SONGBIRD STUDIES IN NEW BRUNSWICK FORESTS TREATED WITH SEMI-OPERATIONAL APPLICATIONS OF MATACIL® FLOWABLE FORMULATIONS IN 1982.

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INTRODUCTION

Studies were conducted in 1981 by the Environmental Impact Section of the Forest Pest Management Institute to assess the effects of MATACIL® 180F (Flowable) formulations on terrestrial invertebrates in New Brunswick (Millikin 1981) and on pollinating insects in Ontario (Kingsbury et al. 1981). Further studies were conducted in New Brunswick in 1982 to include effects on forest songbirds under semi-operational spray conditions, the results of which are reported herein. Aquatic impact studies carried out at the same time are reported separately (Kreutzweiser 1982).

SITE DESCRIPTION

Seven areas were utilized for the forest songbird census studies, two areas in each treatment block and three check sites (Figure 1). Treatment Block 82 was approximately 23 km northeast of Fredericton, and Treatment Block 86 was approximately 30 km southwest of Fredericton. The Acadia Untreated Check Block was approximately 5 km northeast of Treatment Block 82; two of the three check sites were located here. The third check site (the Yoho Untreated Check Block) was approximately 2.5 km southeast of Treatment Block 86. Bird transect areas were located along old bush roads while spot censuses were situated in completely forested areas (Figure 2 and 3). A detailed vegetation analysis of these areas was carried out at the end of the study using methods recommended by James and Shugart (1970) for bird population studies. Results showed that the three control plots were more densely forested, but with somewhat smaller trees, than the treated plots (Tables 1 to 7). The untreated Acadia check plots were also found to have a substantially higher hardwood component than the other study plots. The two treated plots were reasonably similar in their forest cover except that while red spruce, *Picea rubens* Sarg., dominated plots in Treatment Block 82, balsam fir, *Abies balsamea* (L.) Mill., dominated plots in Treatment Block 86.

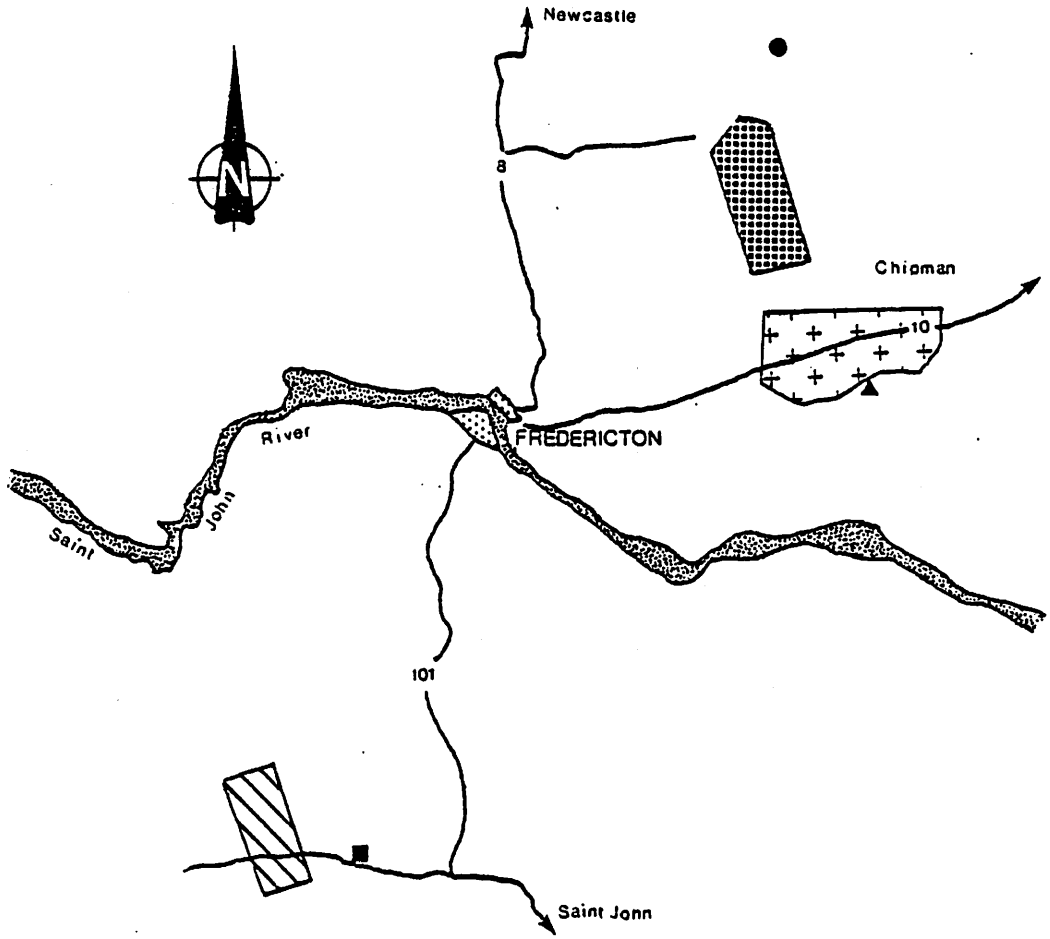
Adult banding studies were conducted in areas separate from the census studies to prevent interruption of the bird populations (Figure 2 and 3). The check site for adult banding studies was located near Acadia Research Station (Figure 1), 25 km northeast of Fredericton. Fledgling studies were conducted along the bird census transect lines of Treatment Blocks 82 and 86 and the Yoho Untreated Check Block (Figure 2 and 3).

SPRAY APPLICATION

BLOCK 82

Block 82 was treated three times with MATACIL® 180F at the rate of 0.070 kg/ha active ingredient in 1.46 L/ha of oil solution. The actual spray mixture consisted of:

MATACIL® 180F	25.93% by volume
Insecticide Diluent 585	74.07% by volume



TREATMENT BLOCK 82

TREATMENT BLOCK 86

ACADIA FOREST EXPERIMENT STATION

ACADIA UNTREATED CHECK BLOCK

YOHO UNTREATED CHECK BLOCK

UNTREATED CHECK AREA - ADULT BANDING STUDIES

SCALE 1:500,000

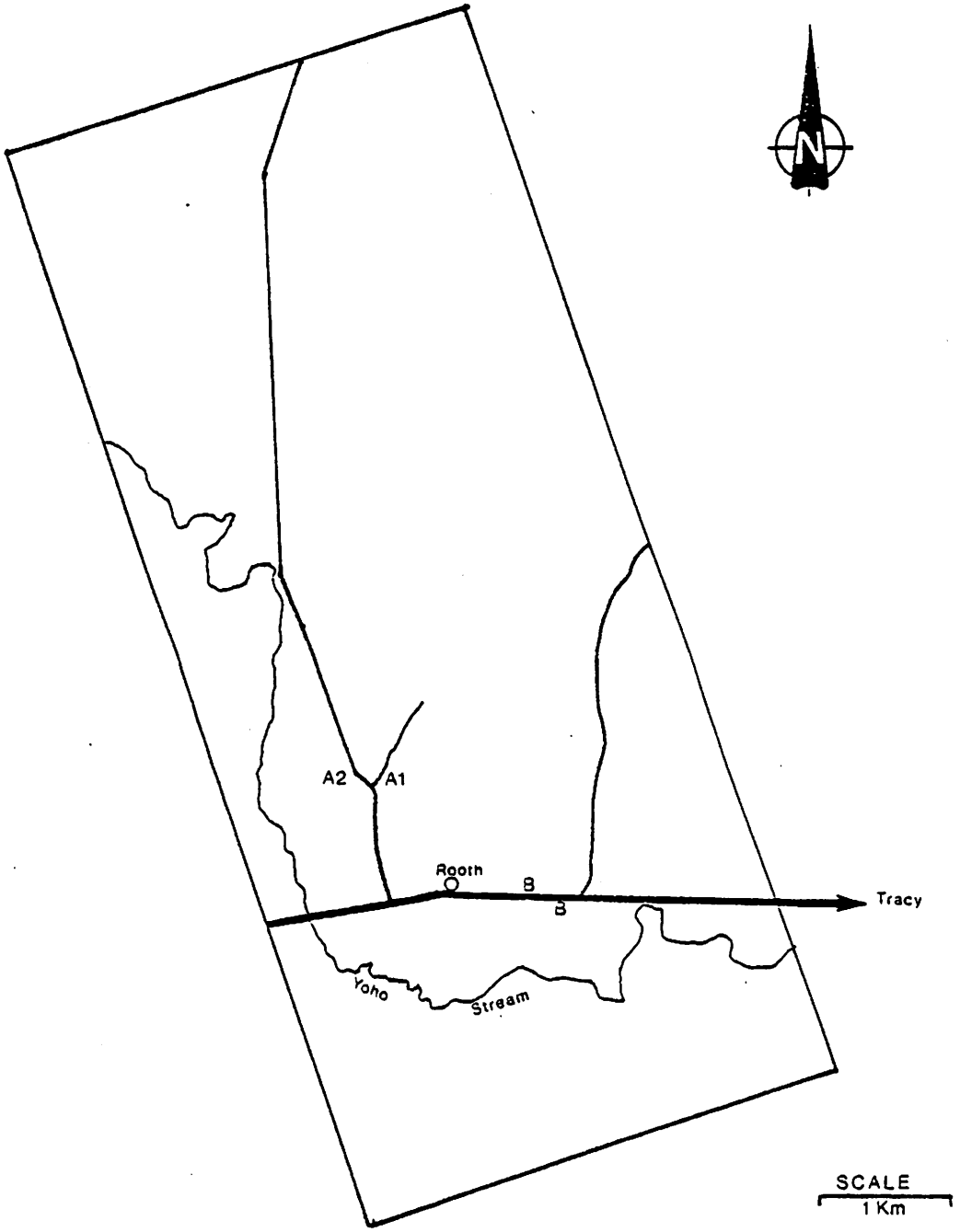
Figure 1. Location of spray blocks.

A1 ADULT POPULATION CENSUS AREA 1

A2 ADULT POPULATION CENSUS AREA 2

B ADULT BANDING STUDIES

Figure 2. Location of sampling stations in Treatment Block 82.



A1 ADULT POPULATION CENSUS AREA 1

A2 ADULT POPULATION CENSUS AREA 2

B ADULT BANDING STUDIES

Figure 3. Location of sampling stations in Treatment Block 86.

Table 1. Vegetation analysis, Treatment Block 82, Transect census area.

Number of circles 10

TREES:	DENSITY[1]									BASAL AREA[4]								
	Number of trees in all circles by diameter of size class									Cross sectional area of the trunk at breast height (d.b.h.)								FREQUENCY[7]
SPECIES	A 3-6	B 6-9	C 9-15	D 15-21	E 21-27	F 27-33	Total	Trees/Acre[2] (by species)	Relative Density[3] (by Species)	A[5] (0.1)	B (0.3)	C (0.8)	D (1.8)	E (3.1)	F (4.9)	Total basal area (by species; sq ft)	[6]Relative dominance (by species)	No. of circles in which species occurred	[8]Relative frequency
Abies balsamea (L.) Mill.	34	6					40	40	12	3.4	1.8					5.2	5	8	80
Picea rubens Sarg.	99	53	13				165	165	51	9.9	15.9	10.4				36.2	36	10	100
Populus tremuloides Michx.		1	1	1			3	3	1		0.3	0.8	1.8			2.9	3	3	30
Acer rubrum L.	41	23	6	1			71	71	22	4.1	6.9	18.4	1.8			31.2	31	9	90
Betula papyrifera Marsh.	5	5	2				12	12	4	0.5	1.5	4.0				6.0	6	5	50
Pinus strobus L.	2	5	2	2		1	12	12	4	0.2	1.5	4.0	3.6		4.9	14.2	14	2	20
Picea glauca (Moench) Voss	4	1					5	5	2	0.4	0.3	0.8				1.5	1.5	3	30
Larix laricina (Du Roi) K. Koch	2	1	6				9	9	3	0.2	0.3	0.8				1.3	1.3	4	40
Picea mariana (Mill.) B.S.P.	2	2					4	4	1	0.2	0.6	1.6				2.4	2.4	3	30
Totals	189	97	30	4		1	321	321	100%	18.9	29.1	40.8	7.2		4.9	100.9	100%		
Trees/acre (By size class)	189	97	30	4		1	Basal area (by size class)			18.9	29.1	40.8	7.2		4.9				
Relative density (by size class)	59	30	9	1		0.3	Relative basal area (by size class)			18.7	28.8	40.4	7.1		4.8				

SHRUBS: Total shrub stems in all transects (2 per circle x 1000, divided by the number of transects = 44550 shrub stems per acre

GROUND COVER: Total pluses (+) recorded (20 sightings per circle) x 100, divided by the total number of sightings = 93% ground cover

CANOPY COVER: Total pluses (+) recorded (20 sightings per circle) x 100, divided by the total number of sightings = 57.5% canopy cover

CANOPY HEIGHT: Average = 54/10 Range = 30-90/3-20

NOTES: OS 26% US 24% mixed, open, second growth, lowland, flat, selective cut, fairly dry overall, quite a few dead *Abies balsamea*, sticky substance from *Larix* on vegetation.
major spp. of shrubs - *Viburnum cassinoides* L., *Spirea sp.*, Abies balsamea, *Acer rubrum*

[1]Number per unit area

[2]Total trees counted x 1.0

[3]Relative density is the percent of the total number of trees which are the species in question

[4]Basal area is the cross sectional area of the trunk of a tree at 4.5 feet (dbh)

[5]Multiply the number of trees in all circles in size class A times 0.1 (average area in square feet for this size class)

[6]$\frac{\text{Total basal area of the species}}{\text{Total basal area of all species}} \times 100$

[7]Frequency indicates the evenness of distribution of a species

[8]$\frac{\text{Number of circles in which the species occurred}}{\text{Total number of circles}} \times 100$

Table 2. Vegetation analysis, Treatment Block 82, Spot census area.

