THE IMPACT OF SPRUCE BUDWORM, CHORISTONEURA FUMIFERANA CLEMENS, CONTROL OPERATIONS INVOLVING SEQUENTIAL INSECTICIDE APPLICATIONS UPON FOREST AVIFAUNA IN THE LOWER ST. LAWRENCE REGION OF QUEBEC.

by

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ABSTRACT

Operational forest protection programmes in 1977 and 1978 in the Province of Quebec employed the sequential application of three insecticides (1977) and the sequential use of three different spray aircraft (1978). Forest avifauna were studied to determine possible adverse effects resulting from either operation. No bird mortality resulted from either operation and breeding territories of selected birds remained occupied throughout both operations.

RÉSUMÉ

Tout au long des compagnes antitordeuse menées au Québec en 1977 et en 1978, qui ont consisté, tour à tour, à épandre trois insecticides en 1977, et à employer trois différents modèles d'avion pour en pulvériser en 1978, on n'a noté aucune mortalité d'oiseau ni d'abandon de territoire de nidification chez les espèces observées. L'étude a été entreprise pour déterminer si l'un des épandages avait eu des effets défavorables sur l'avifaune sylvicole.

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INTRODUCTION

Large scale forest protection programmes covering millions of hectares of spruce budworm, *Choristoneura fumiferana* Clemens, infested timber began in New Brunswick in 1952 and have subsequently been adopted by the province of Quebec, with smaller protection programmes being carried out in Newfoundland, Ontario, Manitoba and British Columbia. D.D.T. was the chemical of choice at the beginning of these large-scale spray programmes but has since given way to other less persistent chemical materials such as fenitrothion and aminocarb. Forest protection programmes using either fenitrothion or aminocarb as registered and recommended for forestry use have generally proved to be environmentally acceptable with minimal ecological disturbance. Recently, however, concerns have been expressed about the risk to the environment of forest protection programmes employing sequential applications of two or more insecticides, or in the use of several types of spray aircraft during a single protection operation.

The Environmental Impact Section of the Forest Pest Management Institute had the opportunity, during the 1977 and 1978 control operation in the province of Quebec, to monitor forest avifauna exposed to both such operations.

SPRAY REGIMES AND METHODS

In 1977, the Quebec Department of Lands and Forests carried out budworm control operations in the lower St. Lawrence area near the town of St. Pascal, employing a sequential application of three insecticides (Block 102, Figure 1).

Phosphamidon (2-chloro-N,N-diethyl-3-hydroxy-crotonamide dimethylphosphate) was applied at the emitted dosage rate of 0.140 kg AI/ha when 20 percent of the second instar budworm larvae had emerged. This initial operation was followed three days later by an application of fenitrothion (0,0-dimethyl 0-(4-nitro-m-tolyl) phosphorothioate) at the emitted dosage rate of 0.210 kg AI/ha and, 20 days later when 25 percent of the budworm had reached 4th instar, by an application of MATACIL® (aminocarb 4-(dimethylamino)-m-tolyl methylcarbamate) emitted at 0.070 kg AI/ha. All formulated sprays were delivered at the rate of 0.82 ℓ/ha by DC-6B aircraft equipped with the Litton Inertial Navigation System (LTN-51).

In 1978, the same operational block (Quebec operational block 102) was re-treated with an application of fenitrothion (0.210 kg AI/ha) aimed at 50 percent second instar larval emergence, and two sequential applications of MATACIL® (0.052 kg AI/ha) within a 12 day interval aimed at fourth and fifth instar larvae respectively. The initial application was made with DC-6B aircraft, the second with Super Constellations, and the final treatment with DC-3's. All spray aircraft were fitted with the Litton Navigational System, and the formulated materials delivered at the rate of 1.169 ℓ/ha.

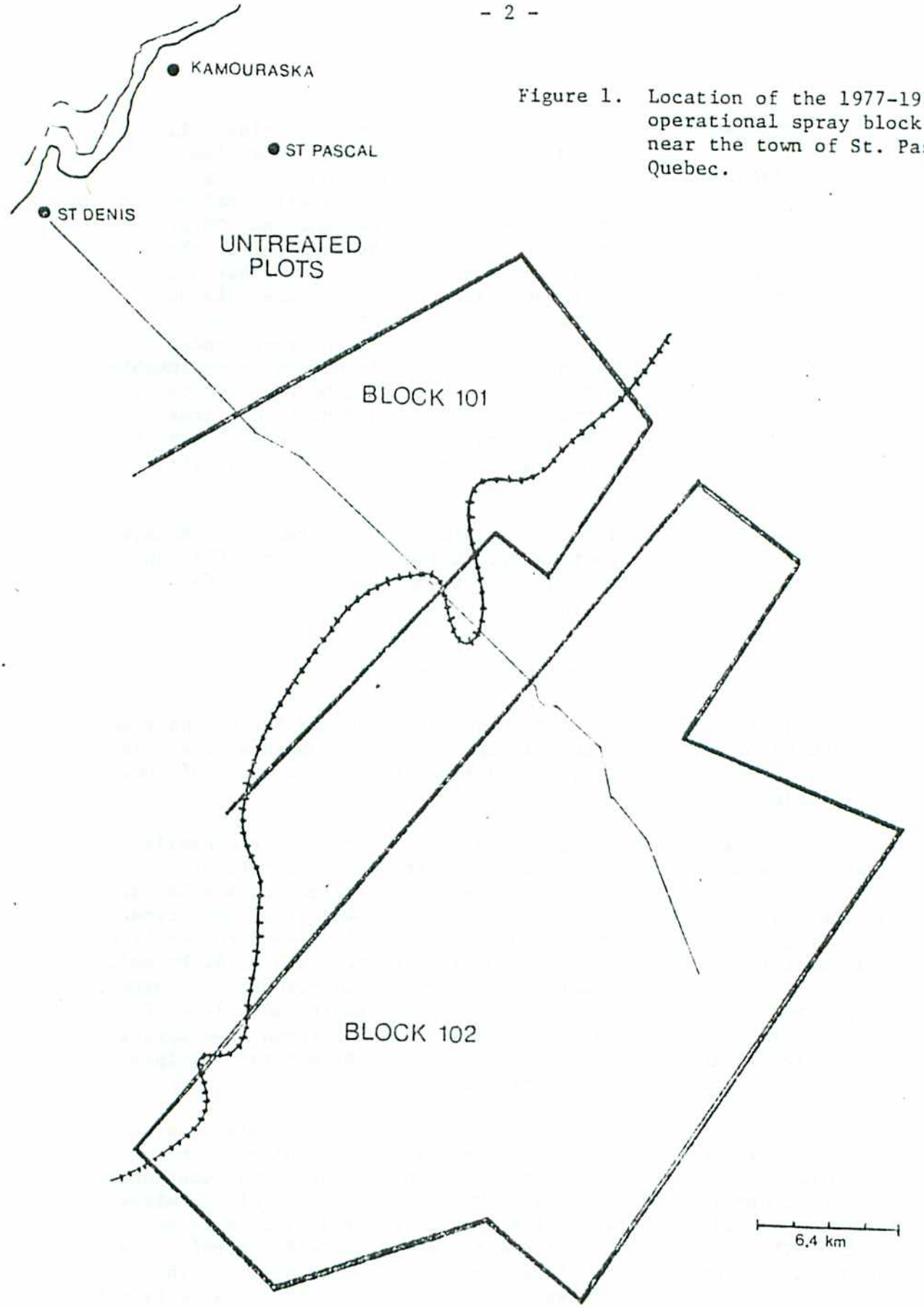


Figure 1. Location of the 1977-1978 operational spray block 102 near the town of St. Pascal, Quebec.

Insecticide deposit data is not available for this report.

The census and monitoring of forest bird populations throughout the two field operations were carried out using techniques similar to those described by Kendeigh, (1944 and 1947), Germain (1979) and Kingsbury and McLeod (1979), in which 10-hectare plots were established and all singing and sighted birds plotted and recorded on plot maps in relation to numbered markers established at 40 m intervals. Daily census records were combined and breeding territories of the following species were plotted; ruby-crowned kinglet, *Regulus calendula* (Linneaus); Magnolia warbler, *Dendroica magnolia* (Wilson); Tennessee warbler, *Vermivora peregrina* (Wilson); ovenbird, *Seirus aurocapillus* (Linneaus); white-throated sparrow, *Zonotrichia albicollis* (Gmelin); Swainson's thrush, *Hylocichla ustulala* (Nuttall); bay-breasted warbler, *Dendroica castanea* (Wilson); and the dark-eyed junco, *Junco hyemalis* (Linneaus).

RESULTS

1977. The censusing of avian populations commenced on 5 May (one day following the application of phosphamidon, 0.140 kg AI/ha) when few bird species had migrated into the area and set up territories.

No pre-spray data was collected due to logistic problems but plot searches failed to reveal any birds showing symptoms of pesticide poisoning and no dead birds were found. A slight decline in activity occurred on the treatment plot on the morning of 7 May prior to the application of fenitrothion (0.210 kg AI/ha, but does not appear to be related to the initial application. Activity on both plots following the second treatment remained relatively constant until 11 May when a flock of pine siskins, *Spinus pinus*, (Wilson) was recorded foraging through the treatment plot, (Figure 2, appendix Table II).

Avian activity on both the treated and untreated control plots was very similar over the period of the third treatment (MATACIL®, 0.070 kg AI/ha) except on 31 May when warblers (family Parulidae) declined on the untreated plot from a high the day before (Tables I and II).

No major decline in populations or activity resulting from the operations was recorded (appendix tables I and II) throughout the census period. Plot searches were conducted following each operation and no birds displaying the typical symptoms of pesticide stress, such as excessive bill wiping, erratic perching or flying, tremors or other abnormal behavior, were observed.

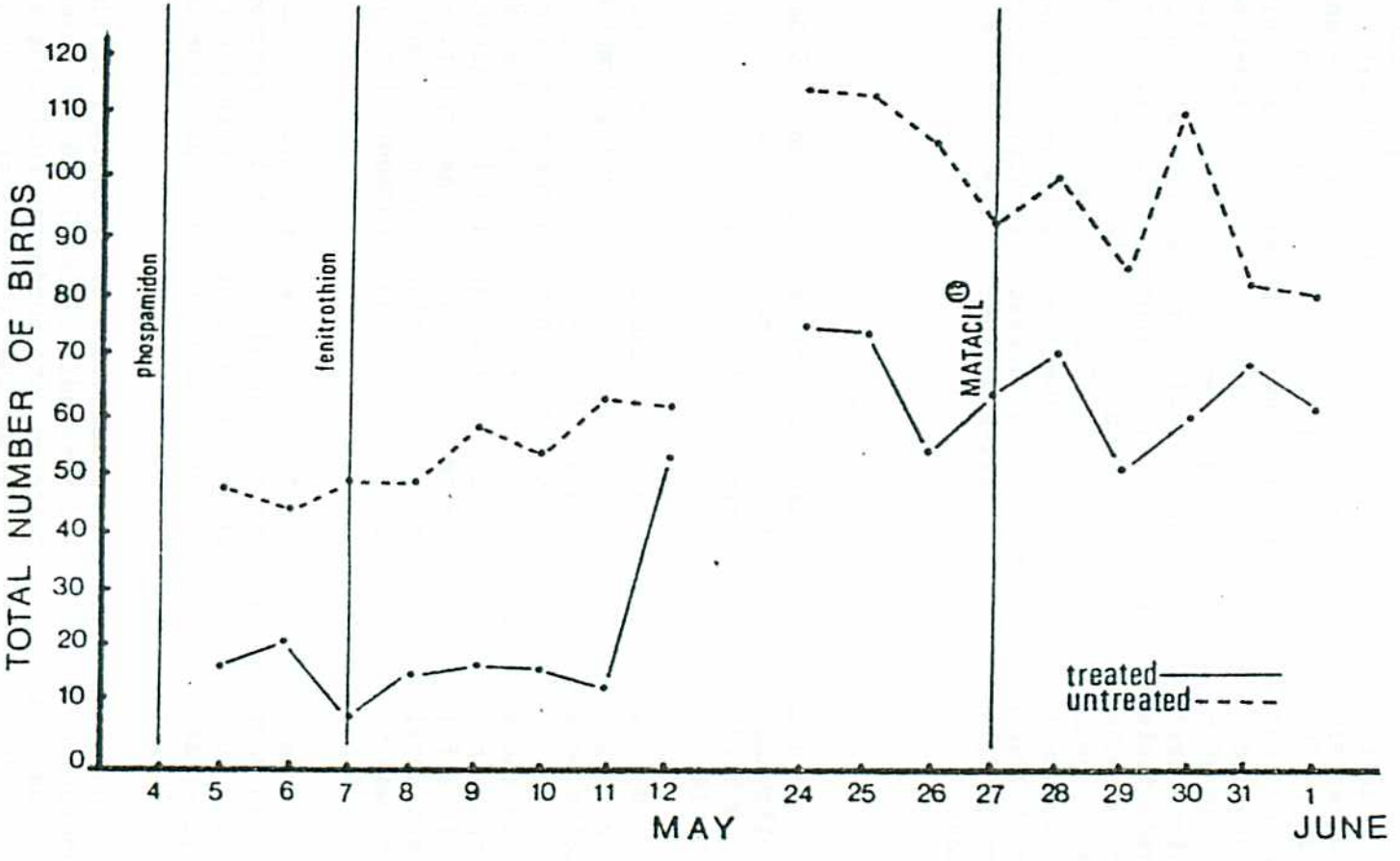


Figure 2. Avian activity trends on plot 102 and a untreated control plot throughout a budworm control operation using a sequential application of three insecticides, St. Pascal Quebec, 1977.

TABLE I

FOREST BIRD POPULATION CENSUS

UNTREATED CONTROL PLOT 1

ST. PASCAL, QUEBEC

5 MAY-1 JUNE

1977

FAMILY	Post phosphamidon spray				Post fenitrothion spray						Pre MATACIL® spray					Post MATACIL® spray					
	May 5	May 6	May 7	Daily avg.	May 8	May 9	May 10	May 11	May 12	Daily avg.	May 24	May 25	May 26	May 27	Daily avg.	May 28	May 29	May 30	May 31	June 1	Daily avg.
	+1	+2	+3		+1	+2	+3	+4	+5		-3	-2	-1	-0		+1	+2	+3	+4	+5	
Anatidae	0	0	0	0.0	0	0	0	0	0	0.0	1	1	1	0	0.8	1	1	0	1	1	0.8
Ardeidae	2	0	2	1.3	2	4	2	2	2	2.4	0	0	0	0	0.0	0	0	0	0	0	0.0
Accipitridae	0	0	0	0.0	0	0	2	1	0	0.6	0	0	0	0	0.0	0	0	0	2	0	0.4
Scolopacidae	0	0	0	0.0	0	1	1	0	3	1.0	0	0	0	0	0.0	0	1	0	1	1	0.6
Picidae	0	0	0	0.0	0	0	0	0	0	0.0	0	0	0	0	0.0	0	0	2	0	2	0.8
Tyrannidae	0	0	0	0.0	0	0	0	0	0	0.0	2	2	4	2	2.5	2	0	4	2	0	1.6
Corvidae	0	0	0	0.0	1	1	3	1	0	1.2	2	2	1	0	1.3	1	0	1	0	0	0.4
Paridae	0	0	0	0.0	0	0	0	0	2	0.4	0	0	0	0	0.0	0	0	0	0	0	0.0
Sittidae	0	1	3	1.3	0	1	1	1	1	0.8	0	0	0	0	0.0	0	2	0	0	0	0.4
Mimidae	0	0	0	0.0	0	0	0	0	0	0.0	2	0	0	0	0.5	0	0	0	0	0	0.0
Turdidae	1	1	1	1.0	7	8	7	5	8	7.0	10	13	10	7	10.0	8	5	7	3	7	6.0
Sylviidae	4	3	6	4.3	4	4	5	3	10	5.2	4	6	2	4	4.0	4	2	5	2	0	2.6
Vireonidae	0	0	0	0.0	0	0	0	0	0	0.0	0	0	0	0	0.0	0	2	2	2	0	1.2
Parulidae	4	2	2	2.7	2	2	4	4	2	2.8	44	39	46	36	41.3	41	40	54	37	35	41.4
Icteridae	22	20	15	19.0	15	19	12	21	16	16.6	17	23	19	22	20.3	16	16	16	14	14	15.2
Thraupidae	0	0	0	0.0	0	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	2	0	0.4
Fringillidae	13	17	20	16.7	18	18	16	25	18	19.0	30	29	23	21	25.8	27	16	19	13	16	18.2
Unidentified Birds	0	0	0	0.0	0	0	0	0	0	0.0	3	0	0	1	1.0	0	0	2	4	4	2.0
TOTALS	46	44	49	46.3	49	58	53	63	62	57.0	115	115	106	93	107.3	100	85	112	83	80	92.0

TABLE II
FOREST BIRD POPULATION CENSUS
EXPERIMENTAL PLOT 102
ST. PASCAL, QUEBEC
5 MAY-1 JUNE

FAMILY	Post phosphamidon spray				Post fenitrothion spray						Pre MATACIL® spray					Post MATACIL® spray					
	May 5 +1	May 6 +2	May 7 +3	Daily avg.	May 8 +1	May 9 +2	May 10 +3	May 11 +4	May 12 +5	Daily avg.	May 24 -3	May 25 -2	May 26 -1	May 27 -0	Daily avg.	May 28 +1	May 29 +2	May 30 +3	May 31 +4	June 1 +5	Daily avg.
Accipitridae	0	0	0	0.0	0	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	1	0.2
Tetraonidae	0	0	0	0.0	0	0	0	0	2	0.4	4	2	0	4	2.5	2	2	2	2	0	1.6
Scolopacidae	0	0	1	0.3	0	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0	0.0
Picidae	0	2	0	0.7	0	0	0	1	0	0.2	0	0	0	0	0.0	0	0	0	0	0	0.0
Corvidae	0	0	0	0.0	0	0	0	0	0	0.0	0	0	0	0	0.0	0	0	1	0	0	0.2
Paridae	0	0	0	0.0	1	0	2	0	0	0.6	2	0	0	3	1.3	0	0	0	0	0	0.0
Turdidae	2	3	5	5.0	2	6	7	7	6	5.6	10	13	13	5	10.3	13	7	8	8	8	8.6
Sylviidae	2	2	0	1.3	0	0	1	2	2	1.0	2	0	2	0	1.0	2	0	2	2	0	1.2
Vireonidae	0	0	0	0.0	0	0	0	0	0	0.0	4	4	0	0	2.0	0	0	6	2	4	2.4
Parulidae	0	0	0	0.0	0	0	0	0	0	0.0	36	44	22	26	32.0	29	26	28	37	38	31.6
Icteridae	2	2	0	1.3	1	0	3	0	1	1.0	0	0	0	0	0.0	0	0	0	0	0	0.0
Fringillidae	8	7	2	5.6	11	8	4	3	42	13.6	17	11	17	24	17.4	26	15	13	18	9	16.2
Unidentified Birds	3	0	0	1.0	0	2	0	0	0	0.4	0	0	0	2	0.5	0	0	0	0	0	0.0
TOTAL BIRDS	17	21	8	15.3	15	16	17	13	53	22.8	75	74	54	64	66.8	71	50	60	69	60	62.0

The nesting territories of five species of forest birds were examined to determine if any of the applications resulted in the abandonment of nesting sites. The species selected represent birds known to be quite sensitive to insecticides, or occupying various niches in the forest ecosystem.

