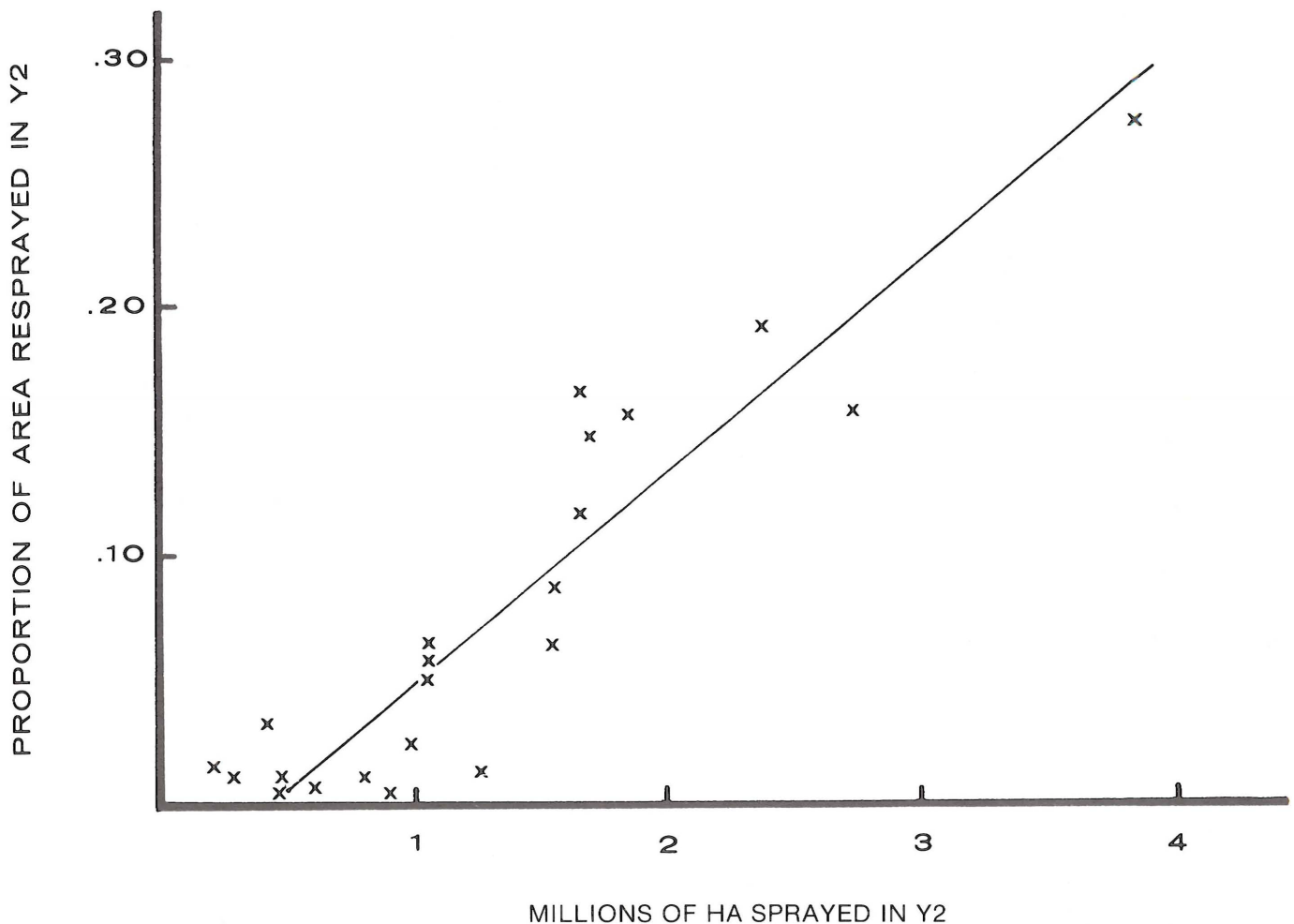


Figure 2. Proportion of forested area sprayed (in Y1) and first resprayed the following year (Y2) as a function of area sprayed in Y2.

hand, the proportion of the area resprayed in Y2 as a function of the area sprayed in Y2 (Fig. 2) has been surprisingly constant.

Based on these records, barring substantial changes in infestation levels or spray strategy, we would estimate the chances of a particular area being sprayed in 1981 and resprayed in 1982 as 10-20%, (depending on the size of the area sprayed in 1982) and again in 1983 as 5-10%. — D.C. Eidt and R.A. Fisher, Maritimes Forest Research Centre, Fredericton, N.B.

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