Number of circles 2

TREES:	DENSITY[1]									BASAL AREA[4]								
	Number of trees in all circles by diameter of size class									Cross sectional area of the trunk at breast height (d.b.h.)								FREQUENCY[7]
SPECIES	A 3-6	B 6-9	C 9-15	D 15-21	E 21-27	F 27-33	Total	Trees/Acre[2] (by species)	Relative Density[3] (by Species)	A[5] (0.1)	B (0.3)	C (0.8)	D (1.8)	E (3.1)	F (4.9)	Total basal area (by species; sq ft)	[6]Relative dominance (by species)	No. of circles in which species occurred	[8]Relative frequency
Acer rubrum L.	5	1					6	30	11	0.5	0.3					0.8	5	2	100
Picea rubens Sarg.	9	19	6	1			35	175	61	0.9	5.7	4.8	1.8			13.2	83	2	100
Betula papyrifera Marsh.	4						4	20	7	0.4						0.4	3	2	100
Populus tremuloides Michx.	2						2	10	4	0.2						0.2	1	1	50
Abies balsamea (L.) Mill.	1						1	5	2	0.1						0.1	1	1	50
Picea glauca (Moench) Voss	1	1					2	10	4	0.1	0.3					0.4	3	1	50
Betula populifolia Marsh.	5						5	25	9	0.5						0.5	3	1	50
Picea mariana (Mill.) B.S.P.	1						1	5	2	0.1						0.1	1	1	50
Larix laricina (Du Roi) K. Koch		1					1	5	2		0.3					0.3	2	1	50
Totals	28	22	6	1			57	285	100%	2.8	6.6	4.8	1.8			16.0	100%		
Trees/acre (By size class)	140	110	30	5			Basal area (by size class)			14.0	33.0	24.0	9.0						
Relative density (by size class)	49	39	11	2			Relative basal area (by size class)			18	41	30	11						

SHRUBS: Total shrub stems in all transects (2 per circle) x 1000, divided by the number of transects = 31250 shrub stems per acre
GROUND COVER: Total pluses (+) recorded (20 sightings per circle) x 100, divided by the total number of sightings = 90% ground cover
CANOPY COVER: Total pluses (+) recorded (20 sightings per circle) x 100, divided by the total number of sightings = 55% canopy cover
CANOPY HEIGHT: Average = 50 Range = 40-60
NOTES: Cover canopy - all, open, cut over in past, moss and ferns, wet in places OS 30-40%
shrubs mainly *Viburnum cassinoides* L. but also a large amount of *Spirea sp.* US 40-50%

[1]Number per unit area
[2]Total trees counted x 5
[3]Relative density is the percent of the total number of trees which are the species in question
[4]Basal area is the cross sectional area of the trunk of a tree at 4.5 feet (dbh)
[5]Multiply the number of trees in all circles in size class A times 0.1 (average area in square feet for this size class)
[6]$\frac{\text{Total basal area of the species}}{\text{Total basal area of all species}} \times 100$
[7]Frequency indicates the evenness of distribution of a species
[8]$\frac{\text{Number of circles in which the species occurred}}{\text{Total number of circles}} \times 100$

Table 3. Vegetation analysis, Treatment Block 86, Transect census area.

Number of circles 10

TREES:	DENSITY[1]									BASAL AREA[4]								FREQUENCY[7]	
	Number of trees in all circles by diameter of size class									Cross sectional area of the trunk at breast height (d.b.h.)									
SPECIES	A 3-6	B 6-9	C 9-15	D 15-21	E 21-27	F 27-33	Total	Trees/Acre[2] (by species)	Relative Density[3] (by Species)	A[5] (0.1)	B (0.3)	C (0.8)	D (1.8)	E (3.1)	F (4.9)	Total basal area (by species; sq ft)	[6]Relative dominance (by species)	No. of circles in which species occurred	[8]Relative frequency
Abies balsamea (L.) Mill.	156	5					161	161	44	15.6	1.5					17.1	19	10	100
Picea mbens Sarg.	53	15	5				73	73	20	5.3	4.5	3.0				13.8	16	10	100
Thuja occidentalis L.	14	40	16				70	70	19	1.4	12.0	12.8				26.2	30	9	90
Acer rubrum L.	5	6	3				14	14	4	0.5	1.8	2.4				4.7	5	7	70
Pinus strobus L.	1	2	4	2			9	9	2	0.1	0.6	3.2	3.9			7.8	9	5	50
Tsuga canadensis (L.) Carr.	1	4	13				18	18	5	0.1	1.2	10.4				11.7	13	6	60
Picea glauca (Moench) Voss	6	2					8	8	2	0.6	0.6					1.2	1	4	40
Betula papyrifera Marsh.	3	3	5				11	11	3	0.3	0.9	4.0				5.2	6	7	70
Totals	239	77	46	2			364	364	100%	23.9	23.1	36.8	3.9			87.7	100%		
Trees/acre (By size class)	239	77	46	2			Basal area (by size class)			23.9	23.1	36.8	3.9						
Relative density (by size class)	66	21	13	1			Relative basal area (by size class)			27	26	42	4						

SHRUBS: Total shrub stems in all transects (2 per circle x 1000, divided by the number of transects = 39650 shrub stems per acre

GROUND COVER: Total plusos (+) recorded (20 sightings per circle) x 100, divided by the total number of sightings = 87% ground cover

CANOPY COVER: Total plusos (+) recorded (20 sightings per circle) x 100, divided by the total number of sightings = 50% canopy cover

CANOPY HEIGHT: Average = 50/10 Range = 30-80/3-25

NOTES: Fairly closed with some open spots, mixed mainly coniferous, cutover, 2nd growth, fair number of dead small *Abies balsamea* shrubs mainly *Picea rubrum, Abies balsamea, Spirea sp.* and to a lesser extent, *Viburnum cassinoides* L. and *Picea glauca*
OS 29% US 97%

[1]Number per unit area

[2]Total trees counted x 1.0

[3]Relative density is the percent of the total number of trees which are the total number of trees which are the species in question

[4]Basal area is the cross sectional area of the trunk of a tree at 4.5 feet (dbh)

[5]Multiply the number of trees in all circles in size class A times 0.1 (average area in square feet for this size class)

[6]$\frac{\text{Total basal area of the species}}{\text{Total basal area of all species}} \times 100$

[7]Frequency indicates the evenness of distribution of a species

[8]$\frac{\text{Number of circles in which the species occurred}}{\text{Total number of circles}} \times 100$

Table 4. Vegetation analysis, Treatment Block 86, Spot census area.

Number of circles 2

TREES:	DENSITY[1]									BASAL AREA[4]									
	Number of trees in all circles by diameter of size class									Cross sectional area of the trunk at breast height (d.b.h.)								FREQUENCY[7]	
SPECIES	A 3-6	B 6-9	C 9-15	D 15-21	E 21-27	F 27-33	Total	Trees/Acre[2] (by species)	Relative Density[3] (by Species)	A[5] (0.1)	B (0.3)	C (0.8)	D (1.8)	E (3.1)	F (4.9)	Total basal area (by species; sq ft)	[6]Relative dominance (by species)	No. of circles in which species occurred	[8]Relative frequency
Abies balsamea (L.) Mill.	21	5					26	130	55	2.1	1.5					3.6	23	2	100
Acer rubrum L.	3	3	1	1			8	40	17	0.3	0.9	0.8		3.1		5.1	32	1	50
Populus tremuloides Michx.		1					1	5	2		0.3					0.3	2	1	50
Tsuga canadensis (L.) Carr.	1	2	1				4	20	9	0.1	0.6	0.8				1.5	9	2	100
Pinus strobus L.			4				4	20	9			3.2				3.2	20	2	100
Picea rubens Sarg.		2	1				3	15	6		0.6	0.8				1.4	9	1	50
Betula papyrifera Marsh.			1				1	5	2			0.8				0.8	5	1	50
Totals	25	13	8	1			47	235	100%	2.5	3.9	6.4		3.1		15.9	100%		
Trees/acre (By size class)	125	65	40	5			Basal area (by size class)			12.5	19.5	32.0		15.5					
Relative density (by size class)	53	28	17	2			Relative basal area (by size class)			79	25	40		19					

SHRUBS: Total shrub stems in all transects (2 per circle) x 1000, divided by the number of transects = 6250 shrub stems per acre
GROUND COVER: Total pluses (+) recorded (20 sightings per circle) x 100, divided by the total number of sightings = 93% ground cover
CANOPY COVER: Total pluses (+) recorded (20 sightings per circle) x 100, divided by the total number of sightings = 48% canopy cover
CANOPY HEIGHT: Average = 55/14 Range = 40-70/4-15
NOTES: Very open, dry, cutover, lots of dead *Abies balsamea*. Shrub species mainly *Abies balsamea* OS 12% US 4%

[1]Number per unit area
[2]Total trees counted x 5
[3]Relative density is the percent of the total number of trees which are the species in question
[4]Basal area is the cross sectional area of the trunk of a tree at 4.5 feet (dbh)
[5]Multiply the number of trees in all circles in size class A times 0.1 (average area in square feet for this size class)
[6]$\frac{\text{Total basal area of the species}}{\text{Total basal area of all species}} \times 100$
[7]Frequency indicates the evenness of distribution of a species
[8]$\frac{\text{Number of circles in which the species occurred}}{\text{Total number of circles}} \times 100$

Table 5. Vegetation analysis, Acadia Untreated Check Block, Transect census area.

Number of circles 4

TREES:	DENSITY[1]									BASAL AREA[4]									
	Number of trees in all circles by diameter of size class									Cross sectional area of the trunk at breast height (d.b.h.)								FREQUENCY[7]	
SPECIES	A 3-6	B 6-9	C 9-15	D 15-21	E 21-27	F 27-33	Total	Trees/Acre[2] (by species)	Relative Density[3] (by Species)	A[5] (0.1)	B (0.3)	C (0.8)	D (1.8)	E (3.1)	F (4.9)	Total basal area (by species; sq ft)	[6]Relative dominance (by species)	No. of circles in which species occurred	[8]Relative frequency
Picea rubens Sarg.	33	21	9	1			64	160	28	3.3	6.3	7.2	1.8			18.6	37	4	100
Acer rubrum L.	53	19	2				74	185	32	5.3	5.7	1.6				12.6	25	4	100
Betula papyrifera Marsh.	10	3					13	32.5	6	1.0	0.9					1.9	4	4	100
Abies balsamea (L.) Mill.	10	3	1				14	35.0	6	1.0	0.9	0.8				2.7	5	4	100
Betula populifolia Marsh.	5						5	12.5	2	0.5						0.5	1	2	50
Fagus grandifolia Ehrh.	22	10	6		1	1	40	100	17	2.2	3.0	4.8				10.0	20	3	75
Betula alleghaniensis Britton	5	1					2	5	1	0.5	0.3					0.8	2	1	25
Picea glauca (Moench) Voss	10	2					12	30	5	1.0	0.6					1.6	3	4	100
Populus tremuloides Michx.	1	1	1				3	7.5	1	0.1	0.3	0.8				1.2	2	2	50
Acer saccharum Marsh.	3						3	7.5	1	0.3						0.3	1	1	25
Totals	148	60	19	1	1	1	230	575	100%	15.2	18.0	15.2	1.8			50.2	100%		
Trees/acre (By size class)	370	150	47.5	2.5	2.5	2.5	Basal area (by size class)			38.0	45.0	38.0	4.5						
Relative density (by size class)	64	26	8	0.4	0.4	0.4	Relative basal area (by size class)			30	36	30	4						

SHRUBS: Total shrub stems in all transects (2 per circle x 1000, divided by the number of transects = 9750 shrub stems per acre
GROUND COVER: Total pluses (+) recorded (20 sightings per circle) x 100, divided by the total number of sightings = 56% ground cover
CANOPY COVER: Total pluses (+) recorded (20 sightings per circle) x 100, divided by the total number of sightings = 63% canopy cover
CANOPY HEIGHT: Average = 51/13 Range = 40-70/3-25
NOTES: OS 55% US 36% Shrubs mainly *Picea rubens, Abies balsamea* and to a lesser extent *Acer pensylvanicum* L.

[1]Number per unit area
[2]Total trees counted x 2.5
[3]Relative density is the percent of the total number of trees which are which are the species in question
[4]Basal area is the cross sectional area of the trunk of a tree at 4.5 feet (dbh)
[5]Multiply the number of trees in all circles in size class A times 0.1 (average area in square feet for this size class)
[6]$\frac{\text{Total basal area of the species}}{\text{Total basal area of all species}} \times 100$
[7]Frequency indicates the evenness of distribution of a species
[8]$\frac{\text{Number of circles in which the species occurred}}{\text{Total number of circles}} \times 100$

Table 6. Vegetation analysis, Acadia Untreated Check Block, Spot census area.

Number of circles 2

TREES:	DENSITY[1]									BASAL AREA[4]								
	Number of trees in all circles by diameter of size class									Cross sectional area of the trunk at breast height (d.b.h.)								FREQUENCY[7]
SPECIES	A 3-6	B 6-9	C 9-15	D 15-21	E 21-27	F 27-33	Total	Trees/Acre[2] (by species)	Relative Density[3] (by Species)	A[5] (0.1)	B (0.3)	C (0.8)	D (1.8)	E (3.1)	F (4.9)	Total basal area (by species; sq ft)	[6]Relative dominance (by species)	No. of circles in which species occurred	[8]Relative frequency
Picea rubens Sarg.	8	17	11				36	180	29	0.8	5.1	8.8				14.7	52	2	100
Acer rubrum L.	42	5					47	235	38	4.2	1.5					5.7	20	2	100
Betula papyrifera Marsh.	3	1					4	20	3	0.3	0.3					0.6	2	1	50
Abies balsamea (L.) Mill.	12	9	2				23	115	18	1.2	2.7	1.6				5.5	20	2	100
Betula populifolia Marsh.	7	1					8	40	6	0.7	0.3					1.0	4	2	100
Fagus grandifolia Ehrh.	3						3	15	2	0.3						0.3	1	1	50
Betula alleghaniensis Britton	4						4	20	3	0.4						0.4	1	2	100
Totals	79	33	13				125	625	100%	7.9	9.9	10.4				28.2	100%		
Trees/acre (By size class)	395	165	65				Basal area (by size class)			39.5	49.5	52.0							
Relative density (by size class)	63	26	10				Relative basal area (by size class)			28	35	37							

SHRUBS: Total shrub stems in all transects (2 per circle x 1000, divided by the number of transects = 7250 shrub stems per acre
GROUND COVER: Total pluses (+) recorded (20 sightings per circle) x 100, divided by the total number of sightings = 78% ground cover
CANOPY COVER: Total pluses (+) recorded (20 sightings per circle) x 100, divided by the total number of sightings = 85% canopy cover
CANOPY HEIGHT: Average = 50/12 Range = 40-60/3-20
NOTES: Mainly coniferous, closed, moss covered, fairly mature OS 70-80% US 5% Major shrub species *Picea rubrum, Abies balsamea* and to a lesser extent *Acer pensylvanicum* L.