Ruby-crowned kinglet: This species is probably the most pesticide-sensitive of the small forest songbirds studied. Two pairs were actively defending territories during the period following the initial treatment, and were recorded in territory during the period following the fenitrothion treatment and the pre-spray period of the MATACIL® treatment. One territory could not be identified following the MATACIL® spray which may have resulted in a border-area territory moving outside the plot as happened on the control plot during the post fenitrothion period (Figure 3).

Magnolia warbler: The Magnolia warbler was not recorded in the experimental area during the period covered by the first two treatments. A pair of birds was recorded on territory throughout the MATACIL® application, but a border-area territory was not recorded after the application (Figure 4).

Tennessee warbler: Tennessee warblers had not migrated into the experimental area until after the first and second treatments had been applied. Territories were established throughout the final treatment and no abandonment of territories took place (Figure 5).

Ovenbird: The ovenbird is a member of the warbler family (family Parulidae) which inhabits the lower canopy and forest floor areas. It was not recorded in territory until just prior to the final treatment. Both ovenbird territories recorded then remained occupied throughout the application (Figure 6).

White-throated sparrow: White-throats were actively defending breeding territories early in the programme. All nesting territories remained occupied throughout the experimental period with a single exception, when one territory could not be positively identified following the final treatment (Figure 7).

Figure 3 . Nesting territories of the ruby-crowned kinglet on experimental plot 102 and untreated control, throughout a sequential application of insecticides, St. Pascal, Quebec, 1977.

represents nesting territory

represents single sighting

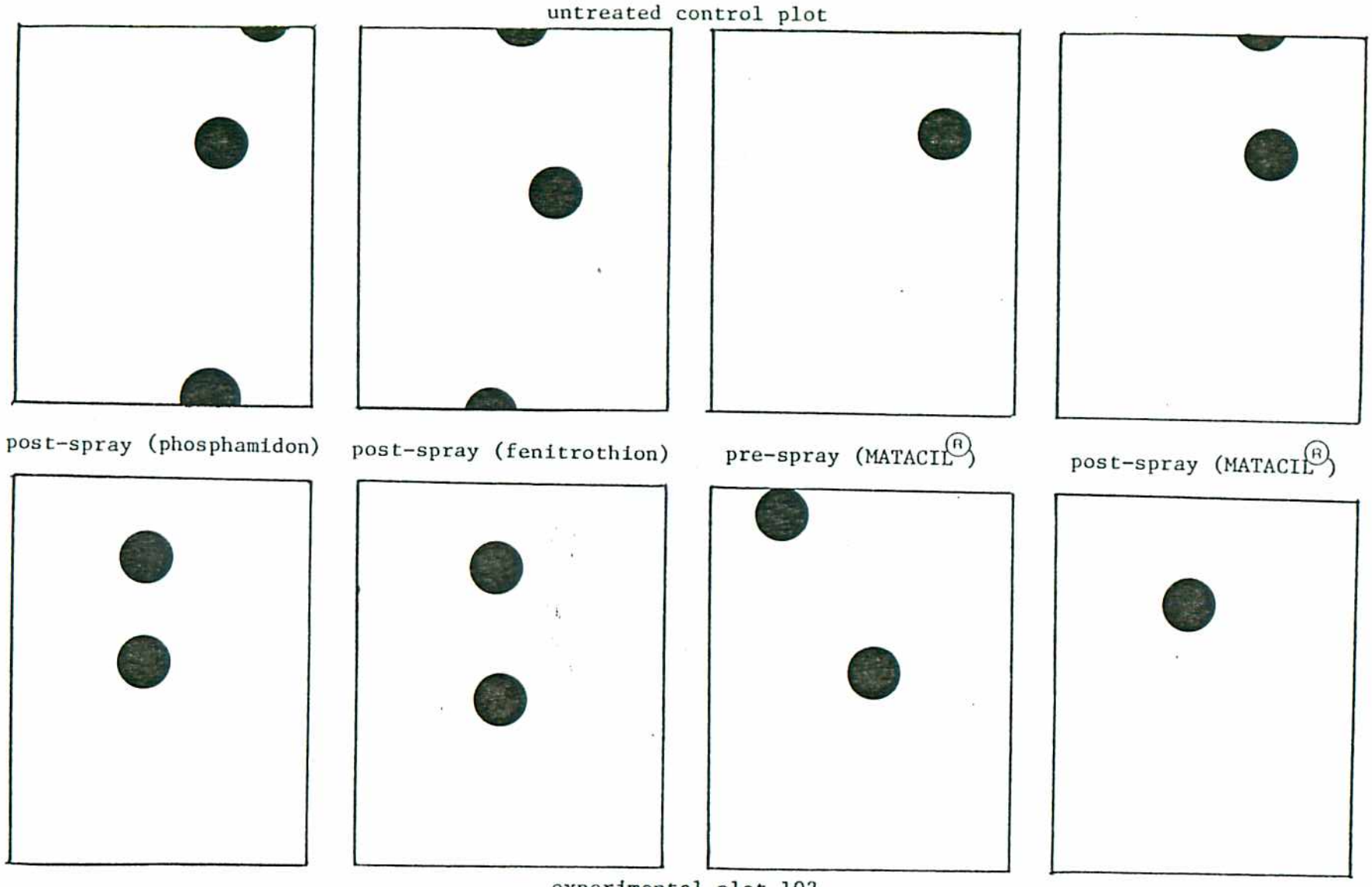

untreated control plot
post-spray (phosphamidon)
post-spray (fenitrothion)
pre-spray (MATACIL®)
post-spray (MATACIL®)
experimental plot 102

Figure 4 . Nesting territories of the Magnolia warbler on experimental plot 102 and untreated control, throughout a sequential application of insecticides, St. Pascal, Quebec, 1977.

● represents nesting territory

● represents single sighting

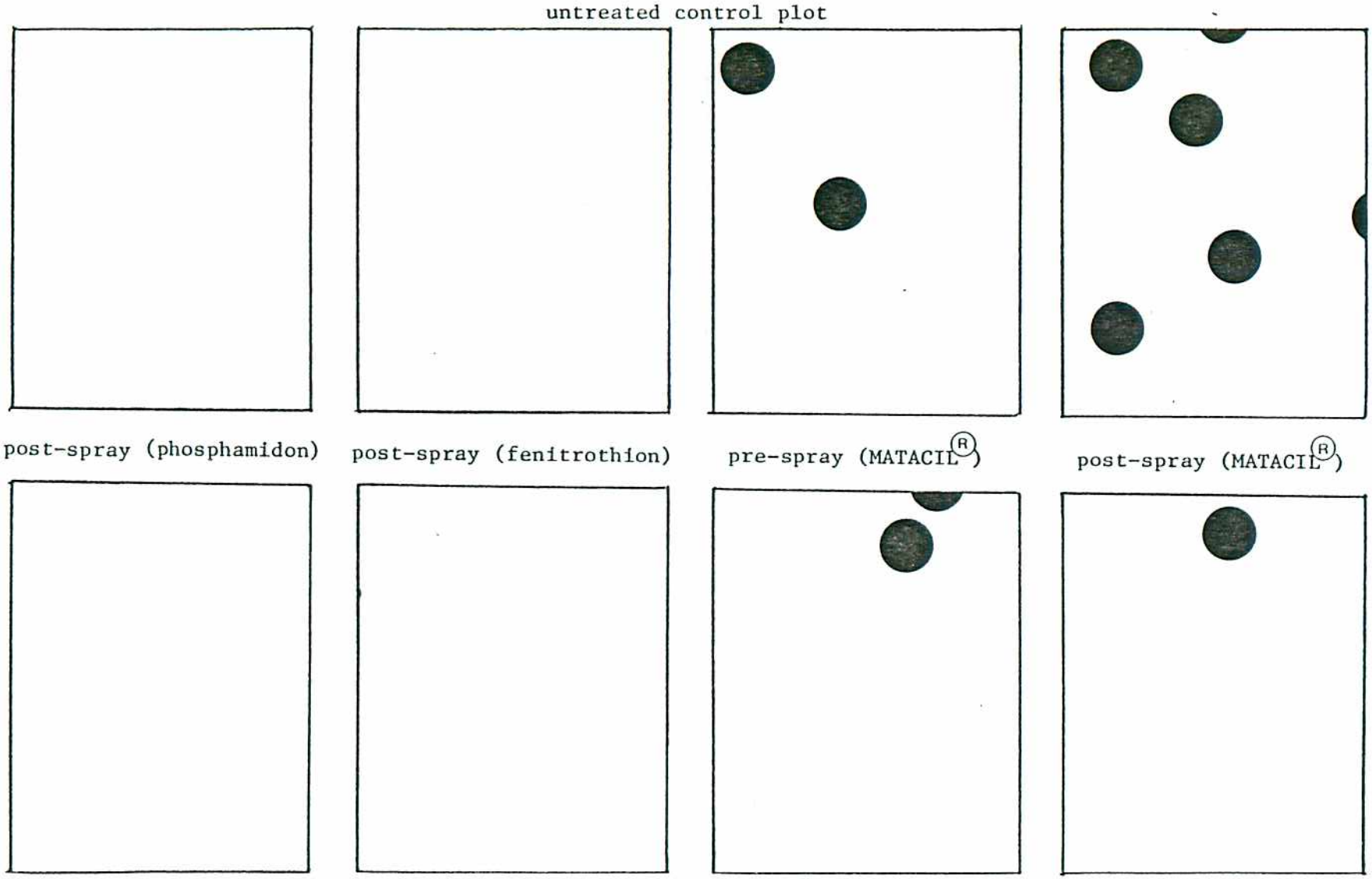

untreated control plot
post-spray (phosphamidon)
post-spray (fenitrothion)
pre-spray (MATACIL®)
post-spray (MATACIL®)
experimental plot 102

Figure 5 . Nesting territories of the Tennessee warbler on experimental plot 102 and untreated control, throughout a sequential application of insecticides, St. Pascal, Quebec, 1977.

represents nesting territory

represents single sighting

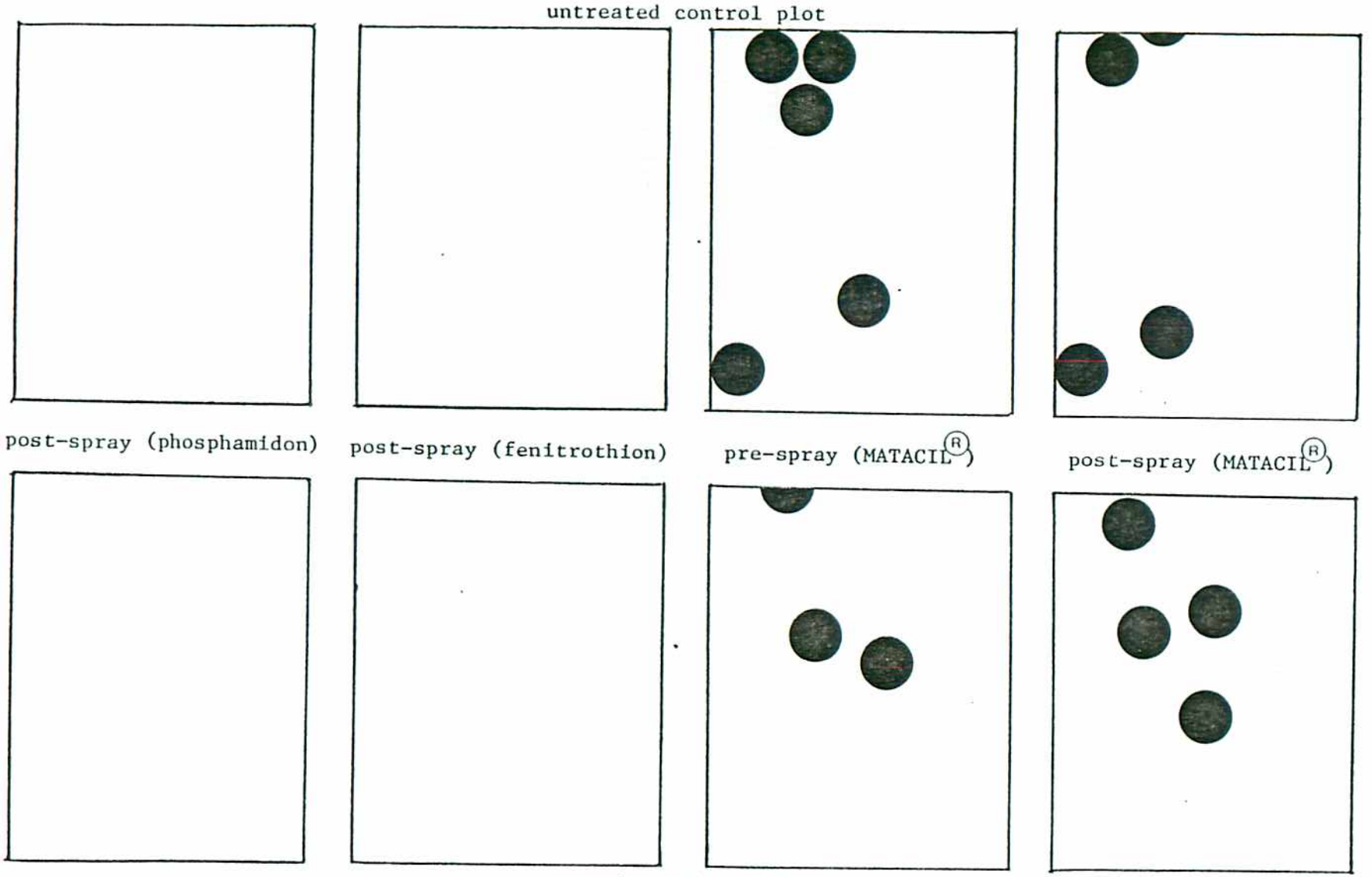

untreated control plot
post-spray (phosphamidon)
post-spray (fenitrothion)
pre-spray (MATACIL®)
post-spray (MATACIL®)
experimental plot 102

Figure 6 . Nesting territories of the ovenbird on experimental plot 102 and untreated control, throughout a sequential application of insecticides, St. Pascal, Quebec, 1977.

represents nesting territory

represents single sighting

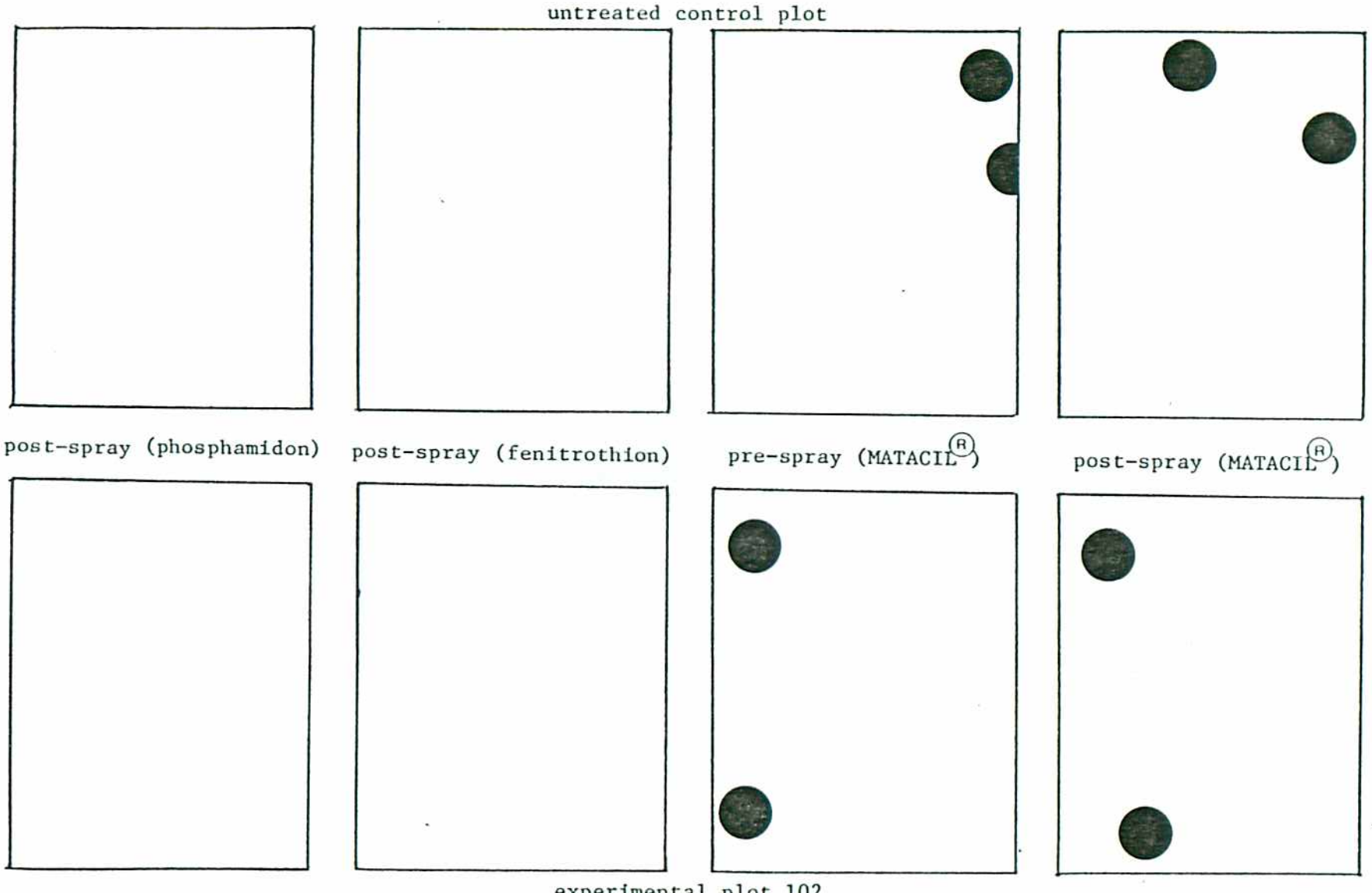
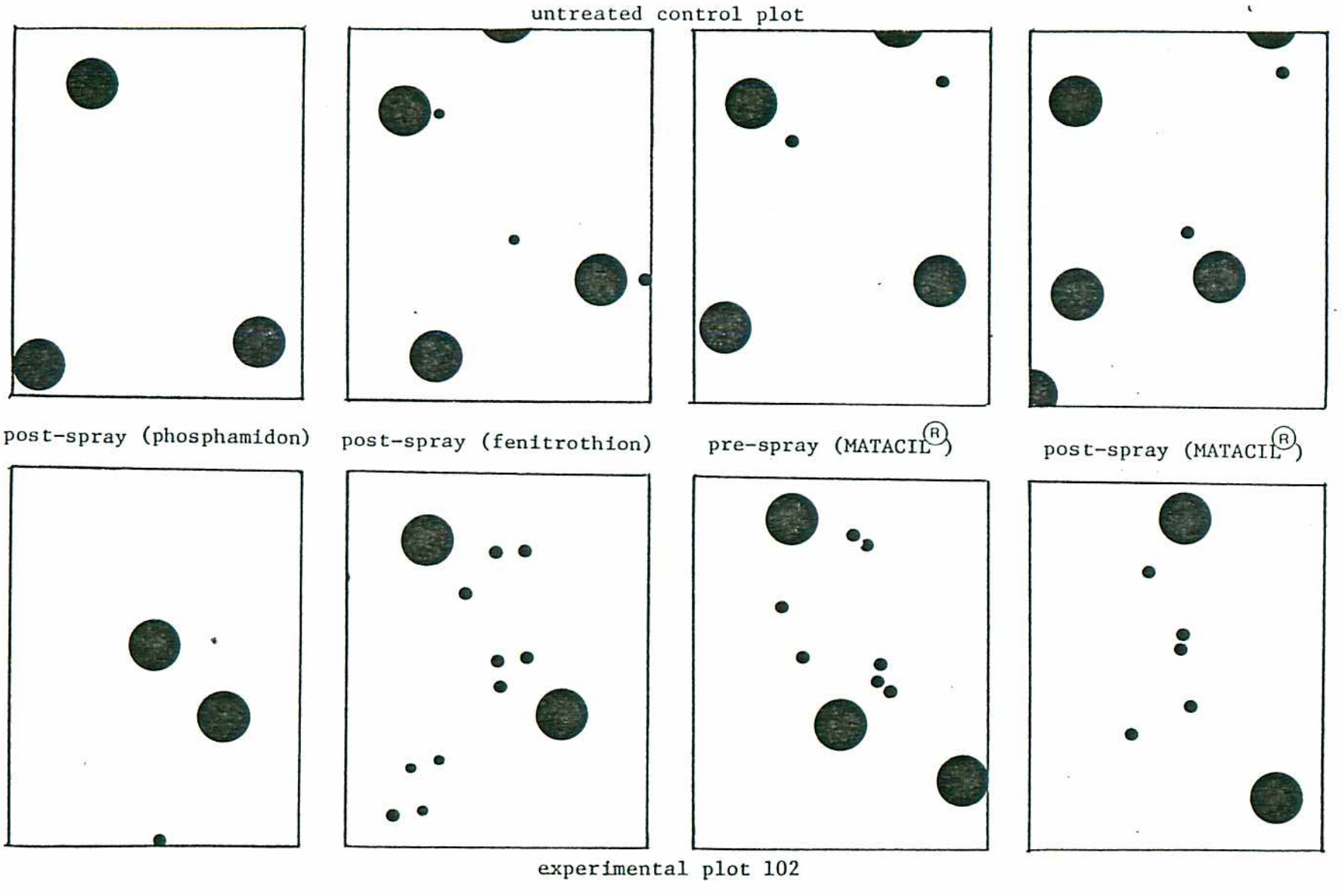

untreated control plot
post-spray (phosphamidon)
post-spray (fenitrothion)
pre-spray (MATACIL®)
post-spray (MATACIL®)
experimental plot 102

Figure 7 . Nesting territories of the white-throated sparrow on experimental plot 102 and untreated control, throughout a sequential application of insecticides, St. Pascal, Quebec, 1977.

● represents nesting territory

● represents single sighting


untreated control plot
post-spray (phosphamidon)
post-spray (fenitrothion)
pre-spray (MATACIL®)
post-spray (MATACIL®)
experimental plot 102

1978: Operational spray block 102 was retreated in 1978 with three budworm control operations consisting of fenitrothion (0.210 kg AI/ha) followed by two sequential treatments of MATACIL® (0.052 kg AI/ha). The treatments were delivered by three different spray aircraft: DC-6, Super Constellation and DC-3.

Avian activity of treatment plot 102-11 and untreated control plot 1 were very similar throughout the entire control operation, with no insecticide induced declines indicated (Figure 8). Considerable fluctuation in daily activity was encountered on both plots reflecting the very unsettled spring weather conditions. Populations of the various family groups were not damaged by any of the three operations, (Tables III to VIII).

Treatment plot 102-12 received the same spray regime as plot 102-11, except that the second operation was carried out in the evening of 3 June, while 102-11 was treated on the morning of 4 June. Avian activity on plot 102-12 and its control plot were quite similar and again reflected the unsettled weather (Figure 9). No immediate or short-term impact was recorded among any of the family groups as a result of the operations, (Tables IX to XIV).

Intensive searches of plots 102-11 and 102-12 following each operation failed to identify any insecticide induced erratic behaviour.

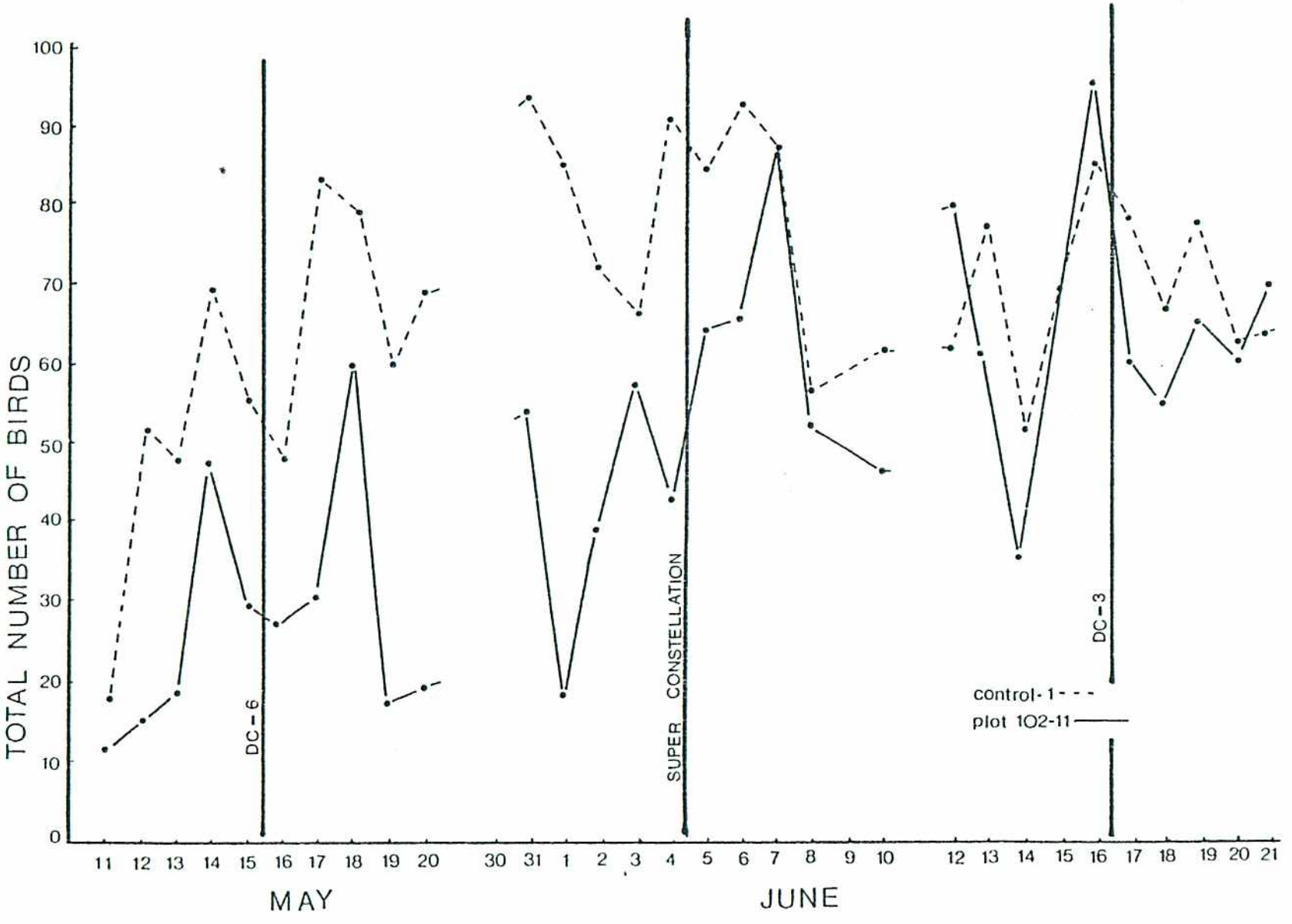


Figure 8. Avian activity on plot 102-11 and untreated control plot-1 throughout the 1978 budworm control operation employing three types of spray aircraft, St. Pascal Quebec, 1978.

TABLE III

FOREST BIRD POPULATION CENSUS

UNTREATED CONTROL PLOT - 1

ST. PASCAL, QUEBEC

11-20 MAY, 1978

(Fenitrothion applied 15 May to experimental block 102)

	Pre-spray						Post DC-6 spray					
FAMILY	May 11	May 12	May 13	May 14	May 15	Daily avg.	May 16	May 17	May 18	May 19	May 20	Daily avg.
	-4	-3	-2	-1	-0		+1	+2	+3	+4	+5	
Ardeidae	0	2	2	2	2	1.6	2	2	2	2	2	2.0
Accipitridae	0	0	0	0	0	0.0	0	1	0	0	0	0.2
Scolopacidae	0	0	0	0	2	0.4	0	0	2	1	0	0.6
Alcedinidae	0	0	0	0	2	0.4	0	0	0	0	0	0.0
Picidae	0	4	2	2	2	2.0	2	3	1	0	5	2.2
Hirundinidae	0	0	0	0	0	0.0	0	4	0	0	0	0.8
Corvidae	0	0	0	1	0	0.2	1	2	0	0	1	0.8
Turdidae	1	6	1	1	4	2.6	3	4	4	4	7	4.4
Syviidae	6	6	6	4	2	4.8	4	6	3	8	1	4.4
Vireonidae	0	0	0	2	0	0.4	0	0	1	0	0	0.2
Parulidae	4	12	10	12	10	9.6	10	24	23	14	24	19.0
Icteridae	2	12	12	19	23	13.6	14	12	10	11	6	10.6
Fringillidae	6	10	15	27	17	15.0	12	25	33	20	21	22.2
Unknown Bird	0	0	0	0	1	0.2	1	0	0	0	2	0.6
TOTAL BIRDS	19	52	48	70	65	50.8	49	83	79	60	69	68.0

TABLE IV
FOREST BIRD POPULATION CENSUS
UNTREATED CONTROL PLOT - 1
ST. PASCAL, QUEBEC
31 MAY-10 JUNE 1978

(MATACIL® applied on 4 June to portion of experimental block 102)

	Pre-spray						Post Super Constellation Spray					
FAMILY	May 31	June 1	June 2	June 3	June 4	Daily avg.	June 5	June 6	June 7	June 8	June 9	Daily avg.
	-4	-3	-2	-1	-0		+1	+2	+3	+4	+6	
Ardeidae	2	0	0	1	2	1.0	2	0	0	2	0	0.8
Alcedinidae	1	0	0	0	0	0.2	0	0	0	0	0	0.0
Picidae	0	0	0	0	0	0.0	0	0	2	0	0	0.4
Tyrannidae	2	0	0	0	0	0.4	2	0	2	0	0	0.8
Paridae	0	0	0	0	0	0.0	4	0	0	0	0	0.8
Corvidae	0	0	2	0	2	0.8	2	0	2	1	0	1.0
Sittidae	0	0	0	0	0	0.0	2	0	0	0	0	0.4
Mimidae	0	0	0	0	2	0.4	2	2	2	0	2	1.6
Turdidae	13	6	4	4	9	7.2	9	4	7	5	0	5.0
Sylviidae	4	8	6	6	4	5.6	6	4	4	2	4	4.0
Vireonidae	0	0	0	0	0	0.0	0	2	0	0	0	0.4
Parulidae	42	37	28	31	46	36.8	36	46	36	26	32	35.2
Icteridae	15	19	13	13	15	15.0	10	17	17	16	15	15.0
Fringillidae	15	15	18	12	11	14.2	11	19	16	4	8	11.6
TOTAL BIRDS	94	85	71	67	91	81.6	86	94	88	56	61	77.0

TABLE V
FOREST BIRD POPULATION CENSUS
UNTREATED CONTROL PLOT - 1
ST. PASCAL, QUEBEC
12-21 JUNE, 1978

(MATACIL® applied on 16 June to experimental block 102)

	Pre-spray						Post DC-3 spray					
FAMILY	June 12	June 13	June 14	June 15	June 16	Daily ave.	June 17	June 18	June 19	June 20	June 21	Daily ave.
	-4	-3	-2	-1	-0		+1	+2	+3	+4	+5	
Ardeidae	1	0	0	2	2	1.0	2	0	0	0	0	0.4
Anatidae	0	0	0	0	0	0.0	2	0	0	0	0	0.4
Picidae	0	0	0	0	1	0.2	0	0	0	0	0	0.0
Tyrannidae	0	4	2	2	2	2.0	4	0	4	4	4	3.2
Corvidae	2	1	0	0	2	1.0	1	0	0	0	0	0.2
Sittidae	0	2	0	0	0	0.4	0	0	0	0	0	0.0
Mimidae	2	2	2	2	2	2.0	2	2	2	0	2	1.6
Turdidae	2	7	5	7	11	6.4	4	6	7	10	9	7.2
Sylviidae	2	2	2	2	2	2.0	4	2	2	0	0	1.6
Bombycillidae	2	1	0	2	2	1.4	2	3	2	2	0	1.8
Vireonidae	0	0	0	0	0	0.0	2	0	0	0	0	0.4
Parulidae	26	30	12	28	34	26.0	35	30	34	24	34	31.4
Icteridae	19	18	19	17	20	18.6	16	19	19	16	12	16.4
Fringillidae	5	10	10	8	8	8.2	4	4	8	6	2	4.8
Unknown birds	0	0	0	0	0	0.0	1	0	0	0	0	0.2
TOTAL BIRDS	61	77	52	70	86	69.2	79	66	78	62	63	69.6

TABLE VI
FOREST BIRD POPULATION CENSUS
EXPERIMENTAL TREATMENT PLOT 102-11
ST. PASCAL, QUEBEC
11-20 MAY 1978

(Fenitrothion applied on evening 15 May at the emitted dosage rate of 0.210 kg AI/ha)

	Pre-spray						Post DC-6 spray					
FAMILY	May 11	May 12	May 13	May 14	May 15	Daily avg.	May 16	May 17	May 18	May 19	May 20	Daily avg.
	-4	-3	-2	-1	-0		+1	+2	+3	+4	+5	
Tetraonidae	0	2	0	0	0	0.4	0	0	0	0	0	0.0
Picidae	1	0	0	0	0	0.2	0	0	0	0	0	0.0
Paridae	0	2	4	2	6	2.8	0	0	3	0	0	0.6
Turdidae	4	1	4	4	3	3.2	7	2	2	6	2	3.8
Sylviidae	1	0	4	10	6	4.2	4	2	10	0	0	3.2
Vireonidae	0	0	0	0	0	0.0	0	0	0	0	2	0.4
Parulidae	0	0	1	8	4	2.6	6	16	21	6	8	11.4
Icteridae	0	0	0	0	1	0.2	0	0	0	0	0	0.0
Fringillidae	4	10	6	23	0	10.4	10	10	23	4	7	10.8
TOTAL BIRDS	10	15	19	47	29	24.0	27	30	59	16	19	30.2

TABLE VII
FOREST BIRD POPULATION CENSUS
EXPERIMENTAL TREATMENT PLOT 102-11
ST. PASCAL, QUEBEC
31 MAY - 10 JUNE 1978

MATACIL® applied on 4 June at the emitted dosage rate of 0.052 kg AI/ha

	Pre-spray						Post Super Constellation spray					
FAMILY	May 31	June 1	June 2	June 3	June 4	Daily avg.	June 5	June 6	June 7	June 8	June 10	Daily avg.
	-4	-3	-2	-1	-0		+1	+2	+3	+4	+5	
Accipitridae	0	0	0	0	0	0.0	1	0	0	0	0	0.2
Tetraonidae	0	0	0	0	0	0.0	2	0	0	0	0	0.4
Picidae	0	0	0	0	3	0.6	2	0	2	0	0	0.8
Tyrannidae	2	0	0	0	0	0.4	2	0	4	2	2	2.0
Hirundinidae	0	0	0	0	0	0.0	1	0	0	0	0	0.2
Corvidae	1	0	0	0	0	0.2	1	0	1	0	0	0.4
Paridae	2	0	0	2	1	1.0	1	1	2	2	0	1.2
Turdidae	7	2	0	6	10	5.0	3	5	10	7	3	5.6
Sylviidae	4	0	2	4	2	2.4	4	4	2	2	2	2.8
Sturnidae	0	0	0	0	0	0.0	1	0	0	0	0	0.2
Vireonidae	4	0	0	0	0	0.8	0	0	0	2	0	0.4
Parulidae	21	4	32	38	22	25.4	39	40	48	30	38	39.0
Icteridae	0	1	0	0	0	0.2	0	0	0	1	0	0.2
Fringillidae	13	0	5	8	4	6.0	6	16	17	6	2	9.4
TOTAL BIRDS	54	17	39	58	42	42.0	63	66	86	52	47	62.8

TABLE VIII
FOREST BIRD POPULATION CENSUS
EXPERIMENTAL TREATMENT BLOCK 102-11
ST. PASCAL, QUEBEC
12 - 21 JUNE 1978

MATACIL® applied on 16 June at the rate of 0.052 kg AI/ha

	Pre-spray						Post DC-3 spray					
FAMILY	June 12	June 13	June 14	June 15	June 16	Daily avg.	June 17	June 18	June 19	June 20	June 21	Daily avg.
	-4	-3	-2	-1	-0		+1	+2	+3	+4	+5	
Accipitridae	0	0	0	0	1	0.2	0	0	0	0	0	0.0
Picidae	0	0	0	0	2	0.4	0	0	2	0	2	0.8
Tyrannidae	2	2	0	4	4	2.4	2	2	2	4	4	2.8
Corvidae	0	1	0	0	0	0.2	1	0	0	0	0	0.0
Paridae	0	2	0	1	0	0.6	1	0	1	0	0	0.4
Turdidae	10	8	4	4	14	8.0	7	9	7	10	11	8.8
Sylviidae	4	4	6	2	4	4.0	2	2	2	2	4	2.4
Vireonidae	0	0	0	0	2	0.4	2	2	0	0	2	1.2
Parulidae	54	34	22	18	56	36.8	34	32	38	32	42	35.6
Fringillidae	7	8	2	4	11	6.4	8	6	10	9	4	7.4
Unknown Birds	2	0	0	0	0	0.4	0	0	0	0	0	0.0
TOTAL BIRDS	79	59	34	33	94	59.8	57	53	62	57	69	59.6