[1]Number per unit area
[2]Total trees counted x 5
[3]Relative density is the percent of the total number of trees which are the total number of trees which are the species in question
[4]Basal area is the cross sectional area of the trunk of a tree at 4.5 feet (dbh)
[5]Multiply the number of trees in all circles in size class A times 0.1 (average area in square feet for this size class)
[6]$\frac{\text{Total basal area of the species}}{\text{Total basal area of all species}} \times 100$
[7]Frequency indicates the evenness of distribution of a species
[8]$\frac{\text{Number of circles in which the species occurred}}{\text{Total number of circles}} \times 100$

Table 7. Vegetation analysis, Yoho Untreated Check Block, Transect census area.

Number of circles 4

TREES:	DENSITY[1]									BASAL AREA[4]									
	Number of trees in all circles by diameter of size class									Cross sectional area of the trunk at breast height (d.b.h.)								FREQUENCY[7]	
SPECIES	A 3-6	B 6-9	C 9-15	D 15-21	E 21-27	F 27-33	Total	Trees/Acre[2] (by species)	Relative Density[3] (by Species)	A[5] (0.1)	B (0.3)	C (0.8)	D (1.8)	E (3.1)	F (4.9)	Total basal area (by species; sq ft)	[6]Relative dominance (by species)	No. of circles in which species occurred	[8]Relative frequency
Abies balsamea (L.) Mill.	43	6	1				50	125	18	4.3	1.8	0.8				6.9	16	4	100
Picea rubens Sarg.	151	11	1				163	408	59	15.1	3.3	0.8				19.2	44	4	100
Populus tremuloides Michx.	23	5					28	70	10	2.3	1.5					3.8	9	4	100
Betula alleghaniensis Britton	1						1	3	0.4	0.1						0.1	0.2	1	25
Acer rubrum L.	6	4	4				14	35	5	0.6	1.2	3.2				5.0	11	3	75
Pinus strobus L.	3	1	4	1			9	23	3	0.3	0.3	3.2	1.8			5.6	13	3	75
Picea glauca (Moench) Voss		5					5	13	2		1.5					1.5	3	2	50
Larix laricina (Du Roi) K. Koch	1	1					2	5	1	0.1	0.3					0.4	1	2	50
Betula populifolia Marsh.	1						1	3	0.4	0.1						0.1	0.2	1	25
Picea mariana (Mill.) B.S.P.		3					3	8	1		0.9					0.9	2	1	25
Totals	238	36	10	1			276	693	100%	22.9	10.8	8.0	1.8			43.5	100%		
Trees/acre (By size class)	595	90	25	3			Basal area (by size class)			57.3	27.0	20.0	4.5						
Relative density (by size class)	86	13	4	0.4			Relative basal area (by size class)			53	25	18	4						

SHRUBS: Total shrub stems in all transects (2 per circle x 1000, divided by the number of transects = 33625 shrub stems per acre
GROUND COVER: Total pluses (+) recorded (20 sightings per circle) x 100, divided by the total number of sightings = 84% ground cover
CANOPY COVER: Total pluses (+) recorded (20 sightings per circle) x 100, divided by the total number of sightings = 78% canopy cover
CANOPY HEIGHT: Average = 51/10 Range = 20-80/3-20
NOTES: mainly coniferous, 2nd growth, fairly open with dense understory, wet, selective cut. Shrubs mainly *Viburnum cassinoides* L., *Picea rubens* and *Abies balsamea*.

[1]Number per unit area
[2]Total trees counted x 2.5
[3]Relative density is the percent of the total number of trees which are the species in question
[4]Basal area is the cross sectional area of the trunk of a tree at 4.5 feet (dbh)
[5]Multiply the number of trees in all circles in size class A times 0.1 (average area in square feet for this size class)
[6]$\frac{\text{Total basal area of the species}}{\text{Total basal area of all species}} \times 100$
[7]Frequency indicates the evenness of distribution of a species
[8]$\frac{\text{Number of circles in which the species occurred}}{\text{Total number of circles}} \times 100$

For the first two treatments, application was by TBM Avenger aircraft equipped with 1010 Flat fan Teejet® nozzles (travelling at a flight speed of 150 knots, 15-30 m above the canopy. Spraying commenced at 0630 ADT on 4 June with the planes flying in a north-south direction progressing from east to west. The last pass was completed at 0705 ADT. The second application began at 0550 ADT and was terminated at 0624 ADT on 9 June. The flight pattern for this application was very complicated due to changes in the wind direction. Consequently, the bird census areas were not sprayed and a third application was necessary. This application was by a Cessna 188 Ag-truck equipped with four AU3000 Micronair® atomizers travelling at a flight speed of 15 knots, 15 m above canopy. The flight plan was similar to that of the first application. However, the area treated was 328 ha as opposed to 5000 ha for the first and second applications. The third application began on 17 June at 1709 ADT and was completed by 1739 ADT.

Meteorological conditions at the time of all three spray applications are summarized below:

Application	I	II	III
Date sprayed	4 June	9 June	17 June
Time-start	06:30	05:50	17:09
-finish	07:05	06:24	17:39
Temp-Ground	7°C	11°C	18°C
-10 m above canopy	9°C	10°C	10°C
Wind direction	E	NE	E
and speed	1-8 kph	1-8 kph	1-6 kph

BLOCK 86

Block 86 was treated twice with MATACIL® 180F at the rate of 0.070 kg/ha active ingredient in 1.46 L/ha of water solution. The actual spray mixture consisted of:

MATACIL® 180F	25.93% by volume
ATLOX 3409F	1.27% by volume
Water	72.8% by volume

Application was by TBM Avenger aircraft equipped with 1010 Flat fan TeeJet® nozzles travelling at a flight speed of 150 knots, 15-30 m above the canopy.

Spraying began at 1908 ADT on 31 May, with the plane flying in a north-south direction working from east to west. The final spray swath was at 1933 ADT. The second application began at 0554 ADT on 8 June with the final pass completed at 0629 ADT. The flight pattern was again north-south but in an east to west direction. The area treated for both applications was 3280 ha.

Meteorological conditions at the time of treatment are summarized below:

Application	I	II
Date sprayed	31 May (PM)	8 June (AM)
Time-start	19:08	05:54
-finish	19:33	06:29
Temp-Ground	18°C	7°C
-10 m above canopy	22°C	9°C
Wind direction	S	NE
and speed	1-8 kph	8-16 kph

SAMPLING METHODS

Adult songbird censuses were conducted in treated and untreated check blocks using both the transect (0.72 km in length) and spot (0.4 ha in area) census methods. In this way, it was possible to increase coverage of the block while maintaining the restrictions of limited personnel. Censusing was by the singing-male territory mapping technique similar to that described by Kendeigh (1947). Bird populations were censused each morning (weather permitting) shortly after dawn, commencing a minimum of eight days prior to the initial application and continuing throughout the experimental period, terminating a minimum of five days after the last treatment. All observations were recorded on daily maps which were later combined over the pre- and post-spray census periods for territory analysis of individual species. All birds were identified to species, sex and type of activity at the time of record. Male birds vocally defending a territory were assumed to be mated and were recorded as two birds, all others (sighted, non-singing etc.) were recorded as one. The number of birds observed during each census served to indicate activity trends and relative abundance.

Banding studies were included as an additional measure of breeding success. Adult birds, caught in mist nets, were weighed, identified and categorized by sex and breeding condition (breeding or non-breeding). Weights were taken with a PESOLA hand balance accurate to 1.0 gm. Fledglings were also identified, weighed and measured. However, a triple beam balance (accurate to 0.1 gm) was used in place of the PESOLA. Records were kept of the number and diversity of young caught.

To further enhance the study of breeding success, nests found within the bird census areas were monitored over the study period (a Tennessee warbler nest in Block 82, a winter wren nest in Block 86, and a white-throated sparrow nest in each block).

RESULTS AND DISCUSSION

ADULT CENSUSES

BLOCK 82

Daily activity measurements (Figure 4) show a steady decline in the number of birds censused over the study period in both the treatment and check blocks, areas 1 and 2. Treatment and check results were closely matched except for the pre-spray time period in area 1, where treatment numbers exceeded those of the check block.

A decreasing trend was also observed for species diversity (Figure 5) in area 2, but in area 1 species diversity was lowest during the pre-spray time period and increased slightly for post-spray 1 and 2. As species diversity in area 1 was lower during pre-spray, the larger pre-spray numbers on treatment (noted above) may have been subdominant or transient males.

Large fluctuations in both activity and species diversity were caused by changes in weather. Days 157 and 158 (6 and 7 June) were windy (10-25 kph), overcast (80-100%), and cool (6-10°C). Day 171 (20 June) was also windy (5-20 kph), and overcast (90-100%), with a slight drizzle for part of the census.

Turdidae, parulidae and fringillidae were the major families censused (Tables 8-11). Activity patterns for these families and others in treatment, were very similar to the check results for the spot census data (Tables 9 and 11). For the transect results however, numbers of tyrannidae, turdidae and parulidae declined over the season in the treatment block (Table 8), while numbers in the check block increased (Table 10). The situation was reversed for fringillidae.

The predominant species in all census areas were the same (the hermit thrush, the Tennessee, magnolia and Cape May warblers, the ovenbird and the white-throated sparrow) (Appendix II, Tables 1-4). There was no indication of a pesticide effect on any species in area 2, whereas activity of a few species in area 1 was reduced from pre-spray levels on treatment while activity in the check block increased. Other species in the transect area (e.g., the ruby-crowned and golden-crowned kinglets) showed reductions similar to those of the check transect.

Overall, changes in the number of territories and frequency of observations were very similar in treatment as compared to the check block for both areas 1 and 2 (Tables 12-15). Substantial decreases in numbers of territories were documented over the study period on both plots, particularly among the thrushes, kinglets and warblers. These reflect natural territorial breakdowns corresponding to the development of the young and changes in the male's breeding behavior. The highest numbers of territories were recorded during the pre-spray and post-spray 2 time periods,

due mainly to a larger number of observation days in these periods enhancing the observer's ability to delineate territories. As the check block had the same number of observation days as the treated blocks, this should not have hampered the detection of territorial reductions due to a pesticide effect. Indeed, the changes to total numbers of territories over the four census periods in Treated and check plots are very similar (Figure 6).

The frequency of observations increased in area 1 but decreased in area 2 for both treatment and check results (Tables 12-15). This is most likely a manifestation of the number of visual observations made in each area as there is less opportunity for visual contact with the spot census method where the observer remains stationary, than there is with the transect method where the observer traverses the area.

Although the numbers of territories defined on census transects declined to rather similar extents on treatment and check blocks for most species, some exceptions were noted. The numbers of least flycatcher, hermit thrush, black-and-white warbler, Canada warbler and ovenbird territories declined by between 1 and 4 on the treatment block while remaining constant or increasing by 1 or 2 on the check block. Blackburnian warbler territories also disappeared from the treatment block in greater numbers (loss of 5) than from the check block (loss of 1). On the other hand, more Cape May warbler, black-throated blue warbler, chestnut-sided warbler and rose-breasted grosbeak territories disappear from the check block than from the treatment block. Numbers of bay-breasted warbler and American redstart territories increased on both blocks over the study period. In light of the general similarity in changes on treatment and check blocks (Figure 6) and a lack of indications of impact on canopy-feeding species generally considered to be pesticide-sensitive (bay-breasted and Cape May warblers, golden-crowned and ruby-crowned kinglets), there is little evidence to support the suggestion that the MATACIL® treatments caused the territorial changes observed. Territorial changes for individual species in area 2 of the treatment block (the spot results) (Table 14) were very similar to the check block (Table 15), again supporting the conclusion that there were no signs of territorial disruption as a result of the MATACIL® treatments (Figure 6).

Observations were made of a Tennessee warbler and white-throated sparrow nest found along the treatment transect. Young of the Tennessee warbler fledged successfully, while the white-throat young had not hatched before termination of the study.

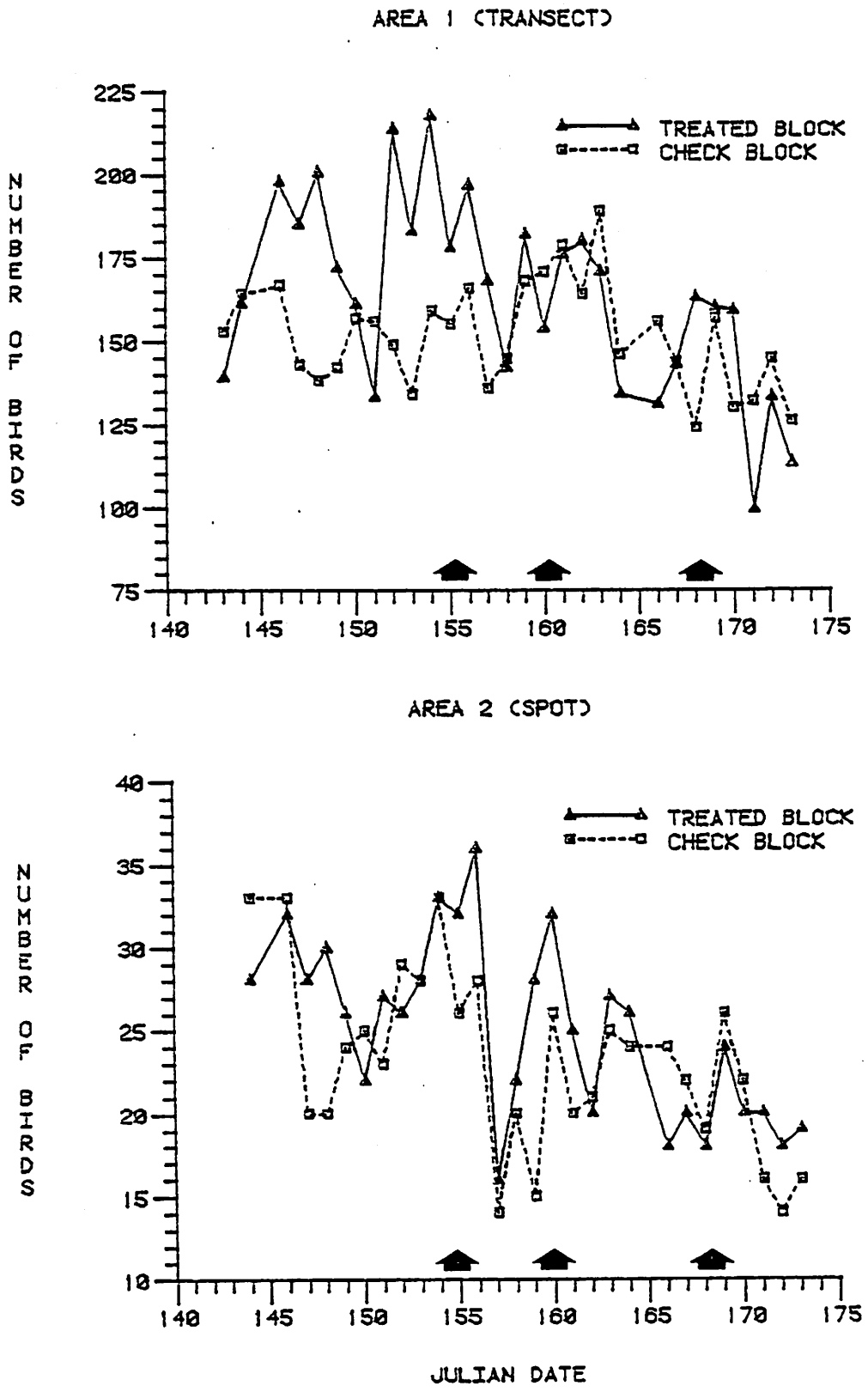


Figure 4. Daily activity measurements for Areas 1 and 2 of Treatment Block 82 and the Untreated Check Block. Arrows represent aerial applications of MATACIL®.