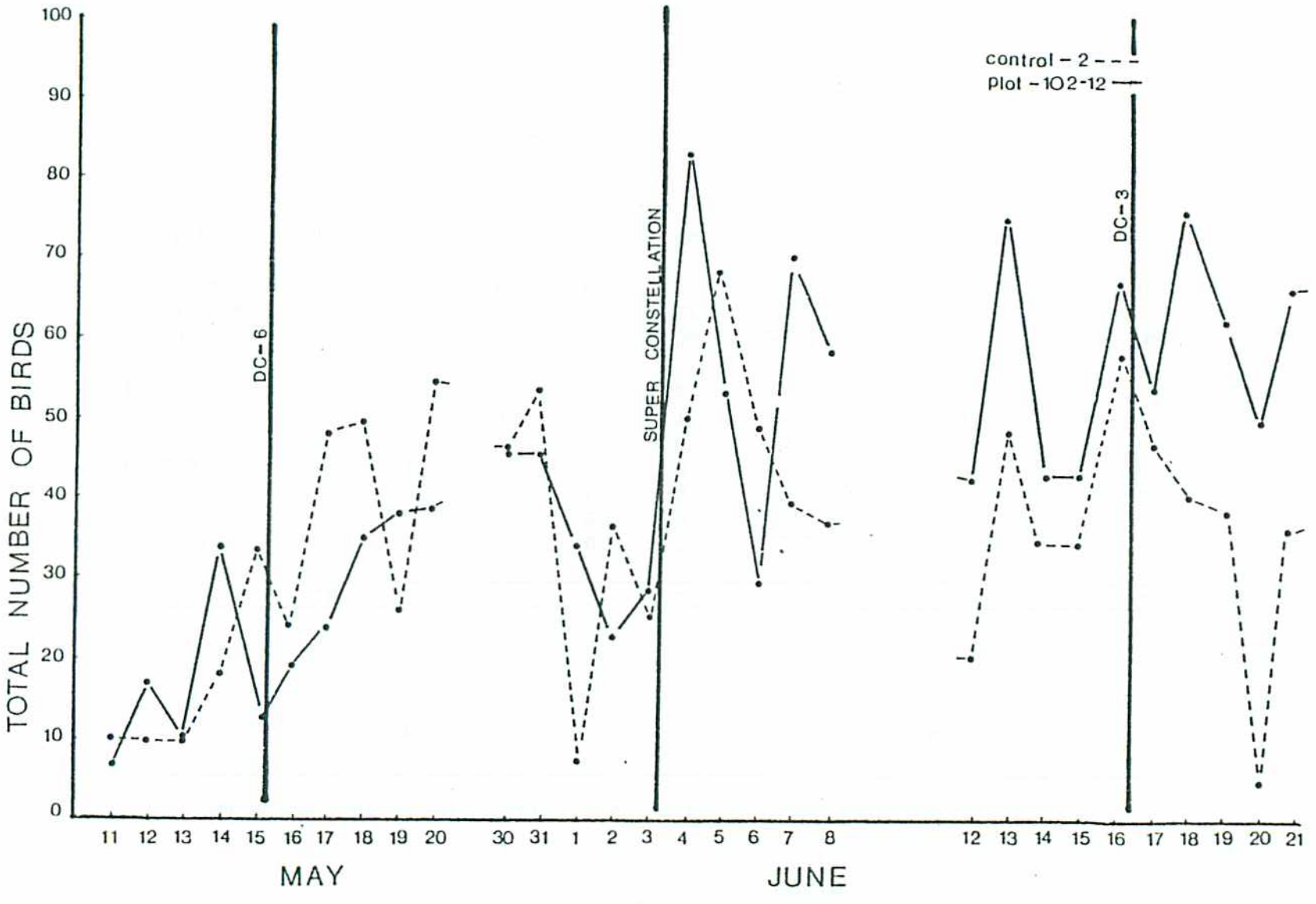


Figure 9. Avian activity on plot 102-12 and untreated control plot-2 throughout the 1978 budworm control operation employing three types of spray aircraft, St. Pascal Quebec, 1978.

TABLE IX
FOREST BIRD POPULATION CENSUS
UNTREATED CONTROL PLOT-2
ST. PASCAL, QUEBEC
11 - 20 MAY 1978

(Fenitrothion applied on 15 May to experimental block 102)

FAMILY	Pre-spray						Post DC-6 spray					
	May 11	May 12	May 13	May 14	May 15	Daily avg.	May 16	May 17	May 18	May 19	May 20	Daily avg.
	-4	-3	-2	-1	-0		+1	+2	+3	+4	+5	
Tetraonidae	2	0	2	2	2	1.6	2	1	2	0	2	1.4
Picidae	0	0	0	1	0	0.2	0	3	0	0	2	1.0
Corvidae	0	0	0	0	0	0.0	1	0	0	0	0	0.2
Paridae	0	0	0	0	0	0.0	0	0	0	0	1	0.2
Sittidae	0	0	0	0	0	0.0	0	0	0	0	2	0.4
Certhiidae	0	0	0	0	0	0.0	2	0	0	0	0	0.4
Troglodytidae	0	0	0	0	0	0.0	0	0	2	0	0	0.4
Turdidae	4	0	2	0	0	1.2	0	3	4	4	4	3.0
Sylviidae	4	6	2	2	2	3.2	0	6	6	2	2	3.2
Vireonidae	0	0	0	2	2	0.8	4	0	2	0	2	1.6
Parulidae	0	4	4	4	18	6.0	8	22	11	10	17	13.6
Icteridae	0	0	0	2	0	0.4	0	2	0	0	0	0.4
Fringillidae	0	0	0	6	10	3.2	4	11	23	10	23	14.2
Unidentified	0	0	0	0	0	0.0	2	0	0	0	0	0.4
TOTAL BIRDS	10	10	10	19	34	16.6	23	48	50	26	55	40.4

TABLE X
FOREST BIRD POPULATION CENSUS
UNTREATED CONTROL PLOT-2
ST. PASCAL, QUEBEC
30 MAY - 8 JUNE 1978

(MATACIL® applied on 3 June to portion of experimental block 102)

FAMILY	Pre-spray						Post Super Constellation spray					
	May 30	May 31	June 1	June 2	June 3	Daily avg.	4	5	6	7	8	Daily avg.
	-4	-3	-2	-1	-0		+1	+2	+3	+4	+5	
Tetraonidae	2	2	0	0	0	0.8	3	0	0	0	0	0.6
Picidae	0	2	0	0	0	0.4	0	0	0	0	0	0.0
Tyrannidae	4	4	0	2	2	2.4	4	10	2	4	4	4.8
Corvidae	4	0	0	0	0	0.8	2	2	0	0	0	0.8
Sittidae	0	0	0	0	0	0.0	0	2	0	0	0	0.4
Certhiidae	0	0	0	2	0	0.4	0	0	0	0	0	0.0
Troglodytidae	2	2	0	0	0	0.8	0	0	0	0	0	0.0
Turdidae	2	2	0	0	6	2.0	2	9	11	6	7	7.0
Sylviidae	0	0	2	0	0	0.4	0	0	0	0	0	0.0
Vireonidae	0	2	0	0	2	0.8	4	2	6	2	2	3.2
Parulidae	28	34	6	28	12	21.6	28	24	26	24	22	24.8
Icteridae	0	0	0	0	0	0.0	0	3	0	0	0	0.6
Fringillidae	4	4	0	4	2	2.8	6	14	2	3	2	5.4
Unidentified Birds	0	1	0	0	2	0.6	0	2	2	0	0	0.8
TOTAL BIRDS	46	53	8	36	26	33.8	49	68	49	39	37	48.4

TABLE XI
FOREST BIRD POPULATION CENSUS
UNTREATED CONTROL PLOT-2
ST. PASCAL, QUEBEC
12-21 JUNE 1978

(MATACIL® applied on 16 June to experimental block 102)

FAMILY	Pre-spray						Post DC-3 spray					
	June 12	June 13	June 14	June 15	June 16	Daily avg.	June 17	June 18	June 19	June 20	June 21	Daily avg.
	-4	-3	-2	-1	-0		+1	+2	+3	+4	+5	
Anatidae	0	0	0	0	0	0.0	0	0	1	0	0	0.2
Tetraonidae	0	0	0	0	3	0.6	0	0	0	0	0	0.0
Tyrannidae	2	4	4	2	2	2.8	2	2	2	0	4	2.0
Corvidae	0	0	1	0	0	0.2	0	2	0	0	2	0.8
Certhiidae	0	0	0	0	0	0.0	0	0	2	0	0	0.4
Turdidae	6	8	9	2	7	6.4	11	10	4	2	4	6.2
Bombycillidae	0	0	0	0	0	0.0	0	0	0	0	0	0.0
Vireonidae	2	4	4	4	6	4.0	8	4	4	0	2	3.6
Parulidae	10	28	14	22	36	22.0	20	18	22	4	16	16.0
Icteridae	0	0	0	0	0	0.0	0	0	0	0	0	0.0
Fringillidae	0	4	2	4	4	2.8	4	2	2	0	4	2.4
Unidentified Birds	0	0	0	0	0	0.0	0	0	0	0	0	0.0
TOTAL BIRDS	20	48	34	34	58	38.8	45	38	37	6	32	31.6

TABLE XII
FOREST BIRD POPULATION CENSUS
EXPERIMENTAL TREATMENT PLOT 102-12
ST. PASCAL, QUEBEC
11 - 20 MAY 1978

(Fenitrothion applied on 15 May at the emitted dosage rate of 0.210 kg AI/ha)

FAMILY	Pre-spray						Post DC-6 spray					
	May 11	May 12	May 13	May 14	May 15	Daily avg.	May 16	May 17	May 18	May 19	May 20	Daily avg.
	-4	-3	-2	-1	-0		+1	+2	+3	+4	+5	
Picidae	0	0	0	0	0	0.0	0	0	0	0	4	0.8
Paridae	0	4	0	0	0	0.8	0	0	2	2	2	1.2
Certhidae	0	0	0	0	0	0.0	2	2	2	0	2	1.6
Troglodytidae	0	0	0	0	2	0.4	0	0	0	0	2	0.4
Turdidae	2	0	2	5	4	2.6	0	1	4	4	2	2.2
Sylviidae	0	2	0	0	0	0.4	0	0	0	0	0	0.0
Vireonidae	0	0	0	0	0	0.0	0	4	4	2	2	2.4
Parulidae	0	0	4	10	2	3.2	2	7	7	7	10	6.6
Fringillidae	4	10	4	17	4	7.8	15	10	16	22	14	15.4
TOTAL BIRDS	6	16	10	32	12	15.2	19	24	35	37	38	30.6

TABLE XIII
FOREST BIRD POPULATION CENSUS
EXPERIMENTAL TREATMENT PLOT 102-12
ST. PASCAL, QUEBEC

(MATACIL® applied on 3 June at the emitted dosage rate of 0.052 kg AI/ha)

FAMILY	Pre-spray						Post Super Constellation spray					
	May 30	May 31	June 1	June 2	June 3	Daily avg.	June 4	June 5	June 6	June 7	June 8	Daily avg.
	-4	-3	-2	-1	-0		+1	+2	+3	+4	+5	
Tetraonidae	0	0	0	0	0	0.0	2	0	0	0	0	0.4
Picidae	2	0	0	1	0	0.6	4	0	2	0	2	1.6
Tyrannidae	0	4	0	0	2	1.2	2	4	2	0	0	1.6
Corvidae	3	0	0	0	0	0.6	0	0	0	2	0	0.4
Sittidae	6	0	0	2	0	1.6	2	0	0	2	4	1.6
Turdidae	2	4	7	5	3	4.2	9	4	4	7	13	7.4
Vireonidae	4	2	0	0	0	1.2	2	2	2	10	4	4.0
Parulidae	15	21	22	12	14	16.8	36	32	12	42	26	29.6
Fringillidae	13	14	5	1	10	8.6	24	10	6	7	8	11.0
TOTAL BIRDS	45	45	34	21	29	34.8	81	52	28	70	57	57.6

TABLE XIV
FOREST BIRD POPULATION CENSUS
EXPERIMENTAL TREATMENT PLOT 102-12
ST. PASCAL, QUEBEC
12 - 21 JUNE 1978

(MATACIL® applied on 16 June at the emitted dosage rate of 0.052 kg AI/ha)

FAMILY	Pre -spray						Post DC-3 spray					
	June 12	June 13	June 14	June 15	June 16	Daily avg.	June 17	June 18	June 19	June 20	June 21	Daily avg.
	-4	-3	-2	-1	-0		+1	+2	+3	+4	+5	
Picidae	0	0	0	0	0	0.0	0	2	0	0	2	0.8
Tyrannidae	0	4	0	2	0	1.2	0	0	0	0	0	0.0
Hirundinidae	0	0	0	0	0	0.0	1	0	0	0	0	0.2
Corvidae	0	0	2	0	2	0.8	4	0	0	0	0	0.8
Sittidae	2	0	0	0	4	1.2	2	4	2	0	0	1.6
Turdidae	8	8	8	4	15	8.6	15	12	16	12	15	14.0
Vireonidae	0	2	2	2	0	1.2	2	2	2	2	6	2.8
Parulidae	26	42	20	16	42	29.2	28	40	28	28	34	31.6
Fringillidae	6	18	9	17	14	12.8	11	17	14	8	8	11.6
TOTAL BIRDS	42	74	41	41	77	55.0	63	77	62	50	65	63.4

The nesting territories of five species were examined to determine possible disturbances resulting from the operation.

Ruby-crowned kinglet: Kinglets were actively defending territories on plots 102-11 and untreated control plot 1 prior to the initial operation (Figure 10) and no abandonment of territories resulted.

Swainson's thrush: Swainson's thrush migrated into the area after the initial applications and were recorded mainly on plots 102-11, 102-12 and untreated control plot 2 (Figure 11). No abandonment of territories is indicated.

Bay-breasted warbler: This small insectivorous warbler of the coniferous forest did not arrive until after the initial spray but was commonly observed on all plots for the remainder of the operation (Figure 12). Some decline or shift of territories outside plot boundaries is indicated on untreated control plot 1 following the second application, and on plot 102-12 following the third treatment. No evidence of pesticide-produced stress was observed within the bird community of plot 102-12 following this treatment.

Dark-eyed junco: Juncos were actively defending territories prior to the first treatment. Some movement around the plots was recorded, but no abandonment of territories is indicated (Figure 13).

White-throated sparrow: White-throated sparrows were already in territory prior to the first application and were recorded on all cencus plots (Figure 14). Territories remained occupied on plot 102-12, but declined somewhat on plot 102-11 and untreated plots 1 and 2. No pesticide stress symptoms were observed and no pesticide-induced abandonment of territories was indicated.

Figure 10. Nesting territories of the ruby-crowned kinglet on treated plots 102-11, 102-12 and two untreated control plots following budworm control operations by three different spray aircraft.

● nesting territory before spray
○ nesting territory after spray
• single sighting

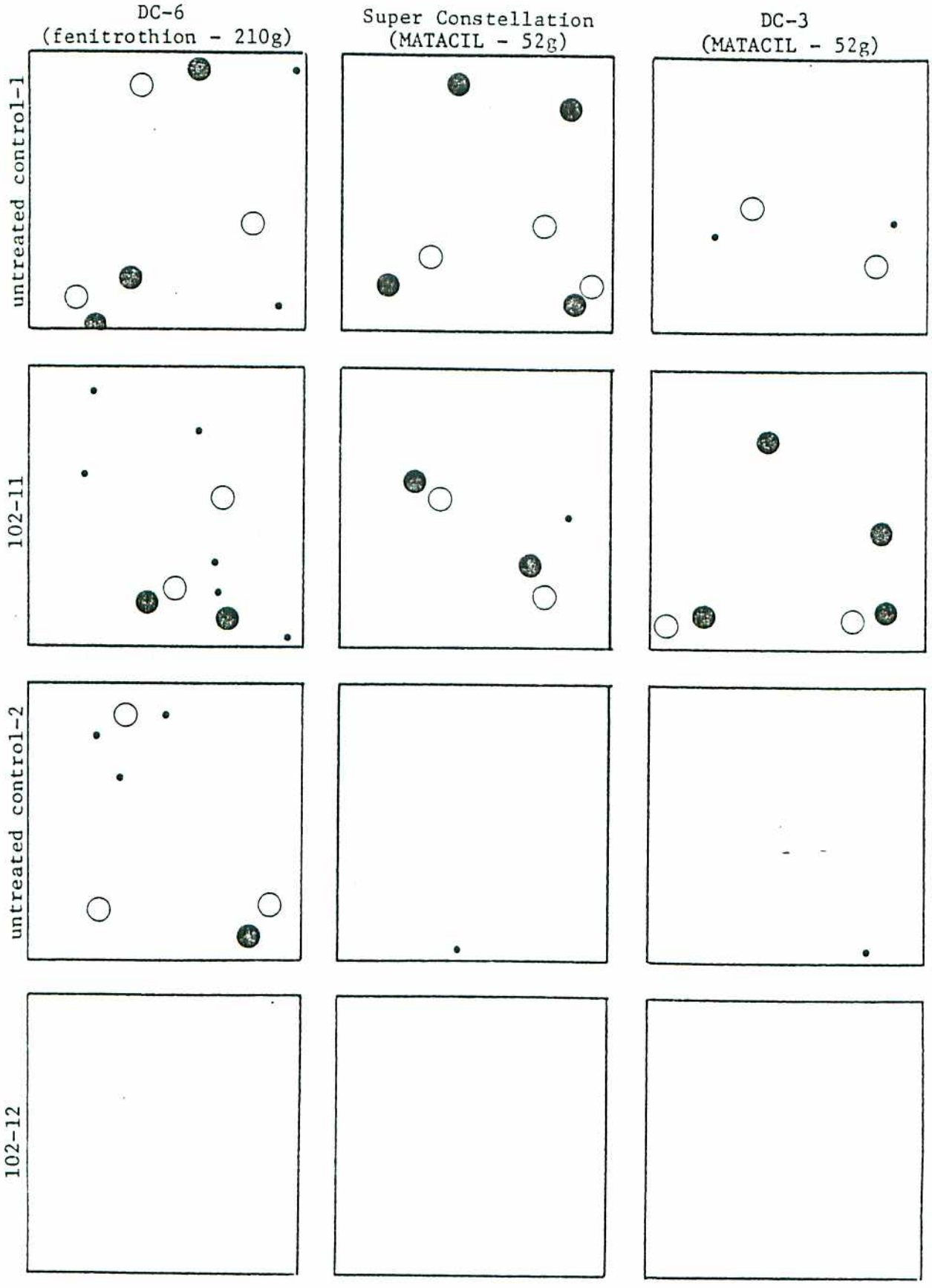

DC-6
(fenitrothion - 210g)
Super Constellation
(MATACIL - 52g)
DC-3
(MATACIL - 52g)
untreated control-1
102-11
untreated control-2
102-12

Figure 11 . Nesting territories of the Swainson's thrush on treated plots 102-11, 102-12 and two untreated control plots following budworm control operations by three different spray aircraft.

● nesting territory before spray
○ nesting territory after spray
• single sighting

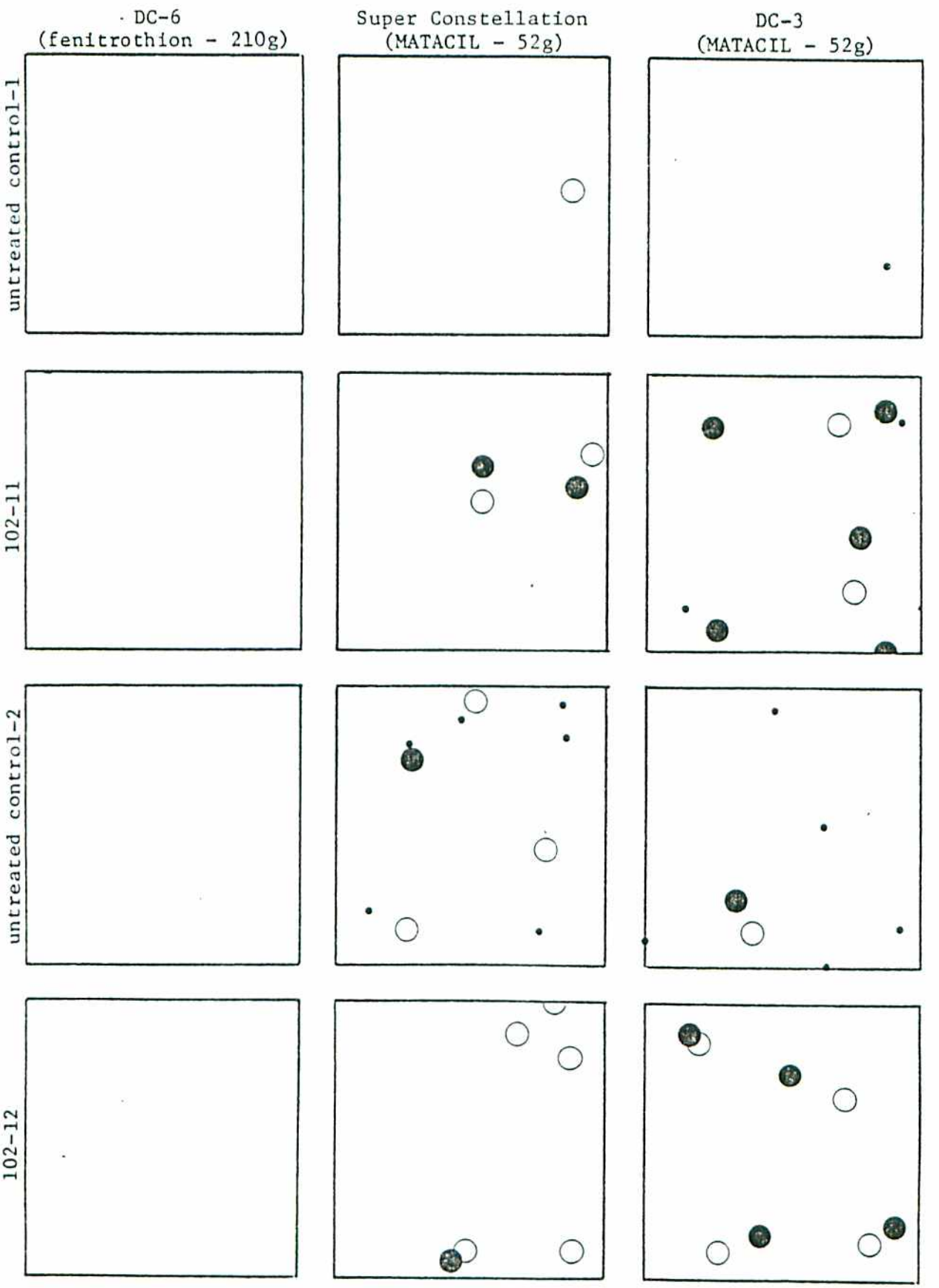

DC-6
(fenitrothion - 210g)
Super Constellation
(MATACIL - 52g)
DC-3
(MATACIL - 52g)
untreated control-1
102-11
untreated control-2
102-12

Figure 12. Nesting territories of the bay-breasted warbler on treated plots 102-11, 102-12 and two untreated control plots following budworm control operations by three different spray aircraft.

● nesting territory before spray
○ nesting territory after spray
• single sighting

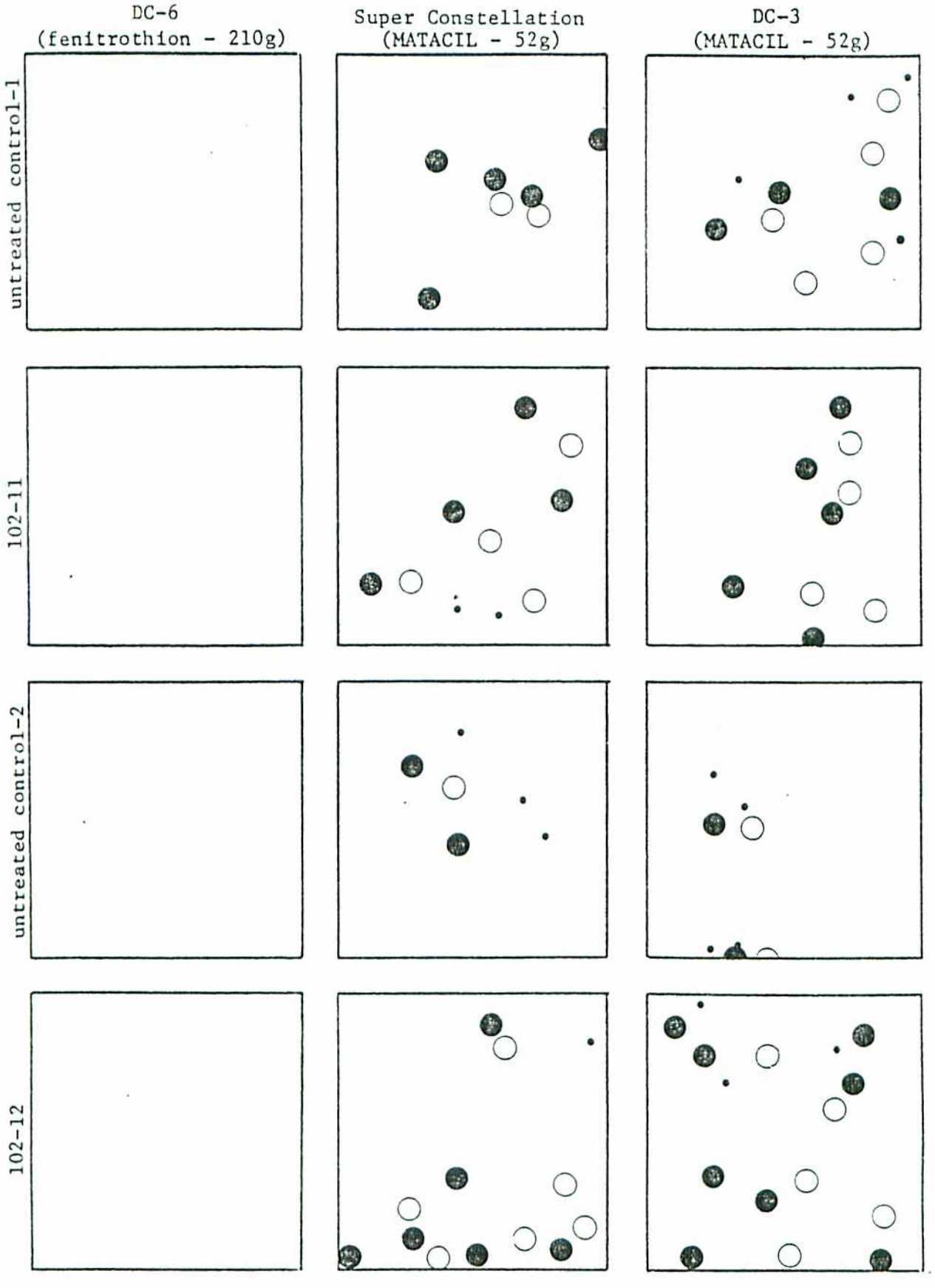
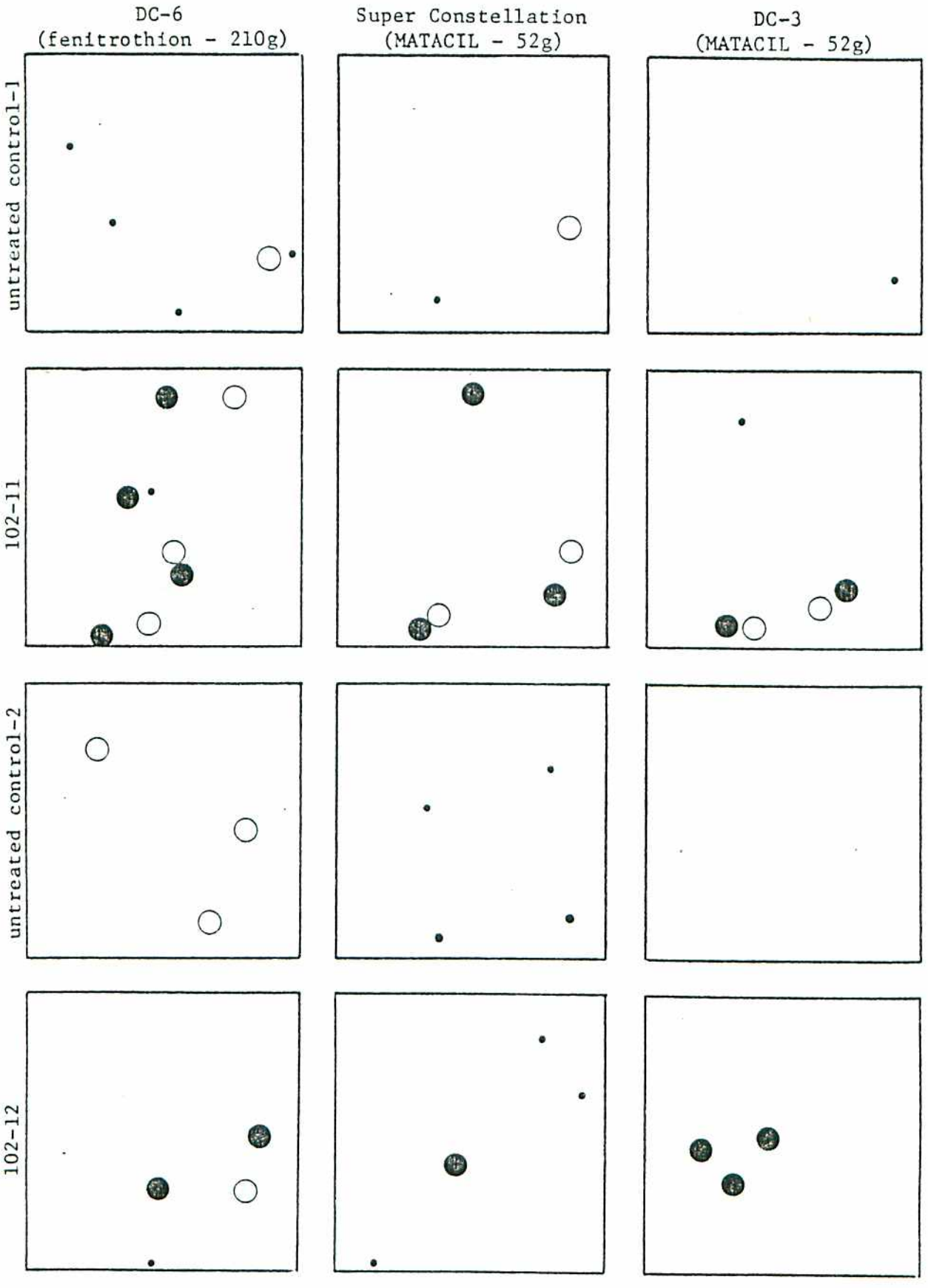

DC-6
(fenitrothion - 210g)
Super Constellation
(MATACIL - 52g)
DC-3
(MATACIL - 52g)
untreated control-1
102-11
untreated control-2
102-12

Figure 13 . Nesting territories of the dark-eyed junco on treated plots 102-11, 102-12 and two untreated control plots following budworm control operations by three different spray aircraft.

● nesting territory before spray
○ nesting territory after spray
• single sighting


DC-6
(fenitrothion - 210g)
Super Constellation
(MATACIL - 52g)
DC-3
(MATACIL - 52g)
untreated control-1
102-11
untreated control-2
102-12

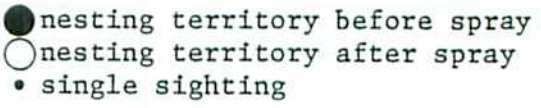
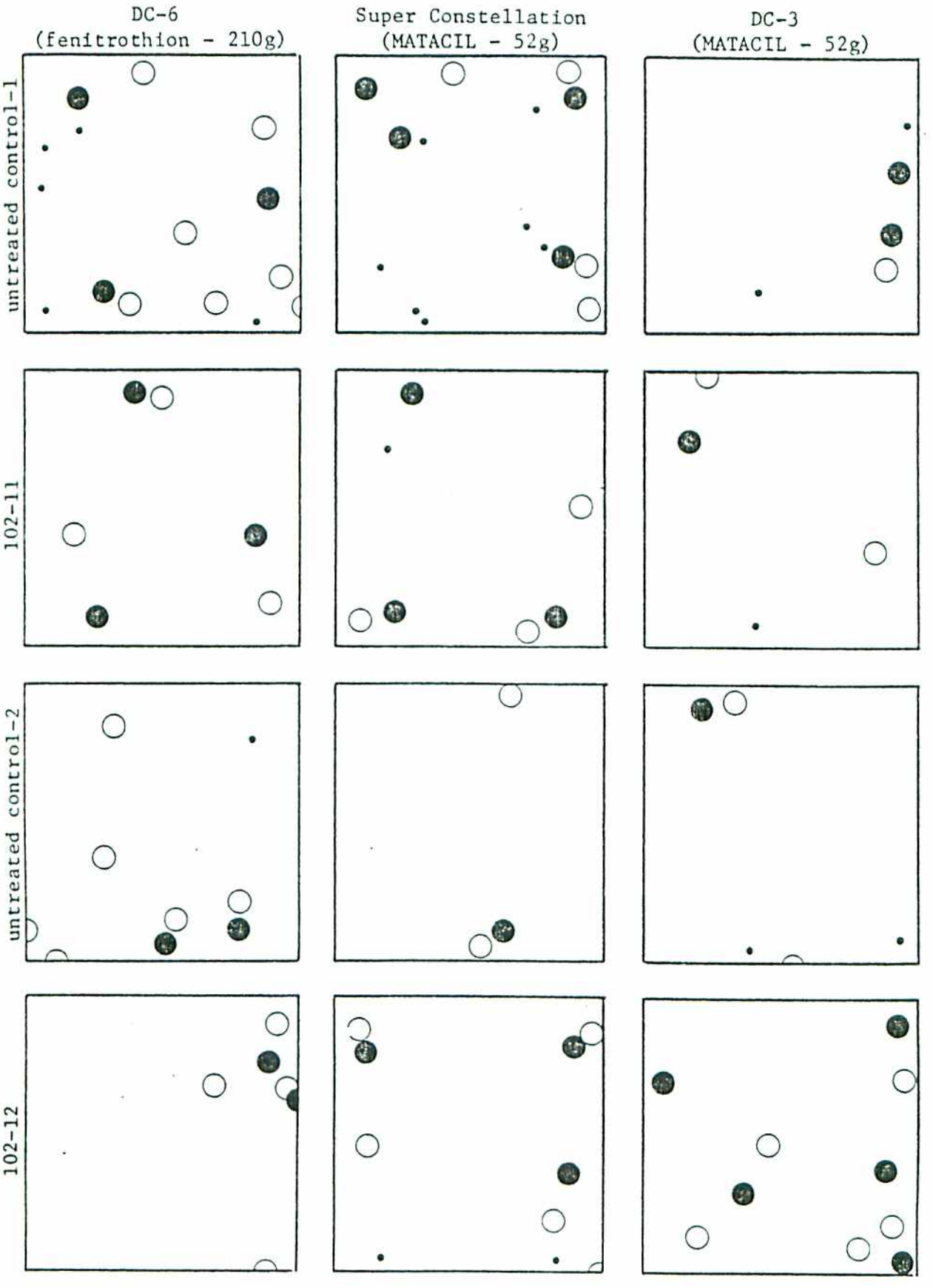


Figure 14. Nesting territories of the white-throated sparrow on treated plots 102-11, 102-12 and two untreated control plots following budworm control operations by three different spray aircraft.


DC-6
(fenitrothion - 210g)
Super Constellation
(MATACIL - 52g)
DC-3
(MATACIL - 52g)
untreated control-1
102-11
untreated control-2
102-12

CONCLUSIONS

The data collected during budworm control operations on block 102 indicates that neither the 1977 or 1978 sequential treatment regimes caused any immediate or short-term impact to forest avifauna. Daily population and activity fluctuations resulted from such incidents as varied weather conditions, the foraging of flocks of birds through plots, or the occasional absence of individual birds from territories at census time.

The nesting territories of several species were plotted and remained occupied throughout the operations, although shifting of territories resulted in the relocation of some territories outside plot boundaries.

In both 1977 and 1978, many migrants had not returned at the time of the earlier insecticide treatments, and this effectively protected them from any direct adverse effects.

The three different aircraft used to apply the three applications of insecticide to block 102 in 1978 did not adversely affect forest avifauna.