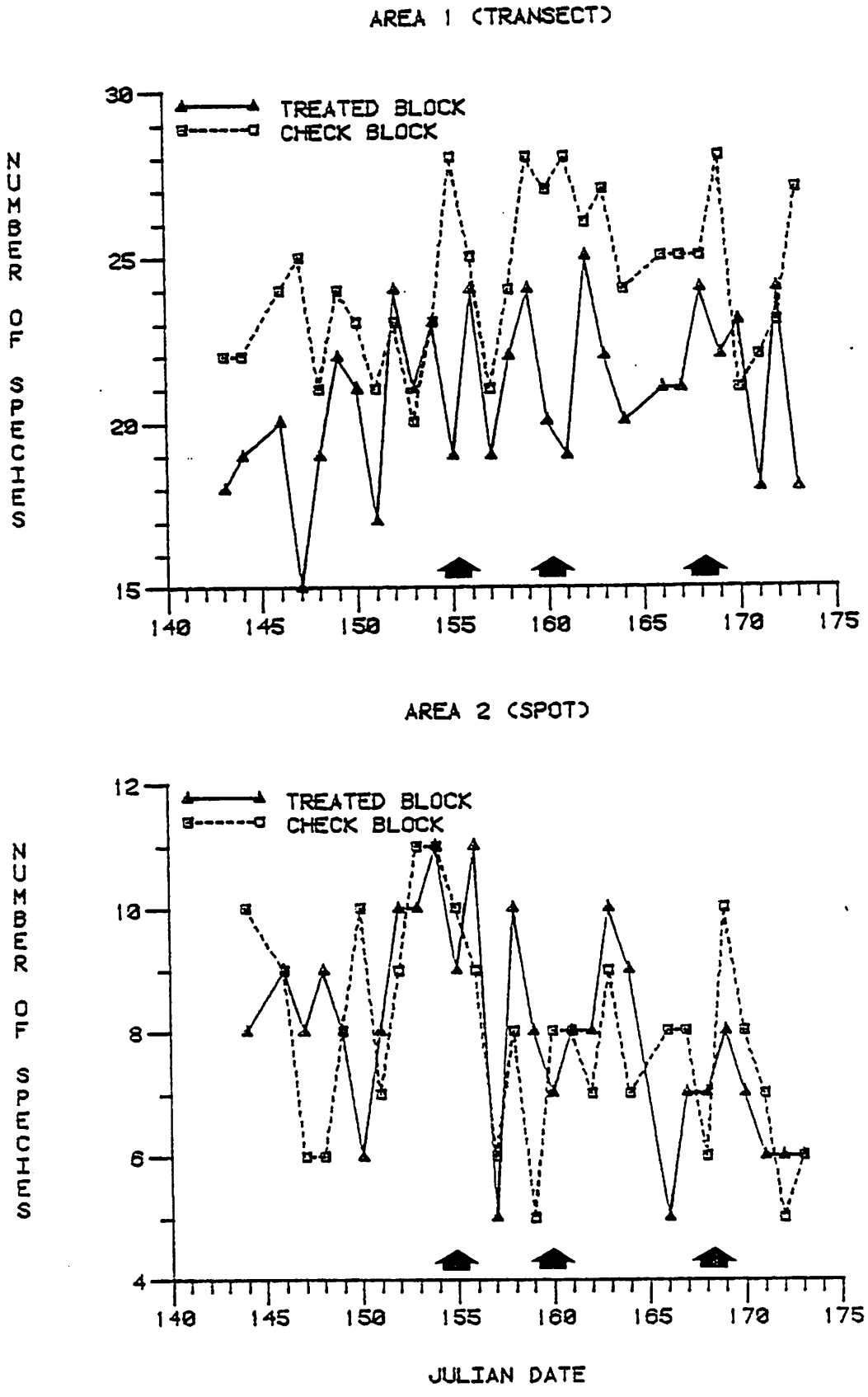


Figure 5. Changes in species diversity over the study period for Areas 1 and 2 of Treatment Block 82 and the Untreated Check Block. Arrows represent aerial applications of MATACIL®.

Table 8. Forest bird population census, Block 82* Area I Transect Data, Fredericton, New Brunswick, 23 May-22 June, 1982.

	PRE-SPRAY													POST-SPRAY I					
	May 23	May 24	May 26	May 27	May 28	May 29	May 30	May 31	June 1	June 2	June 3	June 4		June 5	June 6	June 7	June 8	June 9	
Family	-12	-11	-9	-8	-7	-6	-5	-4	-3	-2	-1	-0	Daily Ave.	+1	+2	+3	+4	+5	Daily Ave.
Tyrannidae	0	0	2	0	2	6	4	2	2	6	2	6	2.7	4	0	0	4	0	1.6
Turdidae	17	24	30	24	26	22	16	18	24	21	18	15	21.3	19	9	8	14	14	12.8
Sylviidae	12	10	20	14	12	16	10	8	20	12	10	4	12.3	8	4	6	6	10	6.8
Vireonidae	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	2	4	0	1.2
Parulidae	98	110	119	122	136	102	105	84	126	110	141	122	114.6	130	124	91	115	98	111.6
Fringillidae	12	16	25	25	25	26	26	21	42	34	47	31	27.5	36	30	35	39	31	34.2
Unidentified birds	0	1	2	0	0	0	0	0	0	0	0	0	0.3	0	1	0	0	1	0.4
Totals	139	161	198	185	201	172	161	133	214	183	218	178	178.9	197	168	142	182	154	168.6
No. of species	18	19	20	15	19	22	21	17	24	21	23	19	19.7	24	19	22	24	20	21.6

*treated with MATACIL® 180F + Insecticide Diluent 585 at 0630 ADT on 4 June, 0550 ADT on 9 June and 1709 ADT on 17 June, 1982.

Table 8. Forest bird population census, Block 82* Area I Transect Data, Fredericton, New Brunswick, 23 May-22 June, 1982 (Continued).

	POST-SPRAY II								POST-SPRAY III					
	June 10	June 11	June 12	June 13	June 15	June 16	June 17		June 18	June 19	June 20	June 21	June 22	
Family	+1	+2	+3	+4	+6	+7	+8	Daily Ave.	+1	+2	+3	+4	+5	Daily Ave.
Tyrannidae	0	2	2	0	0	2	3	1.3	2	2	2	0	0	1.2
Turdidae	15	11	14	9	13	12	19	13.3	19	11	12	13	12	13.4
Sylvildae	6	8	12	10	10	8	2	8.0	10	8	4	8	4	6.8
Vireonidae	0	2	0	0	0	0	2	0.6	0	0	0	0	4	0.8
Parulidae	117	120	114	88	82	92	107	102.9	95	112	69	84	72	86.4
Fringillidae	38	37	29	27	26	29	30	30.9	34	26	12	28	21	24.2
Unidentified birds	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0.0
Totals	176	180	171	134	131	143	163	156.9	160	159	99	133	113	132.8
No. of species	19	25	22	20	21	21	24	21.7	22	23	18	24	18	21.0

*treated with MATACIL® 180F + Insecticide Diluent 585 at 0630 ADT on 4 June, 0550 ADT on 9 June and 1709 ADT on 17 June, 1982.

Table 9. Forest bird population census, Block 82* Area II Spot Data, Fredericton, New Brunswick, 24 May-22 June, 1982.

	PRE-SPRAY											POST-SPRAY I					
	May 24	May 26	May 27	May 28	May 29	May 30	May 31	June 1	June 2	June 3		June 4	June 5	June 6	June 7	June 8	
Family	-11	-9	-8	-7	-6	-5	-4	-3	-2	-1	Daily Ave.	+0	+1	+2	+3	+4	Daily Ave.
Tyrannidae	0	0	0	0	0	0	2	0	2	0	0.4	0	0	0	0	0	0.0
Turdidae	2	0	4	6	2	0	3	2	2	2	2.3	6	4	4	3	4	4.2
Sylvilidae	2	2	2	4	2	0	2	2	2	0	1.8	2	2	0	2	2	1.6
Vireonidae	0	0	0	0	0	0	0	0	0	0	0.0	2	0	0	0	2	0.8
Parulidae	22	24	20	18	20	18	18	18	16	28	20.2	22	26	12	14	14	17.6
Fringillidae	2	6	2	2	2	4	2	4	6	3	3.3	0	4	0	3	2	1.8
Unidentified birds	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0	0	4	0.8
Totals	28	32	28	30	26	22	27	26	28	33	28.0	32	36	16	22	28	26.8
No. of species	8	9	8	9	8	6	8	10	10	11	8.7	9	11	5	10	8	8.6

*treated with MATACIL® 180F + Insecticide Diluent 585 at 0630 ADT on 4 June, 0550 ADT on 9 June, and 1709 ADT on 17 June, 1982.

Table 9. Forest bird population census, Block 82* Area II Spot Data, Fredericton, New Brunswick, 24 May-22 June, 1982 (Continued).

	POST-SPRAY II									POST-SPRAY III					
	June 9	June 10	June 11	June 12	June 13	June 15	June 16	June 17		June 18	June 19	June 20	June 21	June 22	
Family	+0	+1	+2	+3	+4	+6	+7	+8	Daily Ave.	+1	+2	+3	+4	+5	Daily Ave.
Tyrannidae	0	0	0	0	0	0	0	0	0.0	0	2	0	0	0	0.4
Turdidae	6	5	1	3	6	2	2	2	3.4	4	4	6	4	5	4.6
Sylvilidae	0	0	2	4	2	0	0	0	1.0	0	0	0	0	0	0.0
Vireonidae	0	2	0	0	0	0	0	0	0.3	0	0	2	0	0	0.4
Parulidae	24	14	14	16	12	16	16	14	15.8	16	12	12	10	12	12.4
Fringillidae	2	4	3	4	6	0	2	2	2.9	4	2	0	4	2	2.4
Unidentified birds	0	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0.0
Totals	32	25	20	27	26	18	20	18	23.3	24	20	20	18	19	20.2
No. of species	7	8	8	10	9	5	7	7	7.6	8	7	6	6	6	6.6

*treated with MATACIL® 180F + Insecticide Diluent 585 at 0630 ADT on 4 June, 0550 ADT on 9 June, and 1709 ADT on 17 June, 1982.

Table 10. Forest bird population census, Acadia Untreated Check Block*, Transect Data, Fredericton, New Brunswick, 23 May-22 June, 1982.

	PRE-SPRAY													POST-SPRAY I					
	May 23	May 24	May 26	May 27	May 28	May 29	May 30	May 31	June 1	June 2	June 3	June 4		June 5	June 6	June 7	June 8	June 9	
Family	-12	-11	-9	-8	-7	-6	-5	-4	-3	-2	-1	-0	Daily Ave.	+1	+2	+3	+4	+5	Daily Ave.
Tyrannidae	0	0	4	2	0	4	4	4	6	0	2	4	2.5	6	2	8	9	4	5.8
Troglodytidae	0	0	0	0	0	0	0	0	0	0	0	2	0.2	0	0	0	0	0	0.0
Turdidae	19	21	19	12	16	18	13	12	16	17	22	19	17.0	31	19	22	21	28	24.2
Sylvilidae	8	10	8	8	6	8	8	6	6	8	8	16	8.3	6	6	6	3	2	4.6
Vireonidae	2	0	2	0	0	0	0	0	2	0	2	4	1.0	0	4	0	4	4	2.4
Parulidae	106	123	118	94	94	96	108	113	102	82	104	92	102.7	102	96	106	119	125	109.6
Fringillidae	16	8	14	23	18	13	22	19	15	24	21	18	17.6	21	9	1	11	7	9.8
Unidentified birds	2	2	2	4	4	3	2	2	2	3	0	0	2.2	0	0	2	1	1	0.8
Totals	153	164	167	143	138	142	157	156	149	134	159	155	151.4	166	136	145	168	171	157.2
No. of species	22	22	24	25	21	24	23	21	23	20	23	28	23.0	25	21	24	28	27	25.0

*untreated check block for Treatment Block 82

Table 10. Forest bird population census, Acadia Untreated Check Block*, Transect Data, Fredericton, New Brunswick, 23 May-22 June, 1982 (Continued).

	POST-SPRAY II								POST-SPRAY III					
	June 10	June 11	June 12	June 13	June 15	June 16	June 17		June 18	June 19	June 20	June 21	June 22	
Family	+1	+2	+3	+4	+6	+7	+8	Daily Ave.	+1	+2	+3	+4	+5	Daily Ave.
Tyrannidae	6	8	4	4	2	4	6	4.9	4	2	8	6	6	5.2
Troglodytidae	0	0	0	0	0	0	0	0.0	0	0	0	2	2	0.8
Turdidae	33	30	31	25	25	21	12	25.3	31	22	20	16	18	21.4
Sylvidae	4	4	4	2	6	4	4	4.0	4	6	4	0	2	3.2
Vireonidae	0	2	4	4	4	2	2	2.6	4	2	4	2	2	2.8
Parulidae	122	112	134	105	108	104	90	110.7	106	94	88	106	82	95.2
Fringillidae	14	8	12	6	11	9	10	10.0	8	4	8	13	14	9.4
Unidentified birds	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0.0
Totals	179	164	189	146	156	144	124	157.4	157	130	132	145	126	138.0
No. of species	28	26	27	24	25	25	25	25.7	28	21	22	23	27	24.2

*untreated check block for Treatment Block 82

Table 11. Forest bird population census, Acadia Untreated Check Block*, Spot Data, Fredericton, New Brunswick, 24 May-22 June, 1982.

	PRE-SPRAY											POST-SPRAY 1					
	May 24	May 26	May 27	May 28	May 29	May 30	May 31	June 1	June 2	June 3		June 4	June 5	June 6	June 7	June 8	
Family	-11	-9	-8	-7	-6	-5	-4	-3	-2	-1	Daily Ave.	+0	+1	+2	+3	+4	Daily Ave.
Tyrannidae	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0.0
Turdidae	2	2	4	2	1	2	1	8	2	2	2.6	6	4	2	2	4	3.6
Sylvilidae	0	0	0	0	0	0	0	0	0	0	0.0	2	2	0	0	0	0.8
Vireonidae	2	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0.0
Parulidae	25	26	14	14	16	18	14	18	22	26	19.3	16	22	8	14	10	14.0
Fringillidae	4	5	2	4	7	5	8	3	4	5	4.7	2	0	4	4	1	2.2
Unidentified birds	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0.0
Totals	33	33	20	20	24	25	23	29	28	33	26.8	26	28	14	20	15	20.6
No. of species	10	9	6	6	8	10	7	9	11	11	8.7	10	9	6	8	5	7.6

*untreated check block for Treatment Block 82

Table 11. Forest bird population census, Acadia Untreated Check Block*, Spot Data, Fredericton, New Brunswick, 24 May-22 June, 1982 (Continued).

	POST-SPRAY II									POST-SPRAY III					
	June 9	June 10	June 11	June 12	June 13	June 15	June 16	June 17		June 18	June 19	June 20	June 21	June 22	
Family	+0	+1	+2	+3	+4	+6	+7	+8	Daily Ave.	+1	+2	+3	+4	+5	Daily Ave.
Tyrannidae	0	0	0	0	0	0	0	0	0.0	4	0	0	0	0	0.8
Turdidae	2	2	4	2	2	4	2	2	2.5	2	4	4	2	2	2.8
Sylviidae	0	2	0	2	0	0	0	0	0.5	2	0	0	0	0	0.4
Vireonidae	0	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0.0
Parulidae	16	12	14	16	22	18	16	14	16.0	16	14	10	10	10	12.0
Fringillidae	8	4	3	4	0	2	4	3	3.5	2	4	2	2	4	2.8
Unidentified birds	0	0	0	1	0	0	0	0	0.1	0	0	0	0	0	0.0
Totals	26	20	21	25	24	24	22	19	22.6	26	22	16	14	16	18.8
No. of species	8	8	7	9	7	8	8	6	7.6	10	8	7	5	6	7.2

*untreated check block for Treatment Block 82

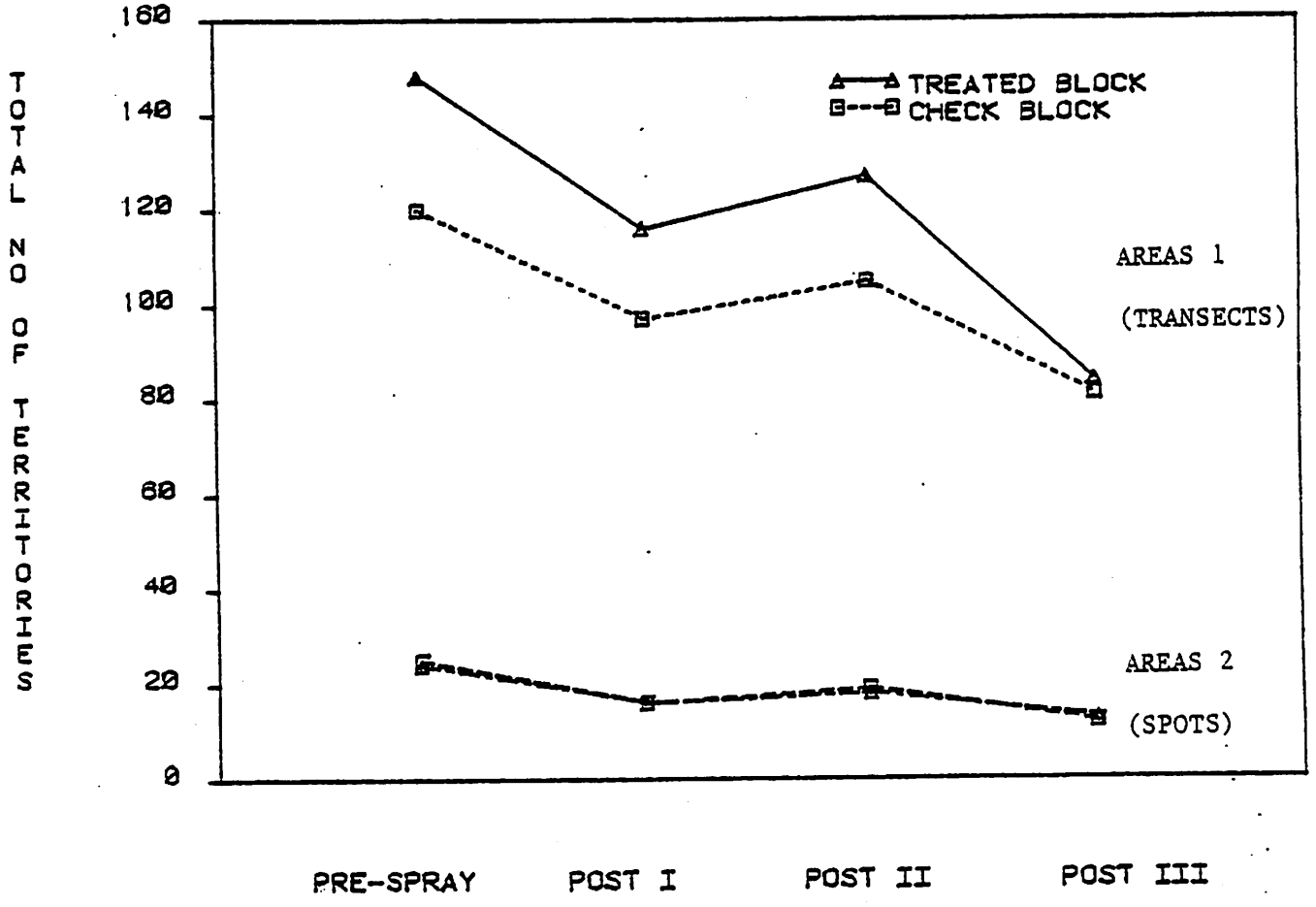


Figure 6. Changes in total numbers of breeding territories identified over the study period for Areas 1 and 2 of Treatment Block 82 and the Untreated Check Block.

Table 12. Change in territorial behaviour of selected species following aerial applications of MATACIL , Treatment Block 82 Area 1 Transect Data, 23 May-22 June, 1982.

Species	Number of Territories						Frequency of Observations*				
	Pre-spray	Post-spray I	Post-spray II	Post-spray III	Absolute Change**	Relative Change (%)+	Pre-spray	Post-spray I	Post-spray II	Post-spray III	Change
Least Flycatcher	2	1	0	0	-2	-100	0.2	0.4	0.1	0.0	-0.2
Eastern Wood Pewee	0	0	0	0	0	0	0.0	0.0	0.1	0.0	0
Olive-sided Flycatcher	2	0	1	1	-1	-50	0.4	0.2	0.4	0.6	+0.2
American Robin	3	0	0	0	-3	-100	0.3	0.4	0.3	0.2	-0.1
Wood Thrush	0	0	1	0	0	0	0.0	0.2	0.3	0.4	+0.4
Hermit Thrush	10	6	8	8	-2	-20	0.7	0.9	0.5	0.6	-0.1
Swainson's Thrush	4	1	3	2	-2	-50	0.6	0.4	0.7	0.6	0
Golden-crowned Kinglet	4	3	3	2	-2	-50	0.5	0.6	0.7	1.0	+0.5
Ruby-crowned Kinglet	5	2	3	2	-3	-60	0.6	0.6	0.5	0.6	0
Solitary Vireo	0	0	0	0	0	0	0.0	0.0	0.3	0.0	0
Red-eyed Vireo	0	1	0	0	0	0	0.0	0.4	0.0	0.2	+0.2
Black-and-white Warbler	2	0	0	0	-2	-100	0.7	0.0	0.4	0.2	-0.5
Tennessee Warbler	22	10	11	5	-17	-77	0.6	0.7	0.6	0.8	+0.2
Nashville Warbler	3	6	6	3	0	0	0.3	0.6	0.5	0.9	+0.6
Parula Warbler	1	2	2	1	0	0	0.3	0.4	0.6	0.6	+0.3
Yellow Warbler	0	0	0	0	0	0	0.8	0.0	0.0	0.0	-0.8
Magnolia Warbler	17	13	12	7	-10	-59	0.5	0.8	0.7	0.7	+0.2
Cape May Warbler	11	8	11	7	-4	-36	0.5	0.7	0.6	0.6	+0.1
Black-throated Blue Warbler	3	2	2	2	-1	-33	0.5	0.6	0.6	0.7	+0.2
Yellow-rumped Warbler	3	2	2	1	-2	-67	0.5	0.3	0.3	0.6	+0.1
Black-throated Green Warbler	4	3	1	1	-3	-75	0.4	0.7	0.7	1.0	+0.6
Blackburnian Warbler	6	5	5	1	-5	-83	0.5	0.5	0.5	0.4	-0.1
Chestnut-sided Warbler	0	1	1	1	+1	++	0.0	0.4	0.3	0.4	+0.4
Bay-breasted Warbler	4	7	8	6	+2	+50	0.4	0.6	0.7	0.8	+0.4
Blackpoll Warbler	0	0	0	0	0	0	0.0	0.2	0.1	0.0	0
Ovenbird	14	13	14	10	-4	-29	0.6	0.7	0.6	0.8	+0.2
Common Yellowthroat	4	4	4	3	-1	-25	0.5	0.5	0.5	0.6	+0.1
Canada Warbler	2	1	1	1	-1	-50	0.4	0.6	0.6	0.8	+0.4
American Redstart	0	2	4	4	+4	++	0.0	0.6	0.7	0.9	+0.9
Rose-breasted Grosbeak	4	2	3	3	-1	-25	0.3	0.4	0.4	0.5	+0.2
Purple Finch	0	0	0	1	+1	++	0.0	0.4	0.1	0.4	+0.4
Dark-eyed Junco	5	10	10	4	-1	+20	0.3	0.7	0.6	0.8	+0.5
Chipping Sparrow	0	0	0	0	0	0	0.0	0.0	0.1	0.0	0
White-throated Sparrow	13	11	11	8	-5	-38	0.8	0.8	0.6	0.8	0
Totals	148	116	127	84	-64	-43	12.2	15.3	14.7	17.5	+5.3

* $\frac{\text{no. days observed}}{\text{total no. of observation days}}$

**change in number of territories over the study period

\+ $\frac{\text{absolute change}}{\text{no. of pre-spray territories}} \times 100$

++incalculable

Table 13. Change in territorial behaviour of selected species, Untreated Check Block for Treatment Block 82, Transect Data, 23 May-22 June, 1982.

Species	Number of Territories						Frequency of Observations[a]				
	Pre-spray	Post-spray I	Post-spray II	Post-spray III	Absolute Change[aa]	Relative Change (%)+	Pre-spray	Post-spray I	Post-spray II	Post-spray III	Change
Yellow-bellied Flycatcher	1	1	1	0	-1	-100	0.3	0.6	0.3	0.2	-0.1
Least Flycatcher	2	2	1	2	0	0	0.4	0.7	1.0	0.8	+0.4
Winter Wren	0	0	0	0	0	0	0.1	0.0	0.0	0.0	-0.1
American Robin	3	1	2	1	-2	-67	0.3	0.8	0.6	0.8	+0.5
Wood Thrush	3	3	3	2	-1	-33	0.9	0.7	0.5	0.7	-0.2
Hermit Thrush	6	3	5	7	+1	+17	0.4	0.8	0.7	0.7	+0.3
Swainson's Thrush	3	4	7	2	-1	-33	0.7	0.5	0.5	0.5	-0.2
Veery	3	2	2	1	-2	-67	0.3	0.7	0.6	0.8	+0.5
Golden-crowned Kinglet	4	2	2	1	-3	-75	0.6	0.6	0.5	0.6	0
Ruby-crowned Kinglet	2	1	2	1	-1	-50	0.8	0.8	0.5	0.6	-0.2
Philadelphia Vireo	1	0	0	0	-1	-100	0.3	0.0	0.0	0.0	-0.3
Solitary Vireo	1	0	0	0	-1	-100	0.2	0.0	0.1	0.0	-0.2
Red-eyed Vireo	0	2	2	2	+2	++	0.1	0.5	0.5	0.7	+0.6
Black-and-white Warbler	1	2	4	4	+3	+300	0.7	0.6	0.8	0.6	-0.1
Tennessee Warbler	10	10	7	2	-8	-80	0.7	0.7	0.6	0.6	-0.1
Nashville Warbler	1	2	2	2	+1	+100	0.3	0.7	0.9	0.8	+0.5
Parula Warbler	5	3	3	3	-2	-40	0.5	0.4	0.5	0.5	0
Magnolia Warbler	12	8	9	7	-5	-42	0.6	0.8	0.7	0.7	+0.1
Cape May Warbler	6	1	2	0	-6	-100	0.3	0.4	0.3	0.2	-0.1
Black-throated Blue Warbler	5	5	3	1	-4	-80	0.5	0.5	0.7	1.0	+0.5
Yellow-rumped Warbler	5	6	3	3	-2	-40	0.5	0.6	0.5	0.8	+0.3
Black-throated Green Warbler	0	0	0	0	0	0	0.1	0.2	0.0	0.2	+0.1
Blackburnian Warbler	7	7	6	6	-1	-14	0.5	0.7	0.7	0.8	+0.3
Chestnut-sided Warbler	1	0	0	0	-1	-100	0.4	0.0	0.0	0.0	-0.4
Bay-breasted Warbler	5	6	8	6	+1	+20	0.5	0.8	0.7	0.8	+0.3
Ovenbird	14	14	15	14	0	0	0.8	0.8	0.7	0.8	0
Common Yellowthroat	1	0	0	1	0	0	0.2	0.0	0.2	0.4	+0.2
Canada Warbler	3	4	4	4	+1	+33	0.6	0.9	1.0	0.9	+0.3
American Redstart	1	1	3	3	+2	+200	0.2	0.4	0.4	0.5	+0.3
Rose-breasted Grosbeak	7	5	4	3	-4	-57	0.6	0.7	0.6	0.7	+0.1
Purple Finch	2	2	1	2	0	0	0.3	0.4	0.7	0.4	+0.1
Dark-eyed Junco	0	0	2	0	0	0	0.0	0.4	0.4	0.4	+0.4
White-throated Sparrow	5	0	2	1	-4	-80	0.5	0.8	0.5	0.8	+0.3
Totals	120	97	105	81	-39	-33	14.2	17.5	16.7	18.3	+4.1

[a] $\frac{\text{no. days observed}}{\text{total no. of observation days}}$

[aa] change in number of territories over the study period

\+ $\frac{\text{absolute change}}{\text{no. of pre-spray territories}} \times 100$

++incalculable

Table 14. Change in territorial behaviour of selected species following aerial applications of MATACIL®, Treatment Block 82 Area II Spot Data, 24 May-22 June, 1982.