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APPENDIX

FOREST BIRD POPULATIONS

TREATMENT PLOT 102

LOWER ST. LAWRENCE REGION OF QUEBEC

1977 - 1978

Appendix table 1
Forest bird population census
Untreated control plot
St. Pascal, Quebec
5 May - 1 June 1977

Family	Species	post phosphamidon spray				post fenitrothion spray						pre MATACIL® spray					post MATACIL® spray					
		May 5 +1	May 6 +2	May 7 +3	Daily avg.	May 8 +1	May 9 +2	May 10 +3	May 11 +4	May 12 +5	Daily avg.	May 24 -3	May 25 -2	May 26 -1	May 27 -0	Daily avg.	May 28 +1	May 29 +2	May 30 +3	May 31 +4	June 1 +5	Daily avg.
Anatidae	Blue-winged Teal	0	0	0	0.0	0	0	0	0	0	0.0	1	1	1	0	0.8	1	1	0	1	1	0.8
Ardeidae	American Bittern	2	0	2	1.3	2	4	2	2	2	2.4	0	0	0	0	0.0	0	0	0	0	0	0.0
Accipitridae	Sharp-shinned Hawk	0	0	0	0.0	0	0	0	1	0	0.2	0	0	0	0	0.0	0	0	0	0	0	0.0
	Marsh Hawk	0	0	0	0.0	0	0	2	0	0	0.4	0	0	0	0	0.0	0	0	0	2	0	0.4
Scolopacidae	Common Snipe	0	0	0	0.0	0	1	1	0	3	1.0	0	0	0	0	0.0	0	1	0	1	1	0.6
Picidae	Hairy Woodpecker	0	0	0	0.0	0	0	0	0	0	0.0	0	0	0	0	0.0	0	0	2	0	2	0.8
Tyrannidae	Yellow-bellied Flycatcher	0	0	0	0.0	0	0	0	0	0	0.0	0	2	4	2	2.0	0	0	2	0	0	0.4
	Least Flycatcher	0	0	0	0.0	0	0	0	0	0	0.0	2	0	0	0	0.5	0	0	0	0	0	0.0
	Olive-sided Flycatcher	0	0	0	0.0	0	0	0	0	0	0.0	0	0	0	0	0.0	2	0	2	2	0	1.2
Corvidae	Blue Jay	0	0	0	0.0	1	1	2	1	0	1.0	2	1	1	0	1.0	1	0	0	0	0	0.2
	Common Raven	0	0	0	0.0	0	0	1	0	0	0.2	0	1	0	0	0.3	0	0	1	0	0	0.2
Paridae	Black-capped Chickadee	0	0	0	0.0	0	0	0	0	2	0.4	0	0	0	0	0.0	0	0	0	0	0	0.0
Sittidae	Red-breasted Nuthatch	0	1	3	1.3	0	1	1	1	1	0.8	0	0	0	0	0.0	0	2	0	0	0	0.4
Mimidae	Catbird	0	0	0	0.0	0	0	0	0	0	0.0	2	0	0	0	0.5	0	0	0	0	0	0.0
Turdidae	American Robin	1	1	0	0.7	4	6	5	3	6	4.8	6	3	4	3	4.0	3	3	5	2	4	3.4
	Hermit Thrush	0	0	1	0.3	3	2	2	2	2	2.2	4	4	4	2	3.5	0	0	0	0	0	0.0
	Swainson's Thrush	0	0	0	0.0	0	0	0	0	0	0.0	0	0	0	0	0.0	3	0	0	1	1	1.0
	Veery	0	0	0	0.0	0	0	0	0	0	0.0	0	6	2	2	2.5	2	2	2	0	2	1.6
Sylviidae	Golden-crowned Kinglet	0	0	0	0.0	0	0	0	0	0	0.0	0	2	0	2	1.0	0	0	0	0	0	0.0
	Ruby-crowned Kinglet	4	3	6	4.3	4	4	5	3	10	5.2	4	4	2	2	3.0	4	2	5	2	0	2.6
Vireonidae	Solitary Vireo	0	0	0	0.0	0	0	0	0	0	0.0	0	0	0	0	0.0	0	2	2	2	0	1.2

Appendix table I (cont'd)

Family	Species	post phosphamidon spray				post fenitrothion spray						pre MATACIL® spray					post MATACIL® spray					
		May 5 +1	May 6 +2	May 7 +3	Daily avg.	May 8 +1	May 9 +2	May 10 +3	May 11 +4	May 12 +5	Daily avg.	May 24 -3	May 25 -2	May 26 -1	May 27 -0	Daily avg.	May 28 +1	May 29 +2	May 30 +3	May 31 +4	June 1 +5	Daily avg.
Parulidae	Tennessee Warbler	0	0	0	0.0	0	0	0	0	0	0.0	10	5	9	6	7.5	6	6	8	5	2	5.4
	Nashville Warbler	0	0	0	0.0	0	0	0	0	0	0.0	2	0	0	2	1.0	4	2	4	4	4	3.6
	Magnolia Warbler	0	0	0	0.0	0	0	0	0	0	0.0	4	2	2	2	2.5	4	4	12	10	7	7.4
	Cape May Warbler	0	0	0	0.0	0	0	0	0	0	0.0	8	6	4	4	5.5	4	0	4	0	8	3.2
	Black-throated Blue Warbler	0	0	0	0.0	0	0	0	0	0	0.0	0	0	0	0	0.0	2	0	0	0	0	0.4
	Yellow-rumped Warbler	4	2	2	2.7	2	2	4	2	2	2.4	4	4	5	2	3.8	2	5	4	2	2	3.0
	Black-throated Green Warbler	0	0	0	0.0	0	0	0	0	0	0.0	2	0	0	0	0.0	0	0	0	0	0	0.0
	Bay-breasted Warbler	0	0	0	0.0	0	0	0	0	0	0.0	6	2	8	8	6.0	9	11	10	8	4	8.4
	Ovenbird	0	0	0	0.0	0	0	0	0	0	0.0	0	6	4	2	3.0	2	2	2	2	4	2.4
	Northern Waterthrush	0	0	0	0.0	0	0	0	2	0	0.4	0	0	0	0	0.0	0	0	0	0	0	0.0
	Common Yellowthroat	0	0	0	0.0	0	0	0	0	0	0.0	4	4	2	2	3.0	2	6	6	2	2	3.6
	Wilson's Warbler	0	0	0	0.0	0	0	0	0	0	0.0	0	0	0	2	0.5	2	2	0	2	0	1.2
	Canada Warbler	0	0	0	0.0	0	0	0	0	0	0.0	4	0	4	2	2.5	2	2	4	2	2	2.4
	American Redstart	0	0	0	0.0	0	0	0	0	0	0.0	0	10	8	4	5.5	2	0	0	0	0	0.4
Icteridae	Redwinged Blackbird	12	16	10	12.7	12	16	12	17	12	13.8	13	18	16	19	16.5	14	14	13	12	11	12.8
	Common Grackle	0	0	0	0.0	0	0	0	0	0	0.0	1	1	0	3	1.3	1	0	1	0	0	0.4
	Brown-headed Cowbird	10	4	5	6.3	3	3	0	4	4	2.8	3	4	3	0	2.5	1	2	2	2	3	2.0
Thraupidae	Scarlet Tanager	0	0	0	0.0	0	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	2	0	0.4
Fringillidae	Rose-breasted Grosbeak	0	0	0	0.0	0	0	0	0	0	0.0	0	0	3	0	0.8	1	0	2	0	0	0.6
	Evening Grosbeak	0	7	0	2.3	0	0	0	0	0	0.0	0	0	1	0	0.3	0	0	0	0	0	0.0
	Purple Finch	2	2	2	2.0	4	0	2	6	2	2.8	2	6	0	5	3.3	3	0	1	0	5	1.8
	Pine Siskin	0	0	0	0.0	0	0	0	0	0	0.0	0	3	0	0	0.8	0	0	0	0	0	0.0
	Dark-eyed Junco	5	4	4	4.3	2	2	0	0	1	1.0	4	1	1	3	2.3	3	3	2	3	2	2.6
	Chipping Sparrow	0	0	0	0.0	0	2	0	0	0	0.4	2	2	2	2	2.0	0	4	0	0	1	1.0
	White-crowned Sparrow	0	0	0	0.0	0	2	0	0	0	0.4	0	0	0	0	0.0	0	0	0	0	0	0.0
	Lincoln's Sparrow	0	0	0	0.0	0	0	0	0	0	0.0	0	0	0	0	0.0	2	0	2	2	2	1.6
	White-throated Sparrow	6	2	8	5.3	7	6	5	9	9	7.2	16	11	8	7	10.5	12	6	12	8	4	8.4
	Swamp Sparrow	0	2	6	2.7	4	6	6	8	4	5.6	4	4	4	2	3.5	6	2	0	0	2	2.0
	Song Sparrow	0	0	0	0.0	1	0	3	2	2	1.6	2	2	4	2	2.5	0	1	0	0	0	0.2
Unidentified birds		0	0	0	0.0	0	0	0	0	0	0.0	3	0	0	1	1.0	0	0	2	4	4	2.0
Total Birds		46	44	49	46.3	49	58	53	63	62	57.0	115	115	106	93	107.3	100	85	112	83	80	92.0

Appendix table II
Forest bird population census
Experimental plot 102
St. Pascal, Quebec
5 May - 1 June 1977

Family	Species	post phosphamidon spray				post fenitrothion spray						pre MATACIL® spray					post MATACIL® spray					
		May 5 +1	May 6 +2	May 7 +3	Daily avg.	May 8 +1	May 9 +2	May 10 +3	May 11 +4	May 12 +5	Daily avg.	May 24 -3	May 25 -2	May 26 -1	May 27 -0	Daily avg.	May 28 +1	May 29 +2	May 30 +3	May 31 +4	June 1 +5	Daily avg.
Accipitridae	Sharp-shinned Hawk	0	0	0	0.0	0	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	1	0.2
Tetraonidae	Ruffed Grouse	0	0	0	0.0	0	0	0	0	2	0.4	4	2	0	4	2.5	2	2	2	2	0	1.6
Scolopacidae	American Woodcock	0	0	1	0.3	0	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0	0.0
Picidae	Common Flicker	0	2	0	0.7	0	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	0	0.0
	Pileated Woodpecker	0	0	0	0.0	0	0	0	1	0	0.2	0	0	0	0	0.0	0	0	0	0	0	0.0
Corvidae	Common Raven	0	0	0	0.0	0	0	0	0	0	0.0	0	0	0	0	0.0	0	0	1	0	0	0.2
Paridae	Black-capped Chickadee	0	0	0	0.0	1	0	2	0	0	0.6	0	0	0	0	0.0	0	0	0	0	0	0.0
	Boreal Chickadee	0	0	0	0.0	0	0	0	0	0	0.0	2	0	0	3	1.3	0	0	0	0	0	0.0
Turdidae	American Robin	2	6	5	4.3	2	6	7	7	5	5.4	5	2	6	5	4.5	7	6	1	5	2	4.2
	Wood Thrush	0	0	0	0.0	0	0	0	0	0	0.0	2	8	4	0	3.5	2	0	4	2	0	1.6
	Hermit Thrush	0	2	0	0.7	0	0	0	0	1	0.2	3	3	1	0	1.8	2	0	1	0	1	0.8
	Swainson's Thrush	0	0	0	0.0	0	0	0	0	0	0.0	0	0	0	0	0.0	1	0	2	0	2	1.0
	Veery	0	0	0	0.0	0	0	0	0	0	0.0	0	0	2	0	0.5	0	1	0	1	3	1.0
Sylviidae	Ruby-crowned Kinglet	2	2	0	1.3	0	0	1	2	2	1.0	2	0	2	0	1.0	2	0	2	2	0	1.2
Vireonidae	Solitary Vireo	0	0	0	0.0	0	0	0	0	0	0.0	0	0	0	0	0.0	0	0	2	0	0	0.4
	Red-eyed Vireo	0	0	0	0.0	0	0	0	0	0	0.0	4	4	0	0	2.0	0	0	4	2	2	1.6
	Philadelphia Vireo	0	0	0	0.0	0	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	2	0.4
Parulidae	Black-and-white Warbler	0	0	0	0.0	0	0	0	0	0	0.0	0	0	2	2	1.0	2	0	0	2	0	0.8
	Tennessee Warbler	0	0	0	0.0	0	0	0	0	0	0.0	12	12	6	8	9.5	8	10	8	6	12	8.8
	Nashville	0	0	0	0.0	0	0	0	0	0	0.0	0	2	0	0	0.5	0	0	0	2	0	0.4
	Magnolia Warbler	0	0	0	0.0	0	0	0	0	0	0.0	2	6	2	4	3.5	2	4	4	4	4	3.6
	Cape May Warbler	0	0	0	0.0	0	0	0	0	0	0.0	8	8	2	6	6.0	7	5	5	5	4	5.2
	Yellow-rumped Warbler	0	0	0	0.0	0	0	0	0	0	0.0	0	0	0	0	0.0	0	1	0	2	0	0.6
	Black-throated Green Warbler	0	0	0	0.0	0	0	0	0	0	0.0	2	0	0	0	0.5	0	0	0	0	0	0.0
	Bay-breasted Warbler	0	0	0	0.0	0	0	0	0	0	0.0	0	8	4	0	3.0	4	2	2	6	2	3.2
	Pine Warbler	0	0	0	0.0	0	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0	0	2	0.4
	Ovenbird	0	0	0	0.0	0	0	0	0	0	0.0	4	2	2	0	2.0	2	0	2	0	4	1.6
	Canada Warbler	0	0	0	0.0	0	0	0	0	0	0.0	0	0	0	0	0.0	0	0	1	4	6	2.2
	American Redstart	0	0	0	0.0	0	0	0	0	0	0.0	8	6	4	6	6.0	4	4	6	6	4	4.8
Icteridae	Rusty Blackbird	0	0	0	0.0	0	0	3	0	0	0.6	0	0	0	0	0.0	0	0	0	0	0	0.0
	Brown-headed Cowbird	2	2	0	1.3	1	0	0	0	1	0.4	0	0	0	0	0.0	0	0	0	0	0	0.0
Fringillidae	Evening Grosbeak	0	1	0	0.3	1	3	0	0	2	1.2	12	2	7	18	9.8	17	12	9	7	4	9.8
	Purple Finch	0	0	0	0.0	0	0	0	0	0	0.0	0	0	0	0	0.0	0	0	1	2	0	0.6
	Pine Siskin	4	3	0	2.3	6	0	1	0	28	7.0	0	0	0	0	0.0	0	0	0	0	0	0.0
	American Goldfinch	0	0	0	0.0	0	0	0	0	0	0.0	1	0	0	0	0.3	0	0	0	0	0	0.0
	Dark-eyed Junco	0	2	0	0.7	0	0	0	0	4	0.8	0	2	1	0	0.8	1	0	0	0	0	0.2
	White-throated Sparrow	4	1	2	2.3	4	5	3	3	8	4.6	4	7	9	6	6.5	8	3	3	9	5	5.6
Unidentified birds		3	0	0	1.0	0	2	0	0	0	0.4	0	0	0	2	0.5	0	0	0	0	0	0.0
Total Birds		17	21	8	15.3	15	16	17	13	53	22.8	75	74	54	64	66.8	71	50	60	69	60	62.0

Appendix table III
Forest bird population census
Untreated control plot-1
St. Pascal, Quebec
11-20 May 1978

(fenitrothion applied on 15 May to experimental block 102)

Family	Species	Pre-spray						Post DC-6 spray					
		May 11	May 12	May 13	May 14	May 15	Daily	May 16	May 17	May 18	May 19	May 20	Daily
		-4	-3	-2	-1	-0	avg.	+1	+2	+3	+4	+5	avg.
Ardeidae	American Bittern	0	2	2	2	2	1.6	2	2	2	2	2	2.0
Accipitridae	Marsh Hawk	0	0	0	0	0	0.0	0	1	0	0	0	0.2
Scolopacidae	Common Snipe	0	0	0	0	2	0.4	0	0	2	1	0	0.6
Alcedinidae	Belted Kingfisher	0	0	0	0	2	0.4	0	0	0	0	0	0.0
Picidae	Common Flicker	0	4	2	2	2	2.0	2	2	0	0	4	1.6
	Hairy Woodpecker	0	0	0	0	0	0.0	0	1	1	0	1	0.6
Hirundinidae	Tree Swallow	0	0	0	0	0	0.0	0	4	0	0	0	0.8
Corvidae	Gray Jay	0	0	0	0	0	0.0	1	0	0	0	0	0.2
	Blue Jay	0	0	0	0	0	0.0	0	2	0	0	1	0.6
	Common Raven	0	0	0	1	0	0.2	0	0	0	0	0	0.0
Turdidae	American Robin	1	6	1	1	4	2.6	3	4	4	4	7	4.4
Sylviidae	Golden-crowned Kinglet	0	0	0	0	0	0.0	0	2	0	0	0	0.4
	Ruby-crowned Kinglet	6	6	6	4	2	4.8	4	4	3	8	1	4.0
Vireonidae	Solitary Vireo	0	0	0	2	0	0.4	0	0	1	0	0	0.2

Appendix table III (cont'd)

Family	Species	Pre-spray May 11 -4	May 12 -3	May 13 -2	May 14 -1	May 15 -0	Daily avg.	Post DC-6 spray May 16 +1	May 17 +2	May 18 +3	May 19 +4	May 20 +5	Daily avg.
Parulidae	Nashville Warbler	0	0	0	4	4	1.6	0	2	4	6	6	3.6
	Parula Warbler	0	0	0	0	0	0.0	0	0	0	0	2	0.4
	Cape May Warbler	0	0	0	4	2	1.2	4	10	8	0	6	5.6
	Yellow-rumped Warbler	4	12	8	4	4	6.4	6	6	8	4	8	6.4
	Blackburnian Warbler	0	0	0	0	0	0.0	0	0	1	0	0	0.2
	Ovenbird	0	0	0	0	0	0.0	0	4	0	2	2	1.6
	Northern Waterthrush	0	0	2	0	0	0.4	0	2	2	2	0	1.2
Icteridae	Redwinged Blackbird	2	8	5	10	18	8.6	10	10	8	10	6	8.8
	Rusty Blackbird	0	1	7	2	1	2.2	0	0	0	1	0	0.2
	Common Grackle	0	0	0	0	0	0.0	2	0	2	0	0	0.8
	Brown-headed Cowbird	0	3	0	7	4	2.8	2	2	0	0	0	0.8
Fringillidae	Evening Grosbeak	0	0	0	0	0	0.0	0	2	3	0	6	2.2
	Purple Finch	2	2	1	7	1	2.6	0	0	4	0	0	0.8
	Vesper Sparrow	0	0	0	0	0	0.0	0	1	0	0	0	0.2
	Dark-eyed Junco	2	0	0	0	0	0.4	0	7	2	0	0	1.8
	Chipping Sparrow	0	0	4	0	0	0.8	0	0	6	2	3	2.2
	White-crowned Sparrow	0	0	0	3	0	0.6	1	0	0	0	0	0.2
	White-throated Sparrow	2	4	6	5	4	4.2	5	9	12	12	6	8.8
	Swamp Sparrow	0	2	0	8	12	4.4	6	6	6	6	6	6.0
	Song Sparrow	0	2	4	4	0	2.0	0	0	0	0	0	0.0
Unidentified birds		0	0	0	0	1	0.2	1	0	0	0	2	0.6
Total Birds		19	52	48	70	65	50.8	49	83	79	60	69	68.0

Appendix table IV
Forest bird population census
Untreated control plot-1
St. Pascal, Quebec
31 May - 10 June 1978

(MATACIL® applied on 4 June to experimental block 102)

Family	Species	Pre-spray						Post Super Constellation spray					
		May 31 -4	June 1 -3	June 2 -2	June 3 -1	June 4 -0	Daily avg.	June 5 +1	June 6 +2	June 7 +3	June 8 +4	June 10 +6	Daily avg.
Ardeidae	American Bittern	2	0	0	1	2	1.0	2	0	0	2	0	0.8
Alcedinidae	Belted Kingfisher	1	0	0	0	0	0.2	0	0	0	0	0	0.0
Picidae	Common Flicker	0	0	0	0	0	0.0	0	0	2	0	0	0.4
Tyrannidae	Least Flycatcher	2	0	0	0	0	0.4	2	0	2	0	0	0.8
Corvidae	Gray Jay	0	0	0	0	2	0.4	0	0	0	0	0	0.0
	Blue Jay	0	0	0	0	0	0.0	0	0	2	0	0	0.4
	Common Raven	0	0	1	0	0	0.2	1	0	0	1	0	0.4
	Common Crow	0	0	1	0	0	0.2	1	0	0	0	0	0.2
Paridae	Black-capped Chickadee	0	0	0	0	0	0.0	2	0	0	0	0	0.4
	Boreal Chickadee	0	0	0	0	0	0.0	2	0	0	0	0	0.4
Sittidae	Red-breasted Nuthatch	0	0	0	0	0	0.0	2	0	0	0	0	0.4
Mimidae	Catbird	0	0	0	0	2	0.4	2	2	2	0	2	1.6
Turdidae	American Robin	5	4	2	2	2	3.0	6	2	2	2	0	2.4
	Hermit Thrush	4	0	0	0	5	1.8	0	0	0	0	0	0.0
	Swainson's Thrush	0	0	0	0	2	0.4	1	0	0	1	0	0.4
	Veery	4	2	2	2	0	2.0	2	2	5	2	0	2.2
Sylviidae	Golden-crowned Kinglet	0	0	2	2	2	1.2	0	0	0	0	0	0.0
	Ruby-crowned Kinglet	4	8	4	4	2	4.4	6	4	4	2	4	4.0
Vireonidae	Red-eyed Vireo	0	0	0	0	0	0.0	0	2	0	0	0	0.4