Species	Number of Territories						Frequency of Observations*				
	Pre-spray	Post-spray I	Post-spray II	Post-spray III	Absolute Change**	Relative Change (%)+	Pre-spray	Post-spray I	Post-spray II	Post-spray III	Change
Least Flycatcher	1	0	0	0	-1	-100	0.2	0.0	0.0	0.0	-0.2
Eastern Wood Pewee	0	0	0	0	0	0	0.0	0.0	0.0	0.2	+0.2
American Robin	1	0	0	0	-1	-100	0.2	0.2	0.0	0.0	-0.2
Hermit Thrush	2	3	3	3	+1	+50	0.4	0.5	0.6	0.7	+0.3
Swainson's Thrush	1	1	0	0	-1	-100	0.2	0.4	0.1	0.2	0
Golden-crowned Kinglet	1	0	0	0	-1	-100	0.3	0.0	0.0	0.0	-0.3
Ruby-crowned Kinglet	1	1	1	0	-1	-100	0.6	0.8	0.4	0.0	-0.6
Solitary Vireo	0	0	0	0	0	0	0.0	0.2	0.1	0.2	+0.2
Red-eyed Vireo	0	0	0	0	0	0	0.0	0.2	0.0	0.0	0
Black-and-white Warbler	0	0	0	0	0	0	0.1	0.0	0.1	0.0	-0.1
Tennessee Warbler	3	2	2	1	-2	-67	0.7	0.6	0.5	0.6	-0.1
Nashville Warbler	0	0	0	0	0	0	0.1	0.0	0.1	0.0	-0.1
Parula Warbler	1	0	0	0	-1	-100	0.2	0.0	0.1	0.2	0
Magnolia Warbler	3	1	2	1	-2	-67	0.7	0.6	0.5	0.4	-0.3
Cape May Warbler	2	2	2	2	0	0	0.5	0.9	0.9	0.8	+0.3
Yellow-rumped Warbler	1	0	0	0	-1	-100	0.4	0.2	0.1	0.0	-0.4
Black-throated Green Warbler	0	0	0	0	0	0	0.1	0.2	0.0	0.0	-0.1
Blackburnian Warbler	1	0	0	0	-1	-100	0.3	0.2	0.1	0.0	-0.3
Bay-breasted Warbler	1	2	0	0	-1	-100	0.2	0.4	0.1	0.2	0
Ovenbird	3	3	3	3	0	0	0.8	0.9	0.7	0.8	0
Canada Warbler	0	0	1	0	0	0	0.0	0.0	0.4	0.0	0
American Redstart	0	0	1	1	+1	++	0.0	0.0	0.3	0.4	+0.4
Rose-breasted Grosbeak	1	0	1	1	0	0	0.6	0.2	0.4	0.4	-0.2
Purple Finch	0	0	0	0	0	0	0.1	0.0	0.0	0.1	0
Dark-eyed Junco	0	1	1	1	+1	++	0.1	0.4	0.6	0.6	+0.5
White-throated Sparrow	1	0	1	0	-1	-100	0.6	0.4	0.4	0.0	-0.6
Totals	24	16	18	13	-11	-46	7.4	7.3	6.5	5.8	-1.6

* $\frac{\text{no. days observed}}{\text{total no. of observation days}}$

**change in number of territories over the study period

\+ $\frac{\text{absolute change}}{\text{no. of pre-spray territories}} \times 100$

++incalculable

Table 15. Change in territorial behaviour of selected species, Untreated Check Block for Treatment Block 82, Spot Data, 24 May-22 June, 1982.

Species	Number of Territories						Frequency of Observations*				
	Pre-spray	Post-spray I	Post-spray II	Post-spray III	Absolute Change**	Relative Change (%)+	Pre-spray	Post-spray I	Post-spray II	Post-spray III	Change
Least Flycatcher	0	0	0	0	0	0	0.0	0.0	0.0	0.2	+0.2
American Robin	1	0	0	0	-1	-100	0.5	0.2	0.0	0.2	-0.3
Wood Thrush	0	0	0	0	0	0	0.1	0.0	0.0	0.0	-0.1
Hermit Thrush	1	2	2	1	0	0	0.3	0.6	0.6	1.0	+0.7
Swainson's Thrush	1	0	0	0	-1	-100	0.4	0.2	0.0	0.2	-0.2
Golden-crowned Kinglet	1	1	0	0	-1	-100	0.2	0.4	0.0	0.2	0
Solitary Vireo	0	0	0	0	0	0	0.1	0.0	0.0	0.0	-0.1
Tennessee Warbler	0	0	0	0	0	0	0.1	0.0	0.0	0.0	-0.1
Nashville Warbler	0	1	0	0	0	0	0.0	0.4	0.0	0.0	0
Parula Warbler	2	0	1	1	-1	-50	0.4	0.0	0.3	0.4	0
Magnolia Warbler	1	1	1	0	-1	-100	0.6	0.4	0.3	0.2	-0.4
Cape May Warbler	1	1	1	1	0	0	0.4	0.6	0.5	0.6	+0.2
Black-throated Blue Warbler	2	1	1	1	-1	-50	0.7	0.4	0.5	0.4	-0.3
Yellow-rumped Warbler	0	0	0	0	0	0	0.1	0.2	0.0	0.0	-0.1
Black-throated Green Warbler	2	0	1	1	-1	-50	0.4	0.2	0.5	0.4	0
Blackburnian Warbler	1	1	2	0	-1	-100	0.9	0.6	0.4	0.2	-0.7
Bay-breasted Warbler	2	2	2	1	-1	-50	0.4	0.5	0.7	0.2	-0.2
Ovenbird	5	4	4	3	-2	-40	0.7	0.7	0.9	0.9	+0.2
Common Yellowthroat	0	0	0	0	0	0	0.0	0.0	0.0	0.2	+0.2
American Redstart	0	0	0	0	0	0	0.0	0.0	0.0	0.2	+0.2
Rose-breasted Grosbeak	2	1	1	0	-2	-100	0.3	0.6	0.3	0.2	-0.1
Purple Finch	0	0	0	1	+1	++	0.0	0.0	0.0	0.4	+0.4
Dark-eyed Junco	1	1	1	1	0	0	0.5	0.4	0.3	0.4	-0.1
White-throated Sparrow	2	0	2	1	-1	-50	0.6	0.2	0.5	0.4	-0.2
Totals	25	16	19	12	-13	-52	7.7	6.6	5.8	6.9	-0.8

* $\frac{\text{no. days observed}}{\text{total no. of observation days}}$

** change in number of territories over the study period

\+ $\frac{\text{absolute change}}{\text{no. of pre-spray territories}} \times 100$

++ incalculable

BLOCK 86

Daily activity measurements in area 1 were essentially the same for treatment and check blocks up to Day 158 (7 June), after which activity declined considerably on the treatment transect but not on the check transect (Figure 7). However, area 2 census results were closely matched over the entire study, with a steady decline in the number of birds similar to that observed in Block 82.

Trends in species diversity on block 86 and its check block were similar to those seen on Block 82 and its check block (Figure 8). Species diversity on the transects was lowest during pre-spray and increased slightly for post-spray 1 and 2. Species diversity decreased gradually over the study period in the spot census areas.

Fluctuations in activity and species diversity were again caused by adverse weather conditions. Days 163 and 164 (12 and 13 June) in particular were cool(5-8°C), windy (5-15 kph) and overcast (80-100%); conditions which substantially reduced bird activity on the treated block.

The predominant families censused were again turdidae, parulidae and fringillidae, but in area 2 of the treatment block tyrannidae were also quite common (Tables 16-19). Although fairly large reductions of parulidae and fringillidae were recorded during the second post-spray period in area 1 of the treatment block, no reduction was recorded for area 1 of the check block, or for area 2 of either block. Species contributing to the large reduction in activity noted in area 1 of the treatment block were the hermit thrush, the black-and-white, Tennessee and Magnolia warblers, the common yellowthroat, and the white-throated sparrow (Appendix II, Table 5). Activity of all these species did, however, also decline, though to lesser extents, on the untreated check transect over the same period, with the exception of hermit thrush activity which increased somewhat and yellowthroats, which were only occasionally recorded on the check transect throughout the study. Changes in activity of other thrush species (the wood thrush and the Swainson's thrush), crown-inhabiting species such as the ruby-crowned and golden-crowned kinglets and the Cape May, black-throated green, blackburnian, bay-breasted and Canada warblers were similar on treated and check transects.

Post-spray numbers of territories in area 1 were 20% lower than pre-spray on the treatment transect, but 4% greater than pre-spray for the untreated check transect (Figure 9, Tables 20 and 21). The frequency of observations, however, were very similar. This discrepancy in territorial behavior was mainly due to fairly large reductions in territories of the hermit thrush, the Tennessee and magnolia warblers, the common yellow throat, and the rose-breasted grosbeak in the treatment block, and large increases in territories of the black-and-white warbler and the dark-eyed junco in the check block. There was no observed territorial disruption of canopy-feeding species in general (the ruby-crowned and golden-crowned kinglets, and the Cape May, blackburnian, and bay-breasted warblers) or of

species feeding on the wing (the yellow-bellied, least and olive-sided flycatchers). Although reductions were noted for the Tennessee and magnolia warblers and the common yellowthroat, there appeared to be no overall disturbance to the breeding behavior of shrub-feeding species (the Nashville, yellow-rumped and Canada warblers).

Overall changes in the numbers of territories and frequency of observations were fairly similar in area 2 of the treatment and check blocks (Figure 8, Tables 22 and 23). Disappearances of individual least fly catcher, Philadelphia vireo, Cape May warbler, black-throated blue warbler and white-throated sparrow territories on the treated block were not linked to similar changes on the check block, but were compensated for by increases or lack of change in the numbers of territories of other species for which no increases or losses were observed on the check block. There were no apparent effects on territories of the black-throated green warbler or territories of other canopy-feeding species (e.g., the blackburnian and bay-breasted warblers).

Nests of a winter wren and a white-throated sparrow found in the treatment block were monitored, but the program was terminated before any confirmation of breeding success could be made.

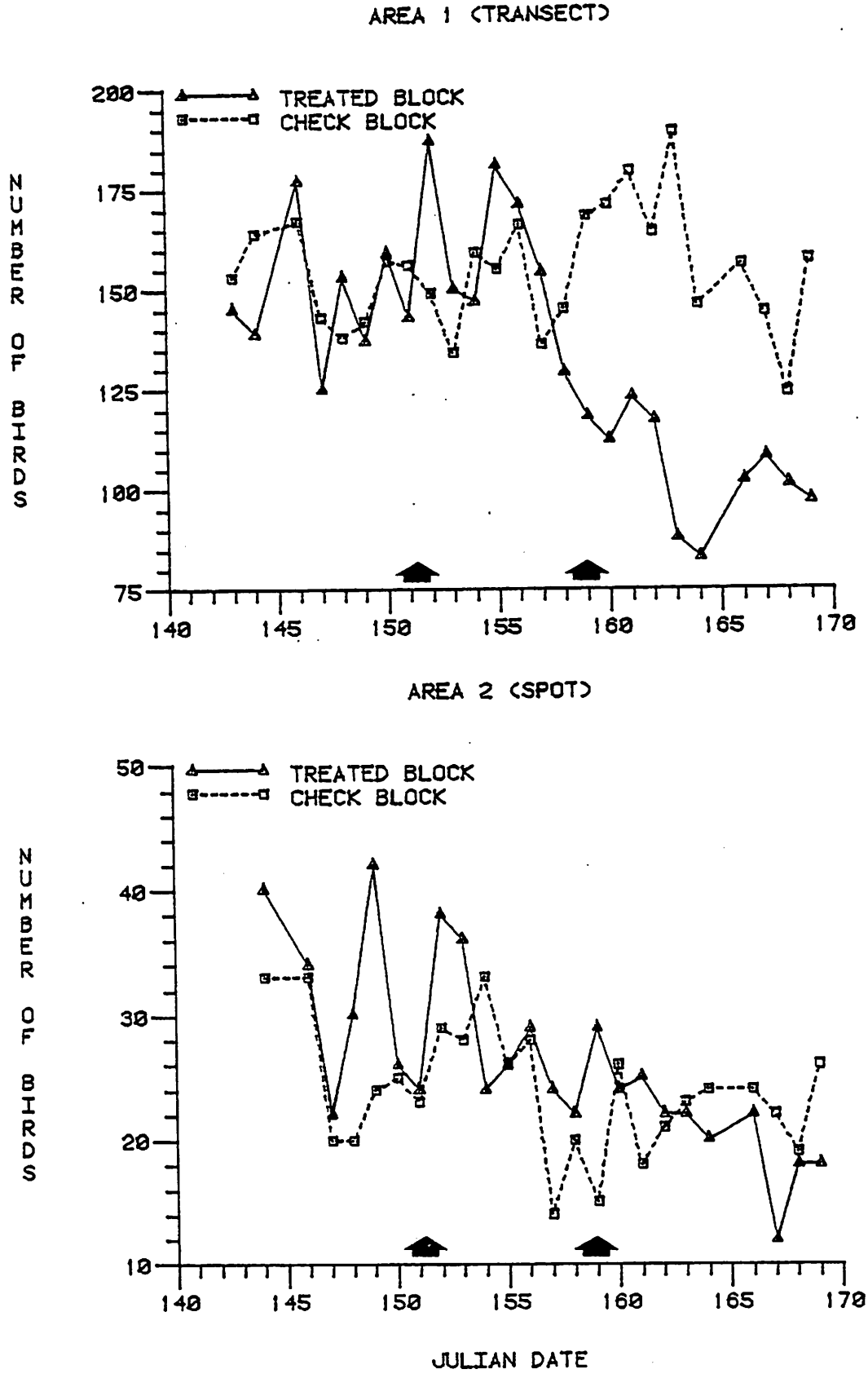


Figure 7. Daily activity measurements for Areas 1 and 2 of Treatment Block 86 and the Untreated Check Block. Arrows represent aerial applications of MATACIL®.