Appendix table IV (cont'd)

Family	Species	Pre-spray						Post Super Constellation spray					
		May 31 -4	June 1 -3	June 2 -2	June 3 -1	June 4 -0	Daily avg.	June 5 +1	June 6 +2	June 7 +3	June 8 +4	June 10 +6	Daily avg.
Parulidae	Black-and-white Warbler	0	0	0	2	0	0.4	0	0	0	2	0	0.4
	Tennessee Warbler	16	10	8	6	8	9.6	10	10	4	6	4	6.8
	Nashville Warbler	0	0	2	2	4	1.6	2	4	0	0	4	2.0
	Parula Warbler	2	2	0	2	0	1.2	2	0	0	0	0	0.4
	Magnolia Warbler	8	6	8	5	12	7.8	4	4	8	2	6	4.8
	Cape May Warbler	4	4	6	6	6	5.2	8	10	10	8	10	9.2
	Yellow-rumped Warbler	0	1	2	2	4	1.8	0	2	4	0	0	1.2
	Blackburnian Warbler	2	2	0	0	4	1.6	0	4	2	4	2	2.4
	Bay-breasted Warbler	8	6	2	4	4	4.8	0	4	4	0	4	2.4
	Ovenbird	2	0	0	2	2	1.2	4	4	2	2	2	2.8
	Northern Waterthrush	0	2	0	0	0	0.4	2	0	0	2	0	0.8
	Common Yellowthroat	0	2	0	0	0	0.4	4	0	2	0	0	1.2
	Canada Warbler	0	2	0	0	2	0.8	0	4	0	0	0	0.8
Icteridae	Redwinged Blackbird	15	17	13	11	13	13.8	10	13	15	14	13	13.0
	Common Grackle	0	2	0	2	2	1.2	0	2	2	0	2	1.2
	Brown-headed Cowbird	0	0	0	0	0	0.0	0	2	0	2	0	0.8
Fringillidae	Rose-breasted Grosbeak	4	6	2	4	0	3.2	3	6	2	4	2	3.4
	Evening Grosbeak	0	1	1	0	1	0.6	0	0	0	0	1	0.2
	Purple Finch	0	0	0	2	0	0.4	4	2	0	0	2	1.6
	Dark-eyed Junco	0	2	0	0	2	0.8	0	0	1	0	0	0.2
	Chipping Sparrow	0	0	4	2	0	1.2	2	0	4	0	0	1.2
	White-throated Sparrow	9	6	9	4	6	6.8	2	11	7	0	3	4.6
	Swamp Sparrow	2	0	2	0	2	1.2	0	0	2	0	0	0.4
Total Birds		94	85	71	67	91	81.6	86	94	88	56	61	77.0

Appendix table V
Forest bird population census
Untreated control plot-1
St. Pascal, Quebec
12-21 June 1978

(MATACIL® applied on 16 June to experimental plot 102)

Family	Species	Pre-spray						Post DC-3 spray					
		June 12	June 13	June 14	June 15	June 16	Daily	June 17	June 18	June 19	June 20	June 21	Daily
		-4	-3	-2	-1	-0	avg.	+1	+2	+3	+4	+5	avg.
Ardeidae	American Bittern	1	0	0	2	2	1.0	2	0	0	0	0	0.4
Anatidae	Black Duck	0	0	0	0	0	0.0	2	0	0	0	0	0.4
Picidae	Common Flicker	0	0	0	0	1	0.2	0	0	0	0	0	0.0
Tyrannidae	Least Flycatcher	0	2	2	2	2	1.6	2	0	4	4	4	2.8
	Olive-sided Flycatcher	0	2	0	0	0	0.4	2	0	0	0	0	0.4
Corvidae	Gray Jay	1	0	0	0	0	0.2	0	0	0	0	0	0.0
	Common Raven	1	1	0	0	2	0.8	1	0	0	0	0	0.2
Sittidae	Red-breasted Nuthatch	0	2	0	0	0	0.4	0	0	0	0	0	0.0
Mimidae	Catbird	2	2	2	2	2	2.0	2	2	2	0	2	1.6
Turdidae	American Robin	2	5	5	5	8	5.0	2	6	7	6	5	5.2
	Swainson's Thrush	0	0	0	0	1	0.2	0	0	0	0	2	0.4
	Veery	0	2	0	2	2	1.2	2	0	0	4	2	1.6
Sylviidae	Golden-crowned Kinglet	2	0	0	2	0	0.8	0	0	0	0	0	0.0
	Ruby-crowned Kinglet	0	2	2	0	2	1.2	4	2	2	0	0	1.6
Bombycillidae	Cedar Waxwing	2	1	0	2	2	1.4	2	3	2	2	0	1.8
Vireonidae	Red-eyed Vireo	0	0	0	0	0	0.0	2	0	0	0	0	0.4

Appendix table V (cont'd)

Family	Species	Pre-spray June 12 -4	June 13 -3	June 14 -2	June 15 -1	June 16 -0	Daily avg.	Post DC-3 spray June 17 +1	June 18 +2	June 19 +3	June 20 +4	June 21 +5	Daily avg.
Parulidae	Tennessee Warbler	0	4	0	4	6	2.8	4	4	6	2	0	3.2
	Nashville Warbler	4	2	4	2	2	2.8	2	0	4	4	0	2.0
	Parula Warbler	2	2	0	2	2	1.6	2	2	2	2	2	2.0
	Magnolia Warbler	0	4	2	0	4	2.0	2	0	2	2	4	2.0
	Cape May Warbler	6	6	2	4	6	4.8	4	6	4	0	6	4.0
	Yellow-rumped Warbler	4	0	0	0	2	1.2	0	0	0	2	2	0.8
	Blackburnian Warbler	0	0	0	0	0	0.0	0	0	2	2	0	0.8
	Bay-breasted Warbler	4	4	2	8	4	4.4	12	8	6	6	14	9.2
	Ovenbird	4	2	2	2	2	2.4	5	2	2	4	4	3.4
	Common Yellowthroat	0	4	0	0	6	2.0	2	6	4	0	2	2.8
	Canada Warbler	2	2	0	6	0	2.0	2	2	2	0	0	1.2
Icteridae	Redwinged Blackbird	16	18	16	17	18	17.0	12	19	15	14	12	14.4
	Common Grackle	3	0	3	0	0	1.2	0	0	4	0	0	0.8
	Brown-headed Cowbird	0	0	0	0	2	0.4	4	0	0	2	0	1.2
Fringillidae	Rose-breasted Grosbeak	4	6	2	2	2	3.2	0	0	2	0	0	0.4
	Evening Grosbeak	1	0	2	2	3	1.6	0	1	2	2	1	1.2
	Purple Finch	0	0	2	2	0	0.8	4	0	0	2	0	1.2
	Pine Grosbeak	0	0	2	0	0	0.4	0	0	3	0	0	0.6
	Dark-eyed Junco	0	0	0	0	0	0.0	0	0	1	0	0	0.2
	Chipping Sparrow	0	0	0	0	0	0.0	0	0	0	0	1	0.2
	White-throated Sparrow	0	4	2	2	3	2.2	0	3	0	2	0	1.0
Unidentified birds		0	0	0	0	0	0.0	1	0	0	0	0	0.2
Total Birds		61	77	52	70	86	69.2	79	66	78	62	63	69.6

Appendix table VI
Forest bird population census
Experimental treatment plot 102-11
St. Pascal, Quebec
11-20 May 1978

(fenitrothion applied on the evening of 15 May at the emitted dosage rate of 0.210 kg AI/ha)

Family	Species	Pre-spray						Post DC-6 spray					
		May 11 -4	May 12 -3	May 13 -2	May 14 -1	May 15 -0	Daily avg.	May 16 +1	May 17 +2	May 18 +3	May 19 +4	May 20 +5	Daily avg.
Tetraonidae	Ruffed Grouse	0	2	0	0	0	0.4	0	0	0	0	0	0.0
Picidae	Common Flicker	1	0	0	0	0	0.2	0	0	0	0	0	0.0
Paridae	Boreal Chickadee	0	2	4	2	6	2.8	0	0	3	0	0	0.6
Turdidae	American Robin	3	1	4	4	3	3.0	7	2	0	4	2	3.0
	Hermit Thrush	1	0	0	0	0	0.2	0	0	0	2	0	0.4
	Swainson's Thrush	0	0	0	0	0	0.0	0	0	2	0	0	0.4
Sylviidae	Ruby-crowned Kinglet	1	0	4	10	6	4.2	4	2	10	0	0	3.2
Vireonidae	Solitary Vireo	0	0	0	0	0	0.0	0	0	0	0	2	0.4
Parulidae	Nashville Warbler	0	0	0	0	0	0.0	0	0	0	2	0	0.4
	Cape May Warbler	0	0	0	4	0	0.8	2	10	12	4	4	6.4
	Yellow-rumped Warbler	0	0	1	4	4	1.8	4	2	9	0	4	3.8
	Ovenbird	0	0	0	0	0	0.0	0	4	0	0	0	0.8
Icteridae	Brown-headed Cowbird	0	0	0	0	1	0.2	0	0	0	0	0	0.0
Fringillidae	Purple Finch	0	0	0	0	0	0.0	0	2	6	0	0	1.6
	Pine Grosbeak	0	0	0	4	0	0.8	2	2	2	0	0	1.2
	Dark-eyed Junco	0	2	6	16	6	6.0	7	0	6	0	4	3.4
	Chipping Sparrow	0	0	0	0	0	0.0	0	0	0	0	2	0.4
	White-throated Sparrow	4	8	0	3	3	3.6	1	6	9	4	1	4.2
Total Birds		10	15	19	47	29	24.0	27	30	59	16	19	30.2

Appendix table VII
Forest bird population census
Experimental treatment plot 102-11
St. Pascal, Quebec
31 May - 10 June 1978

(MATACIL® applied on 4 June at the emitted dosage rate of 0.052 kg AI/ha)

Family	Species	Pre-spray						Post Super Constellation spray					
		May 31 -4	June 1 -3	June 2 -2	June 3 -1	June 4 -0	Daily avg.	June 5 +1	June 6 +2	June 7 +3	June 8 +4	June 10 +6	Daily avg.
Accipitridae	Broad-winged Hawk	0	0	0	0	0	0.0	1	0	0	0	0	0.2
Tetraonidae	Ruffed Grouse	0	0	0	0	0	0.0	2	0	0	0	0	0.4
Picidae	Common Flicker	0	0	0	0	2	0.4	2	0	2	0	0	0.8
	Yellow-bellied Sapsucker	0	0	0	0	1	0.2	0	0	0	0	0	0.0
Tyrannidae	Yellow-bellied Flycatcher	0	0	0	0	0	0.0	0	0	0	0	2	0.4
	Least Flycatcher	2	0	0	0	0	0.4	2	0	4	2	0	1.6
Hirundinidae	Barn Swallow	0	0	0	0	0	0.0	1	0	0	0	0	0.2
Corvidae	Blue Jay	1	0	0	0	0	0.2	1	0	0	0	0	0.2
	Common Crow	0	0	0	0	0	0.0	0	0	1	0	0	0.2
Paridae	Boreal Chickadee	2	0	0	2	1	1.0	1	1	2	2	0	1.2
Turdidae	American Robin	1	1	0	0	1	0.6	0	0	2	0	0	0.4
	Hermit Thrush	0	0	0	1	5	1.2	1	2	2	4	0	1.8
	Swainson's Thrush	4	0	0	3	2	1.8	1	2	2	3	3	2.2
	Veery	2	1	0	2	2	1.4	1	1	4	0	0	1.2
Sylviidae	Ruby-crowned Kinglet	4	0	2	4	2	2.4	4	4	2	2	2	2.8
Sturnidae	Starling	0	0	0	0	0	0.0	1	0	0	0	0	0.2
Vireonidae	Solitary Vireo	4	0	0	0	0	0.8	0	0	0	2	0	0.4
Parulidae	Black-and-white Warbler	0	0	0	2	2	0.8	0	0	0	0	0	0.0
	Tennessee Warbler	4	8	8	8	4	6.4	10	12	8	8	8	9.2
	Nashville Warbler	2	0	4	4	2	2.4	4	0	2	2	8	3.2
	Magnolia Warbler	7	0	8	6	6	5.4	6	4	10	4	6	6.0
	Cape May Warbler	2	0	2	0	0	0.8	1	0	2	0	4	1.4
	Black-throated Blue Warbler	0	0	0	0	0	0.0	0	2	0	0	0	0.4
	Yellow-rumped Warbler	2	0	2	2	6	2.4	4	4	6	2	2	3.6
	Blackburnian Warbler	2	2	6	6	0	3.2	4	8	12	10	4	7.6
	Chestnut-sided Warbler	0	0	0	0	0	0.0	2	2	0	0	0	0.8
	Bay-breasted Warbler	2	4	2	8	0	3.2	6	4	6	4	4	4.8
	Ovenbird	0	0	0	0	0	0.0	0	2	0	0	0	0.4
	American Redstart	0	0	0	2	0	0.4	0	0	0	0	0	0.0
	Canada Warbler	0	0	0	0	2	0.4	2	2	2	0	2	1.6
Icteridae	Common Grackle	0	1	0	0	0	0.2	0	0	0	1	0	0.2
Fringillidae	Rose-breasted Grosbeak	0	0	1	0	0	0.2	2	2	6	0	0	2.0
	Evening Grosbeak	0	0	0	0	0	0.0	1	2	4	0	0	1.4
	Purple Finch	5	0	0	2	2	1.8	0	2	0	2	0	0.8
	Dark-eyed Junco	4	0	2	4	0	2.0	3	2	4	2	2	2.6
	White-throated Sparrow	4	0	2	2	2	2.0	0	8	3	2	0	2.6
Total Birds		54	17	39	58	42	42.0	63	66	86	52	47	62.8

Appendix table VIII
Forest bird population census
Experimental treatment block 102-11
St. Pascal, Quebec
12-21 June 1978

(MATACIL® applied on 16 June at the emitted dosage rate of 0.052 kg AI/ha)

Family	Species	Pre-spray						Post DC-6 spray					
		June 12 -4	June 13 -3	June 14 -2	June 15 -1	June 16 -0	Daily avg.	June 17 +1	June 18 +2	June 19 +3	June 20 +4	June 21 +5	Daily avg.
Accipitridae	Broad-winged Hawk	0	0	0	0	1	0.2	0	0	0	0	0	0.0
Picidae	Common Flicker	0	0	0	0	2	0.4	0	0	2	0	2	0.8
Tyrannidae	Yellow-bellied Flycatcher	0	0	0	4	2	1.2	0	0	0	2	2	0.8
	Least Flycatcher	2	2	0	0	2	1.2	2	2	2	2	2	2.0
Corvidae	Blue Jay	0	1	0	0	0	0.2	1	0	0	0	0	0.2
Paridae	Boreal Chickadee	0	2	0	1	0	0.6	1	0	1	0	0	0.4
Turdidae	American Robin	1	0	0	2	3	1.2	2	2	2	2	2	2.0
	Hermit Thrush	2	2	0	0	2	1.2	2	6	2	6	7	4.6
	Swainson's Thrush	4	6	4	2	8	4.8	3	1	3	2	2	2.2
	Veery	3	0	0	0	1	0.8	0	0	0	0	0	0.0
Sylviidae	Golden-crowned Kinglet	0	0	0	0	2	0.4	0	0	0	0	0	0.0
	Ruby-crowned Kinglet	4	4	6	2	2	3.6	2	2	2	2	4	2.4
Vireonidae	Solitary Vireo	0	0	0	0	2	0.4	2	2	0	0	2	1.2
Parulidae	Tennessee Warbler	8	4	2	4	4	4.4	4	2	4	0	2	2.4
	Nashville Warbler	6	8	4	2	6	5.4	4	4	2	4	4	3.6
	Magnolia Warbler	10	4	4	2	16	7.2	2	2	8	6	8	5.2
	Cape May Warbler	4	0	4	2	6	3.2	6	8	6	6	10	7.2
	Yellow-rumped Warbler	2	2	4	2	4	2.8	6	6	4	2	2	4.0
	Blackburnian Warbler	12	8	2	4	8	6.8	2	4	2	2	6	3.2
	Bay-breasted Warbler	10	6	2	2	6	5.2	8	4	8	8	8	7.2
	Ovenbird	0	0	0	0	2	0.4	0	0	0	0	0	0.0
	Canada Warbler	2	2	0	0	4	1.6	2	2	4	4	2	2.8
Fringillidae	Rose-breasted Grosbeak	0	2	0	0	2	0.8	0	0	2	2	0	0.8
	Evening Grosbeak	5	2	0	0	1	1.6	0	0	2	1	0	0.6
	Pine Grosbeak	0	0	0	2	0	0.4	0	0	1	0	0	0.2
	Dark-eyed Junco	2	2	0	2	4	2.0	4	2	2	2	0	2.0
	White-throated Sparrow	0	2	2	0	4	1.6	4	4	3	4	4	3.8
Unidentified birds		2	0	0	0	0	0.4	0	0	0	0	0	0.0
Total Birds		79	59	34	33	94	59.8	57	53	62	57	69	59.6

Appendix table IX
Forest bird population census
Untreated control plot-2
St. Pascal, Quebec
11-20 May 1978

(fenitrothion applied on 15 May to experimental block 102)