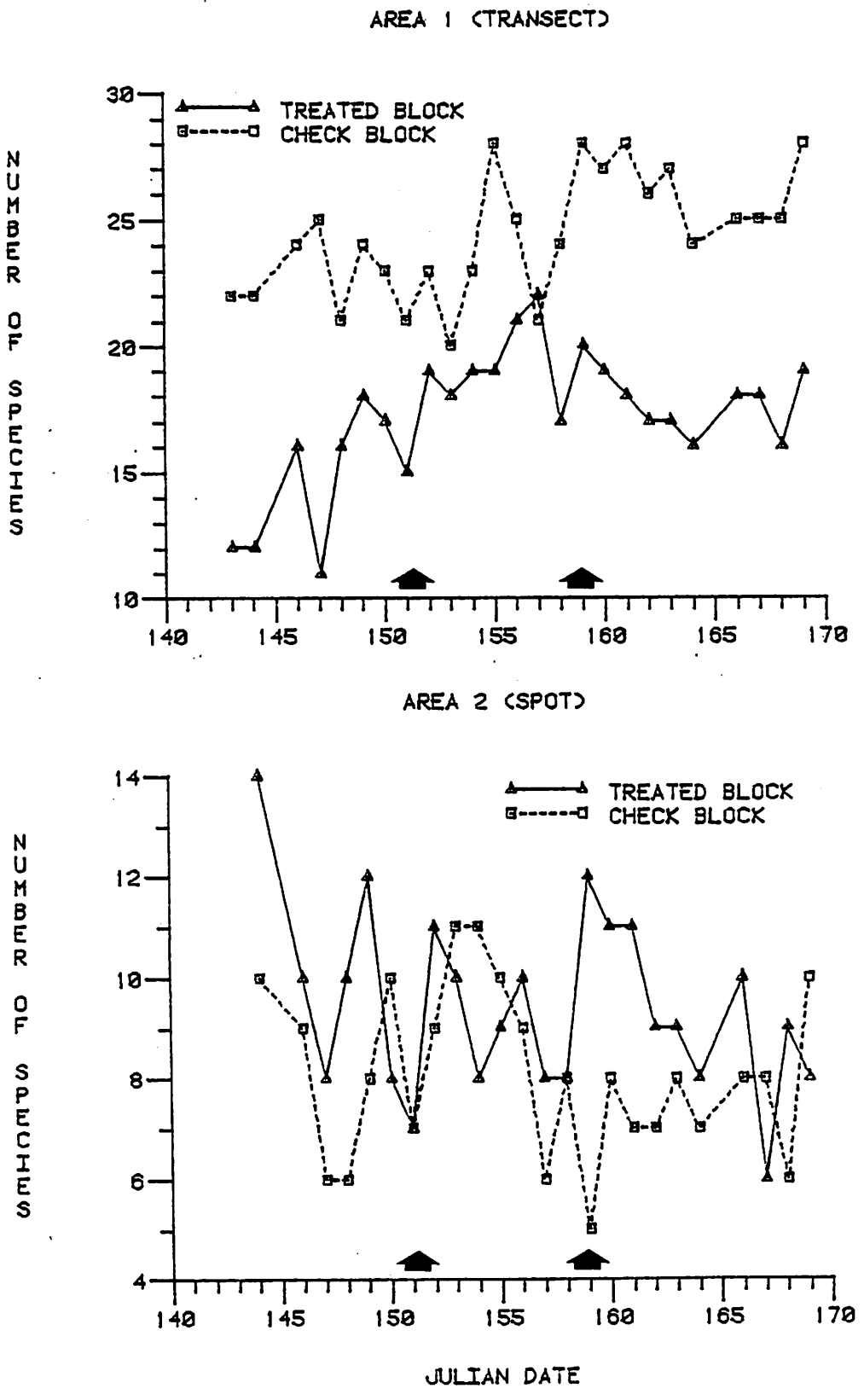


Figure 8. Changes in species diversity over the study period for Areas 1 and 2 of Treatment Block 86 and the Untreated Check Block. Arrows represent aerial applications of MATACIL®.

Table 16. Forest bird population census, Block 86[a] Area I Transect Data, Fredericton, New Brunswick, 23 May-18 June, 1982.

	PRE-SPRAY									POST-SPRAY I								POST-SPRAY II										
	May 23	May 24	May 26	May 27	May 28	May 29	May 30	May 31		June 1	June 2	June 3	June 4	June 5	June 6	June 7		June 8	June 9	June 10	June 11	June 12	June 13	June 15	June 16	June 17	June 18	
Family	-8	-7	-5	-4	-3	-2	-1	-0	Daily Ave.	+1	+2	+3	+4	+5	+6	+7	Daily Ave.	+0	+1	+2	+3	+4	+5	+7	+8	+9	+10	Daily Ave.
Tyrannidae	4	8	6	8	6	6	14	10	7.8	16	16	10	18	16	14	14	14.9	11	14	14	14	8	10	16	18	14	12	13.1
Troglodytidae	0	0	0	0	2	4	0	0	0.8	0	0	0	0	2	0	0	0.3	0	0	0	0	0	0	0	0	0	0	0
Turdidae	8	9	18	6	16	16	10	10	11.6	15	15	16	17	18	14	9	14.9	5	7	9	9	2	4	6	15	11	10	7.8
Sylviidae	2	0	4	2	2	4	10	10	4.3	6	4	6	4	8	4	4	5.1	4	4	6	2	4	0	0	0	2	4	2.6
Vireonidae	2	0	2	0	2	0	0	0	0.8	0	0	2	2	2	0	0	0.9	2	2	2	2	2	0	2	0	0	0	1.2
Parulidae	113	114	124	102	106	96	112	104	108.9	130	104	98	126	112	116	100	112.3	94	82	88	88	68	60	72	70	70	66	75.8
Fringillidae	16	8	23	7	19	11	13	9	13.3	20	11	15	14	13	6	2	11.6	2	3	4	2	4	7	6	5	4	5	4.2
Unidentified Birds	0	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0	0	0.0	0	0	0	0	0	2	0	0	0	0	0.2
Totals	145	139	177	125	153	137	159	143	147.3	187	150	147	181	171	154	129	159.9	118	112	123	117	88	83	102	108	101	97	104.9
No. of species	12	12	16	11	16	18	17	15	14.6	19	18	19	19	21	22	17	19.3	20	19	18	17	17	16	18	18	16	19	17.8

[a] treated with MATACIL® 180F + ATLOX 3409F + water at 1908 ADT on 31 May and 0554 ADT on 8 June, 1982.

Table 17. Forest bird population census, Block 86* Area II Spot Data, Fredericton, New Brunswick, 24 May-18 June, 1982.

	PRE-SPRAY								POST-SPRAY I								POST-SPRAY II										
	May 24	May 26	May 27	May 28	May 29	May 30	May 31	Daily Ave.	June 1	June 2	June 3	June 4	June 5	June 6	June 7	Daily Ave.	June 8	June 9	June 10	June 11	June 12	June 13	June 15	June 16	June 17	June 18	Daily Ave.
Family	-7	-5	-4	-3	-2	-1	-0		+1	+2	+3	+4	+5	+6	+7		+0	+1	+2	+3	+4	+5	+7	+8	+9	+10	
Tyrannidae	4	2	2	0	4	2	2	2.3	2	4	2	2	4	2	2	2.6	0	0	0	4	0	0	0	0	0	2	0.6
Troglodytidae	0	2	0	2	4	2	0	1.4	4	4	0	2	2	2	0	2.0	2	2	4	2	2	2	2	0	2	0	1.8
Turdidae	0	0	0	4	4	0	0	1.1	8	0	0	0	3	0	0	1.6	1	2	3	2	0	4	2	0	2	2	1.8
Sylviidae	2	0	0	0	0	0	0	0.3	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0.0
Vireonidae	0	0	0	0	2	4	2	1.1	4	2	0	0	0	0	0	0.9	0	0	0	0	2	2	2	2	2	2	1.2
Parulidae	28	28	18	22	22	18	20	22.3	18	22	22	22	20	18	20	20.3	26	20	18	14	18	12	16	10	12	12	16.0
Fringillidae	6	2	2	2	6	0	0	2.6	2	0	0	0	0	2	0	0.6	0	0	0	0	0	0	0	0	0	0	0.0
Unidentified Birds	0	0	0	0	0	0	0	0.0	0	4	0	0	0	0	0	0.6	0	0	0	0	0	0	0	0	0	0	0.0
Totals	40	34	22	30	42	26	24	31.1	38	36	24	26	29	24	22	28.4	29	24	25	22	22	20	22	12	18	18	21.2
No. of species	14	10	8	10	12	8	7	9.9	11	10	8	9	10	8	8	9.1	12	11	11	9	9	8	10	6	9	8	9.3

* treated with MATACIL® 180F + ATLOX 3409F + water at 1908 ADT on 31 May and 0554 ADT on 8 June, 1982.

Table 18. Forest bird population census, Yoho Untreated Check Block*, Transect Data, Fredericton, New Brunswick, 23 May-18 June, 1982.

	PRE-SPRAY									POST-SPRAY I								POST-SPRAY II										
	May 23	May 24	May 26	May 27	May 28	May 29	May 30	May 31		June 1	June 2	June 3	June 4	June 5	June 6	June 7		June 8	June 9	June 10	June 11	June 12	June 13	June 15	June 16	June 17	June 18	
Family	-8	-7	-5	-4	-3	-2	-1	-0	Daily Ave.	+1	+2	+3	+4	+5	+6	+7	Daily Ave.	+0	+1	+2	+3	+4	+5	+7	+8	+9	+10	Daily Ave.
Tyrannidae	0	0	4	2	0	4	4	4	2.3	6	0	2	4	6	2	8	4.0	9	4	6	8	4	4	2	4	6	4	7.3
Troglodytidae	0	0	0	0	0	0	0	0	0.0	0	0	0	2	0	0	0	0.3	0	0	0	0	0	0	0	0	0	0	0.0
Turdidae	19	21	19	12	16	18	13	12	16.3	16	17	22	19	31	19	22	20.9	21	28	33	30	31	25	25	21	12	31	25.7
Sylvilidae	8	10	8	8	6	8	8	6	7.8	6	8	8	16	6	6	6	8.0	3	2	4	4	4	2	6	4	4	4	3.7
Vireonidae	2	0	2	0	0	0	0	0	0.5	2	0	2	4	0	4	0	1.7	4	4	0	2	4	4	4	2	2	4	3.0
Parulidae	106	123	118	94	94	96	108	113	106.5	102	82	104	92	102	96	106	97.7	119	125	122	112	134	105	108	104	90	106	112.5
Fringillidae	16	8	14	23	18	13	22	19	16.6	15	24	21	18	21	9	1	15.6	11	7	14	8	12	6	11	9	10	8	9.6
Unidentified Birds	2	2	2	4	4	3	2	2	2.6	2	3	0	0	0	0	2	1.0	1	1	0	0	0	0	0	0	0	0	0.2
Totals	153	164	167	143	138	142	157	156	152.5	149	134	159	155	166	136	145	149.1	168	171	179	164	189	146	156	144	124	157	159.8
No. of Species	22	22	24	25	21	24	23	21	22.8	23	20	23	28	25	21	24	23.4	28	27	28	26	27	24	25	25	25	28	26.3

*untreated check block for Treatment Block 86

Table 19. Forest bird population census, Yoho Untreated Check Block*, Spot Data, Fredericton, New Brunswick, 24 May-18 June, 1982.

	PRE-SPRAY								POST-SPRAY I								POST-SPRAY II										
	May 24	May 26	May 27	May 28	May 29	May 30	May 31		June 1	June 2	June 3	June 4	June 5	June 6	June 7		June 8	June 9	June 10	June 11	June 12	June 13	June 15	June 16	June 17	June 18	
Family	-7	-5	-4	-3	-2	-1	-0	Daily Ave.	+1	+2	+3	+4	+5	+6	+7	Daily Ave.	+0	+1	+2	+3	+4	+5	+7	+8	+9	+10	Daily Ave.
Tyrannidae	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0	0	0	0	4	0.4
Turdidae	2	2	4	2	1	2	1	2.0	8	2	2	6	4	2	2	3.7	4	2	2	4	2	2	4	2	2	2	2.6
Sylviidae	0	0	0	0	0	0	0	0.0	0	0	0	2	2	0	0	0.6	0	0	2	0	2	0	0	0	0	2	0.6
Vireonidae	2	0	0	0	0	0	0	0.3	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0.0
Parulidae	25	26	14	14	16	18	14	18.1	18	22	26	16	22	8	14	18.0	10	16	12	14	16	22	18	16	14	16	15.4
Fringillidae	4	5	2	4	7	5	8	5.0	3	4	5	2	0	4	4	3.1	1	8	2	3	2	0	2	4	3	2	2.7
Unidentified Birds	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0	0	0.0	0	0	0	0	1	0	0	0	0	0	0.1
Totals	33	33	20	20	24	25	23	25.4	29	28	33	26	28	14	20	25.4	15	26	18	21	23	24	24	22	19	26	21.8
No. of Species	10	9	6	6	8	10	7	8.0	9	11	11	10	9	6	8	9.1	5	8	7	7	8	7	8	8	6	10	7.4