Family	Species	Pre-spray						Post DC-6 spray					
		May 11	May 12	May 13	May 14	May 15	Daily	May 16	May 17	May 18	May 19	May 20	Daily
		-4	-3	-2	-1	-0	avg.	+1	+2	+3	+4	+5	avg.
Tetraonidae	Ruffed Grouse	2	0	2	2	2	1.6	2	1	2	0	2	1.4
Picidae	Common Flicker	0	0	0	0	0	0.0	0	2	0	0	2	0.8
	Hairy Woodpecker	0	0	0	1	0	0.2	0	1	0	0	0	0.2
Corvidae	Gray Jay	0	0	0	0	0	0.0	1	0	0	0	0	0.2
Paridae	Boreal Chickadee	0	0	0	0	0	0.0	0	0	0	0	1	0.2
Sittidae	Red-breasted Nuthatch	0	0	0	0	0	0.0	0	0	0	0	2	0.4
Certhiidae	Brown Creeper	0	0	0	0	0	0.0	2	0	0	0	0	0.4
Troglodytidae	Winter Wren	0	0	0	0	0	0.0	0	0	2	0	0	0.4
Turdidae	American Robin	2	0	0	0	0	0.4	0	3	2	4	3	2.4
	Hermit Thrush	2	0	2	0	0	0.8	0	0	2	0	0	0.4
	Veery	0	0	0	0	0	0.0	0	0	0	0	1	0.2
Sylviidae	Ruby-crowned Kinglet	4	6	2	2	2	3.2	0	6	6	2	2	3.2
Vireonidae	Solitary Vireo	0	0	0	2	2	0.8	4	0	2	0	2	1.6
Parulidae	Nashville Warbler	0	0	0	0	0	0.0	0	0	0	0	2	0.4
	Cape May Warbler	0	0	0	2	8	2.0	2	6	8	4	6	5.2
	Black-throated Blue Warbler	0	0	0	2	0	0.4	0	0	0	0	0	0.0
	Yellow-rumped Warbler	0	4	4	0	6	2.8	4	6	3	2	3	3.6
	Ovenbird	0	0	0	0	0	0.0	0	4	0	2	2	1.6
	Northern Waterthrush	0	0	0	0	4	0.8	2	6	0	2	4	2.8
Icteridae	Redwinged Blackbird	0	0	0	0	0	0.0	0	2	0	0	0	0.4
	Brown-headed Cowbird	0	0	0	2	0	0.4	0	0	0	0	0	0.0
Fringillidae	Evening Grosbeak	0	0	0	0	0	0.0	0	0	6	1	2	1.8
	Purple Finch	0	0	0	0	6	1.2	4	2	2	0	4	2.4
	Dark-eyed Junco	0	0	0	0	0	0.0	0	4	6	0	4	2.8
	White-throated Sparrow	0	0	0	6	4	2.0	0	5	9	9	13	7.2
Unidentified birds		0	0	0	0	0	0.0	2	0	0	0	0	0.4
Total Birds		10	10	10	19	34	16.6	23	48	50	26	55	40.4

Appendix table X
Forest bird population census
Untreated control plot-2
St. Pascal, Quebec
30 May - 8 June 1978

(MATACIL® applied on 3 June to portion of experimental block 102)

Family	Species	Pre-spray						Post Super Constellation spray					
		May 30 -4	May 31 -3	June 1 -2	June 2 -1	June 3 -0	Daily avg.	June 4 +1	June 5 +2	June 6 +3	June 7 +4	June 8 +5	Daily avg.
Tetraonidae	Ruffed Grouse	2	2	0	0	0	0.8	3	0	0	0	0	0.6
Picidae	Common Flicker	0	2	0	0	0	0.4	0	0	0	0	0	0.0
Tyrannidae	Yellow-bellied Flycatcher	0	0	0	0	0	0.0	0	4	0	0	0	0.8
	Least Flycatcher	4	4	0	2	2	2.4	4	6	2	4	4	4.0
Corvidae	Blue Jay	4	0	0	0	0	0.8	2	2	0	0	0	0.8
Sittidae	Red-breasted Nuthatch	0	0	0	0	0	0.0	0	2	0	0	0	0.4
Certhiidae	Brown Creeper	0	0	0	2	0	0.4	0	0	0	0	0	0.0
Troglodytidae	Winter Wren	2	2	0	0	0	0.8	0	0	0	0	0	0.0
Turdidae	Hermit Thrush	2	2	0	0	2	1.2	0	0	2	0	2	0.8
	Swainson's Thrush	0	0	0	0	2	0.4	2	5	3	4	5	3.8
	Veery	0	0	0	0	2	0.4	0	4	6	2	0	2.4
Sylviidae	Ruby-crowned Kinglet	0	0	2	0	0	0.4	0	0	0	0	0	0.0
Vireonidae	Solitary Vireo	0	2	0	0	2	0.8	4	0	2	0	0	1.2
	Red-eyed Vireo	0	0	0	0	0	0.0	0	2	4	2	2	2.0
Parulidae	Black-and-white Warbler	2	6	0	0	0	1.6	0	0	0	0	0	0.0
	Tennessee Warbler	10	6	2	2	2	4.4	2	0	6	0	0	1.6
	Magnolia Warbler	0	2	0	0	0	0.4	2	2	0	2	2	1.6
	Cape May Warbler	2	2	2	6	0	2.4	4	8	2	4	2	4.0
	Black-throated Blue Warbler	0	0	0	0	0	0.0	2	0	0	0	0	0.4
	Yellow-rumped Warbler	4	4	0	6	4	3.6	6	2	0	0	2	2.0
	Black-throated Green Warbler	2	2	0	0	0	0.8	0	0	0	0	4	0.8
	Blackburnian Warbler	0	0	0	0	0	0.0	0	6	2	2	0	2.0
	Bay-breasted Warbler	4	4	0	6	2	3.2	2	0	4	6	2	2.8
	Blackpoll Warbler	0	0	2	2	2	1.2	0	2	2	0	0	0.8
	Ovenbird	4	6	0	4	2	3.2	6	2	4	8	6	5.2
	Mourning Warbler	0	2	0	0	0	0.4	0	0	0	0	0	0.0
	Canada Warbler	0	0	0	2	0	0.4	4	2	4	2	4	3.2
	American Redstart	0	0	0	0	0	0.0	0	0	2	0	0	0.4
Icteridae	Brown-headed Cowbird	0	0	0	0	0	0.0	0	3	0	0	0	0.6
Fringillidae	Rose-breasted Grosbeak	2	2	0	0	0	0.8	0	3	0	0	0	0.6
	Evening Grosbeak	0	0	0	0	0	0.0	0	1	0	3	0	0.8
	Purple Finch	2	0	0	2	2	1.2	2	4	0	0	2	1.6
	Dark-eyed Junco	0	0	0	0	0	0.0	2	2	0	0	0	0.8
	White-throated Sparrow	0	2	0	2	0	0.8	2	4	2	0	0	1.6
Unidentified birds		0	1	0	0	2	0.6	0	2	2	0	0	0.8
Total Birds		46	53	8	36	26	33.8	49	68	49	39	37	48.4

Appendix table XI
Forest bird population census
Untreated control plot-2
St. Pascal, Quebec
12-22 June 1978

(MATACIL® applied on 16 June to experimental block 102)

Family	Species	Pre-spray						Post DC-3 spray					
		June 12	June 13	June 14	June 15	June 16	Daily	June 17	June 18	June 19	June 20	June 21	Daily
		-4	-3	-2	-1	-0	avg.	+1	+2	+3	+4	+5	avg.
Anatidae	Canada Goose	0	0	0	0	0	0.0	0	0	1	0	0	0.2
Tetraonidae	Ruffed Grouse	0	0	0	0	3	0.6	0	0	0	0	0	0.0
Tyrannidae	Yellow-bellied Flycatcher	0	0	2	0	0	0.4	0	0	0	0	0	0.0
	Least Flycatcher	2	4	2	2	2	2.4	2	2	2	0	4	2.0
Corvidae	Gray Jay	0	0	1	0	0	0.2	0	0	0	0	0	0.0
	Blue Jay	0	0	0	0	0	0.0	0	2	0	0	2	0.8
Certhiidae	Brown Creeper	0	0	0	0	0	0.0	0	0	2	0	0	0.4
Turdidae	American Robin	0	0	1	0	1	0.4	4	0	2	0	0	1.2
	Hermit Thrush	0	2	2	0	0	0.8	0	0	0	0	1	0.2
	Swainson's Thrush	4	2	4	0	2	2.4	3	6	2	2	2	3.0
	Veery	2	4	2	2	4	2.8	4	4	0	0	1	1.8
Vireonidae	Solitary Vireo	0	0	2	2	2	1.2	2	0	0	0	0	0.4
	Red-eyed Vireo	2	4	2	2	4	2.8	6	4	4	0	2	3.2
Parulidae	Black-and-white Warbler	0	0	2	2	0	0.8	0	0	0	0	0	0.0
	Tennessee Warbler	2	2	2	2	0	1.6	0	0	2	0	2	0.8
	Nashville Warbler	0	2	0	2	0	0.8	0	0	0	0	0	0.0
	Magnolia Warbler	0	2	0	0	2	0.8	2	0	2	0	2	1.2
	Cape May Warbler	2	6	2	4	12	5.2	2	0	0	0	0	0.4
	Yellow-rumped Warbler	0	0	0	2	2	0.8	2	4	0	0	4	2.0
	Black-throated Green Warbler	0	0	0	2	0	0.4	2	2	2	2	2	2.0
	Blackburnian Warbler	0	0	2	0	4	1.2	2	2	0	0	0	0.8
	Bay-breasted Warbler	0	6	4	0	8	3.6	0	4	6	0	0	2.0
	Ovenbird	4	6	0	4	8	4.4	10	6	8	2	6	6.4
	Canada Warbler	2	4	2	4	0	2.4	0	0	2	0	0	0.4
Fringillidae	Rose-breasted Grosbeak	0	0	2	0	0	0.4	0	0	0	0	0	0.0
	Evening Grosbeak	0	2	0	2	2	1.2	0	0	0	0	2	0.4
	Purple Finch	0	0	0	0	2	0.4	2	0	2	0	2	1.2
	Pine Grosbeak	0	0	0	2	0	0.4	0	0	0	0	0	0.0
	White-throated Sparrow	0	2	0	0	0	0.4	2	2	0	0	0	0.8
Total Birds		20	48	34	34	58	38.8	45	38	37	6	32	31.6

Appendix table XII
Forest bird population census
Experimental treatment plot 102-12
St. Pascal, Quebec
11-20 May 1978

(fenitrothion applied on 16 May at the emitted dosage of 0.052 kg AI/ha)

Family	Species	Pre-spray						Post DC-6 spray					
		May 11 -4	May 12 -3	May 13 -2	May 14 -1	May 15 -0	Daily avg.	May 16 +1	May 17 +2	May 18 +3	May 19 +4	May 20 +5	Daily avg.
Picidae	Common Flicker	0	0	0	0	0	0.0	0	0	0	0	2	0.4
	Hairy Woodpecker	0	0	0	0	0	0.0	0	0	0	0	2	0.4
Paridae	Black-capped Chickadee	0	4	0	0	0	0.8	0	0	0	0	0	0.0
	Boreal Chickadee	0	0	0	0	0	0.0	0	0	2	2	2	1.2
Certhiidae	Brown Creeper	0	0	0	0	0	0.0	2	2	2	0	2	1.6
Troglodytidae	Winter Wren	0	0	0	0	2	0.4	0	0	0	0	2	0.4
Turdidae	American Robin	2	0	2	5	4	2.6	0	1	4	4	2	2.2
Sylviidae	Ruby-crowned Kinglet	0	2	0	0	0	0.4	0	0	0	0	0	0.0
Vireonidae	Solitary Vireo	0	0	0	0	0	0.0	0	4	4	2	2	2.4
Parulidae	Nashville Warbler	0	0	0	2	0	0.4	0	0	2	2	2	1.2
	Cape May Warbler	0	0	0	0	0	0.0	0	0	0	0	4	0.8
	Yellow-rumped Warbler	0	0	4	8	2	2.8	2	7	5	5	2	4.2
	Ovenbird	0	0	0	0	0	0.0	0	0	0	0	2	0.4
Fringillidae	Rose-breasted Grosbeak	0	0	0	4	0	0.8	0	0	0	0	1	0.2
	Evening Grosbeak	0	0	0	0	0	0.0	0	1	8	3	0	2.4
	Purple Finch	0	0	0	4	0	0.8	0	0	0	0	2	0.4
	Pine Grosbeak	0	0	0	1	0	0.2	2	1	2	4	2	2.2
	Dark-eyed Junco	0	6	2	6	2	3.2	6	2	0	4	1	2.6
	Chipping Sparrow	0	0	0	0	0	0.0	0	0	0	0	2	0.4
	White-throated Sparrow	4	4	2	2	2	2.8	7	6	6	11	6	7.2
Total Birds		6	16	10	32	12	15.2	19	24	35	37	38	30.6

Appendix table XIII
Forest bird population census
Experimental treatment plot 102-12
St. Pascal, Quebec
30 May - 8 June 1978

(HATACIL® applied on 3 June at the emitted dosage rate of 0.052 kg AI/ha)

Family	Species	Pre-spray						Post Super Constellation spray					
		May 30	May 31	June 1	June 2	June 3	Daily	June 4	June 5	June 6	June 7	June 8	Daily
		-4	-3	-2	-1	-0	avg.	+1	+2	+3	+4	+5	avg.
Tetraonidae	Ruffed Grouse	0	0	0	0	0	0.0	2	0	0	0	0	0.4
Picidae	Common Flicker	2	0	0	0	0	0.4	2	0	2	0	2	1.2
	Hairy Woodpecker	0	0	0	0	0	0.0	2	0	0	0	0	0.4
	Downy Woodpecker	0	0	0	1	0	0.2	0	0	0	0	0	0.0
Tyrannidae	Least Flycatcher	0	4	0	0	2	1.2	2	0	0	0	0	0.4
	Eastern Wood Pewee	0	0	0	0	0	0.0	0	4	2	0	0	1.2
Corvidae	Gray Jay	3	0	0	0	0	0.6	0	0	0	0	0	0.0
	Blue Jay	0	0	0	0	0	0.0	0	0	0	2	0	0.4
Sittidae	Red-breasted Nuthatch	6	0	0	2	0	1.6	2	0	0	2	4	1.6
Turdidae	American Robin	0	0	2	2	3	1.4	4	2	2	5	5	3.6
	Hermit Thrush	0	0	0	2	0	0.4	2	0	0	0	4	1.2
	Swainson's Thrush	2	4	5	1	0	2.4	3	2	2	2	4	2.6
Vireonidae	Solitary Vireo	4	2	0	0	0	1.2	2	2	2	4	4	2.8
	Red-eyed Vireo	0	0	0	0	0	0.0	0	0	0	6	0	1.2
Parulidae	Tennessee Warbler	1	0	0	2	0	0.6	4	2	2	2	0	2.0
	Nashville Warbler	0	0	0	0	0	0.0	2	2	0	2	0	1.2
	Parula Warbler	0	0	0	0	0	0.0	0	0	0	0	4	0.8
	Magnolia Warbler	2	0	4	0	4	2.0	8	0	0	0	2	2.0
	Cape May Warbler	0	0	0	0	0	0.0	0	0	0	2	0	0.4
	Black-throated Blue Warbler	0	2	0	0	0	0.4	0	0	0	0	0	0.0
	Yellow-rumped Warbler	0	1	4	0	0	1.0	2	0	0	4	2	1.6
	Black-throated Green Warbler	4	4	6	4	2	4.0	6	10	2	10	2	6.0
	Blackburnian Warbler	0	0	0	4	2	1.2	2	6	2	2	6	3.6
	Chestnut-sided Warbler	0	0	0	0	0	0.0	0	0	0	4	0	0.8
	Bay-breasted Warbler	8	14	8	2	6	7.6	10	8	4	12	8	8.4
	Ovenbird	0	0	0	0	0	0.0	0	2	0	0	0	0.4
	Canada Warbler	0	0	0	0	0	0.0	2	2	2	4	2	2.4
Fringillidae	Rose-breasted Grosbeak	3	4	0	0	4	2.2	2	0	2	2	0	1.2
	Evening Grosbeak	2	0	0	0	0	0.4	5	0	0	0	0	1.0
	Purple Finch	2	0	0	0	0	0.4	0	2	0	0	2	0.8
	Dark-eyed Junco	2	0	0	1	2	1.0	2	0	2	1	0	1.0
	White-throated Sparrow	4	10	5	0	4	4.6	15	8	2	4	6	7.0
Total Birds		45	45	34	21	29	34.8	81	52	28	70	57	57.6

Appendix table XIV
Forest bird population census
Experimental treatment plot 102-12
St. Pascal, Quebec
12-21 June 1978

(MATACIL® applied on 16 June at the emitted dosage rate of 0.052 kg AI/ha)

Family	Species	Pre-spray						Post DC-3 spray					
		June 12 -4	June 13 -3	June 14 -2	June 15 -1	June 16 -0	Daily avg.	June 17 +1	June 18 +2	June 19 +3	June 20 +4	June 21 +5	Daily avg.
Picidae	Common Flicker	0	0	0	0	0	0.0	0	0	0	0	2	0.4
	Hairy Woodpecker	0	0	0	0	0	0.0	0	2	0	0	0	0.4
Tyrannidae	Least Flycatcher	0	4	0	2	0	1.2	0	0	0	0	0	0.0
Hirundinidae	Tree Swallow	0	0	0	0	0	0.0	1	0	0	0	0	0.2
Corvidae	Blue Jay	0	0	2	0	2	0.8	4	0	0	0	0	0.8
Sittidae	Red-breasted Nuthatch	2	0	0	0	4	1.2	2	4	2	0	0	1.6
Turdidae	American Robin	4	0	0	0	2	1.2	1	0	0	0	2	0.6
	Hermit Thrush	0	0	4	2	6	2.4	6	8	8	6	6	6.8
	Swainson's Thrush	2	8	4	2	7	4.6	6	2	4	4	5	4.2
	Veery	2	0	0	0	0	0.4	2	2	4	2	2	2.4
Vireonidae	Solitary Vireo	0	2	2	2	0	1.2	2	2	0	0	4	1.6
	Red-eyed Vireo	0	0	0	0	0	0.0	0	0	2	2	2	1.2
Parulidae	Nashville Warbler	2	0	2	0	4	1.6	2	2	2	0	2	1.6
	Parula Warbler	2	2	0	2	4	2.0	2	4	2	0	2	2.0
	Magnolia Warbler	0	4	2	0	0	1.2	2	0	0	2	0	0.8
	Cape May Warbler	0	0	0	0	2	0.4	2	0	0	0	0	0.4
	Black-throated Blue Warbler	0	0	0	0	2	0.4	0	2	0	2	2	1.2
	Yellow-rumped Warbler	0	2	2	0	2	1.2	2	2	0	2	2	1.6
	Black-throated Green Warbler	6	6	2	4	8	5.2	4	8	4	6	10	6.4
	Blackburnian Warbler	10	8	4	4	8	6.8	6	8	12	8	12	9.2
	Bay-breasted Warbler	6	14	6	4	10	8.0	8	10	8	6	4	7.2
	Canada Warbler	0	6	2	2	2	2.4	0	4	0	2	0	1.2
Fringillidae	Rose-breasted Grosbeak	0	2	2	4	4	2.4	4	4	4	6	4	4.4
	Evening Grosbeak	0	4	0	3	2	1.8	0	2	0	0	0	0.4
	Purple Finch	0	2	2	2	0	1.2	0	2	2	0	0	0.8
	Pine Grosbeak	2	0	0	0	0	0.4	0	0	0	0	0	0.0
	Dark-eyed Junco	0	4	0	0	3	1.4	0	0	0	0	0	0.0
	White-throated Sparrow	4	6	5	8	5	5.6	7	9	8	2	4	6.0
Total Birds		42	74	41	41	77	55.0	63	77	62	50	65	63.4