*untreated check block for Treatment Block 86

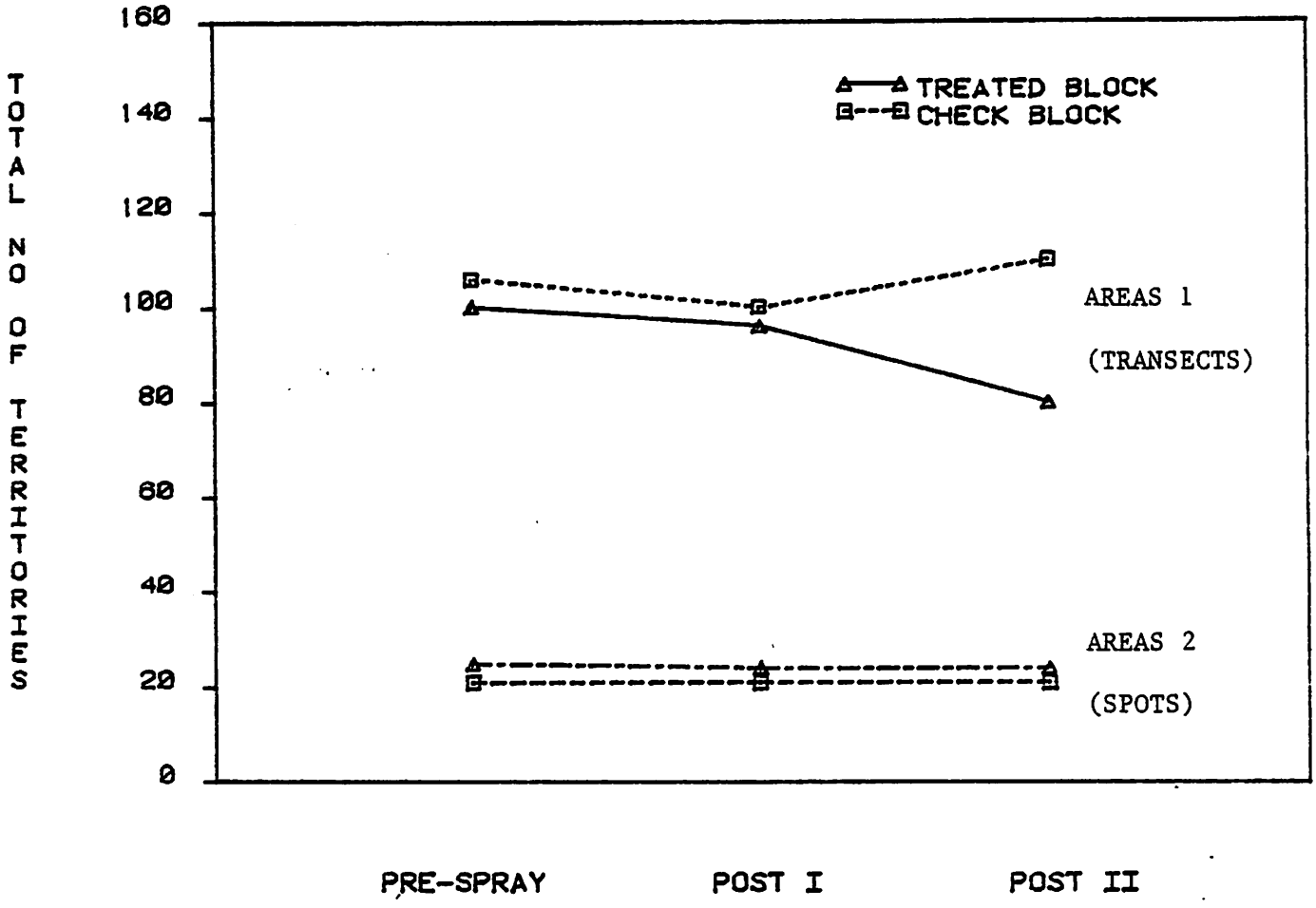


Figure 9. Changes in total numbers of breeding territories identified over the study period for Areas 1 and 2 of Treatment Block 86 and the Untreated Check Block.

Table 20. Change in territorial behaviour of selected species following aerial applications of MATACIL®, Treatment Block 86 Area I Transect Data, 23 May-18 June, 1982.

Species	Number of Territories					Frequency of Observations*			
	Pre-spray	Post-spray I	Post-spray II	Absolute Change**	Relative Change (%)+	Pre-spray	Post-spray I	Post-spray II	Change
Yellow-bellied Flycatcher	0	1	3	+3	++	0.1	0.7	0.5	+0.4
Least Flycatcher	5	5	6	+1	+20	0.5	0.7	0.6	+0.1
Olive-sided Flycatcher	1	2	1	0	0	0.3	0.7	0.8	+0.5
Winter Wren	1	0	0	-1	-100	0.3	0.1	0.0	-0.3
Hermit Thrush	4	4	1	-3	-75	0.6	0.6	0.4	-0.2
Swainson's Thrush	5	5	6	+1	+20	0.5	0.7	0.4	-0.1
Golden-crowned Kinglet	4	4	3	-1	-25	0.5	0.4	0.3	-0.2
Ruby-crowned Kinglet	1	0	1	0	0	0.3	0.1	0.2	-0.1
Philadelphia Vireo	1	1	1	0	0	0.3	0.3	0.5	+0.2
Black-and-white Warbler	3	4	3	0	0	0.6	0.5	0.5	-0.1
Tennessee Warbler	23	16	11	-12	-52	0.7	0.8	0.6	-0.1
Nashville Warbler	2	0	4	+2	+100	0.6	0.0	0.6	0
Parula Warbler	0	0	0	0	0	0.3	0.0	0.0	-0.3
Cape May Warbler	7	5	3	-4	-57	0.6	0.7	0.5	-0.1
Magnolia Warbler	14	12	9	-5	-36	0.8	0.8	0.7	-0.1
Yellow-rumped Warbler	2	3	3	+1	+50	0.3	0.4	0.6	+0.3
Black-throated Green Warbler	3	3	2	-1	-33	0.5	0.5	0.3	-0.2
Blackburnian Warbler	0	0	2	+2	++	0.1	0.1	0.3	+0.2
Bay-breasted Warbler	0	5	6	+6	++	0.1	0.5	0.6	+0.5
Ovenbird	6	6	5	-1	+17	0.6	0.8	0.6	0
Common Yellowthroat	7	9	4	-3	-43	0.6	0.7	0.7	+0.1
Canada Warbler	1	5	3	+2	+200	0.3	0.6	0.8	+0.5
Rose-breasted Grosbeak	4	1	0	-4	-100	0.3	0.4	0.0	-0.3
Dark-eyed Junco	1	2	1	0	0	0.4	0.6	0.2	-0.2
White-throated Sparrow	5	3	2	-3	-60	0.8	0.8	0.6	-0.2
Totals	100	96	80	-20	-20	11.0	12.5	11.3	+0.3

* $\frac{\text{no. days observed}}{\text{total no. of observation days}}$

** change in number of territories over the study period

\+ $\frac{\text{absolute change}}{\text{no. of pre-spray territories}} \times 100$

++ incalculable

Table 21. Change in territorial behaviour of selected species, Untreated Check Block for Treatment Block 86, Transect Data, Transect Data, 23 May-18 June, 1982.

Species	Number of Territories					Frequency of Observations*			
	Pre-spray	Post-spray I	Post-spray II	Absolute Change**	Relative Change (%)+	Pre-spray	Post-spray I	Post-spray II	Change
Yellow-bellied Flycatcher	1	1	1	0	0	0.3	0.3	0.5	+0.2
Least Flycatcher	2	2	2	0	0	0.4	0.6	1.0	+0.6
Winter Wren	0	0	0	0	0	0.0	0.1	0.0	0
American Robin	2	1	3	+1	+50	0.4	0.6	0.4	0
Wood Thrush	3	3	2	-1	-33	0.9	0.8	0.8	-0.1
Hermit Thrush	5	4	6	+1	+20	0.5	0.5	0.7	+0.2
Swainson's Thrush	3	3	5	+2	+67	0.6	0.8	0.6	0
Veery	2	2	2	0	0	0.5	0.6	0.7	+0.2
Golden-crowned Kinglet	3	4	1	-2	-67	1.0	0.6	0.8	-0.2
Ruby-crowned Kinglet	3	2	2	-1	-33	0.5	0.9	0.6	+0.1
Solitary Vireo	1	0	0	0	-1	0.3	0.0	0.1	-0.2
Red-eyed Vireo	0	0	3	+3	++	0.0	0.3	0.4	+0.4
Philadelphia Vireo	0	1	0	0	0	0.0	0.4	0.0	0
Black-and-white Warbler	1	2	3	+2	+200	0.9	0.4	0.9	0
Tennessee Warbler	9	9	7	-2	-22	1.0	0.8	0.6	-0.4
Nashville Warbler	2	2	2	0	0	0.3	0.4	1.0	+0.7
Parula Warbler	1	3	3	+2	+200	0.5	0.4	0.5	0
Magnolia Warbler	9	8	10	+1	+11	0.8	0.7	0.6	-0.2
Cape May Warbler	4	2	2	-2	-50	0.5	0.4	0.3	-0.2
Black-throated Blue Warbler	3	5	4	+1	+33	0.6	0.6	0.5	-0.1
Yellow-rumped Warbler	5	3	2	-3	-60	0.5	0.6	0.4	-0.1
Black-throated Green Warbler	4	2	2	-2	-50	0.5	0.7	0.5	0
Blackburnian Warbler	6	5	7	+1	+17	0.6	0.7	0.6	0
Chestnut-sided Warbler	1	0	0	-1	-100	0.6	0.0	0.0	-0.6
Bay-breasted Warbler	5	6	8	+3	+60	0.6	0.7	0.7	+0.1
Ovenbird	14	14	16	+2	+14	0.8	0.8	0.7	-0.1
Common Yellowthroat	1	0	1	0	0	0.4	0.3	0.0	-0.4
Canada Warbler	3	3	4	+1	+33	0.6	0.7	0.9	+0.3
American Redstart	0	1	3	+2	++	0.0	0.4	0.4	+0.4
Rose-breasted Grosbeak	7	8	4	-3	-43	0.7	0.6	0.6	-0.1
Purple Finch	2	1	1	-1	-50	0.3	0.3	0.6	+0.3
Dark-eyed Junco	0	0	2	+2	++	0.0	0.1	0.4	+0.3
White-throated Sparrow	4	3	2	-2	-50	0.6	0.5	0.5	-0.1
Totals	106	100	110	+4	+4	16.2	16.6	17.3	+1.1

* $\frac{\text{no. days observed}}{\text{total no. of observation days}}$

**change in number of territories over the study period

+ $\frac{\text{absolute change}}{\text{no. of pre-spray territories}} \times 100$

++incalculable

Table 22. Change in territorial behaviour of selected species following aerial applications of MATACIL®, Treatment Block 86 Area II Transect Data, 24 May-18 June, 1982.

Species	Number of Territories					Frequency of Observations*			
	Pre-spray	Post-spray I	Post-spray II	Absolute Change**	Relative Change (%)+	Pre-spray	Post-spray I	Post-spray II	Change
Yellow-bellied Flycatcher	0	1	0	0	0	0.0	0.4	0.1	+0.1
Least Flycatcher	2	1	1	-1	-50	0.6	0.7	0.2	-0.4
Winter Wren	2	2	2	0	0	0.4	0.4	0.5	+0.1
Hermit Thrush	0	1	1	+1	++	0.1	0.3	0.5	+0.4
Swainson's Thrush	0	1	1	+1	++	0.1	0.3	0.4	+0.3
Golden-crowned Kinglet	0	0	0	0	0	0.1	0.0	0.0	-0.1
Solitary Vireo	0	0	1	+1	++	0.0	0.0	0.6	+0.6
Philadelphia Vireo	1	1	0	-1	-100	0.4	0.3	0.0	-0.4
Black-and-white Warbler	1	0	1	0	0	0.4	0.1	0.6	+0.2
Tennessee Warbler	4	4	3	-1	-25	0.6	0.5	0.4	-0.2
Nashville Warbler	0	0	2	+2	++	0.0	0.0	0.4	+0.4
Parula Warbler	2	1	2	0	0	0.6	0.4	0.5	-0.1
Magnolia Warbler	2	4	2	0	0	0.6	0.5	0.4	-0.2
Cape May Warbler	1	1	0	-1	-100	0.4	0.7	0.1	-0.3
Black-throated Blue Warbler	1	0	0	-1	-100	0.3	0.0	0.0	-0.3
Yellow-rumped Warbler	0	0	1	+1	++	0.1	0.1	0.6	+0.5
Black-throated Green Warbler	2	2	1	-1	-50	0.7	0.6	0.7	0
Blackburnian Warbler	1	0	1	0	0	0.4	0.1	0.5	+0.1
Bay-breasted Warbler	1	2	2	+1	+100	0.4	0.4	0.5	+0.1
Ovenbird	3	3	2	-1	-33	0.7	0.6	0.5	-0.2
Canada Warbler	0	0	1	+1	++	0.0	0.0	0.2	+0.2
Rose-breasted Grosbeak	1	0	0	-1	-100	0.4	0.0	0.0	-0.4
Dark-eyed Junco	0	0	0	0	0	0.0	0.1	0.0	0
White-throated Sparrow	1	0	0	-1	-100	0.4	0.1	0.0	-0.4
Totals	25	24	24	-1	-4	7.7	6.6	7.7	0

* $\frac{\text{no. days observed}}{\text{total no. of observation days}}$

**change in number of territories over the study period

\+ $\frac{\text{absolute change}}{\text{no. of pre-spray territories}} \times 100$

++Incalculable

Table 23. Change in territorial behaviour of selected species, Untreated Check Block for Treatment Block 86, Spot Data, 24 May-18 June, 1982.

Species	Number of Territories					Frequency of Observations*			
	Pre-spray	Post-spray I	Post-spray II	Absolute Change**	Relative Change (%)+	Pre-spray	Post-spray I	Post-spray II	Change
Least Flycatcher	0	0	0	0	0	0.1	0.0	0.0	-0.1
American Robin	1	1	0	-1	-100	0.4	0.4	0.0	-0.4
Wood Thrush	0	0	0	0	0	0.0	0.1	0.0	0
Hermit Thrush	1	1	2	+1	+100	0.3	0.7	0.7	+0.4
Swainson's Thrush	1	1	0	-1	-100	0.3	0.4	0.0	-0.3
Golden-crowned Kinglet	0	1	1	+1	++	0.0	0.3	0.3	+0.3
Solitary Vireo	0	0	0	0	0	0.1	0.0	0.0	-0.1
Tennessee Warbler	0	0	0	0	0	0.1	0.0	0.0	-0.1
Nashville Warbler	0	1	0	0	0	0.0	0.3	0.0	0
Parula Warbler	2	1	1	-1	-50	0.3	0.4	0.2	-0.1
Magnolia Warbler	1	1	1	0	0	0.6	0.6	0.3	-0.3
Cape May Warbler	1	1	1	0	0	0.3	0.6	0.6	+0.3
Black-throated Blue Warbler	1	2	1	0	0	1.0	0.5	0.4	-0.6
Yellow-rumped Warbler	0	0	0	0	0	0.1	0.1	0.0	-0.1
Black-throated Green Warbler	2	1	1	-1	-50	0.4	0.4	0.5	+0.1
Blackburnian Warbler	1	1	2	+1	+100	0.9	0.7	0.5	-0.4
Bay-breasted Warbler	1	2	2	+1	+100	0.3	0.6	0.6	+0.3
Ovenbird	4	4	4	0	0	0.9	0.8	0.8	-0.1
American Redstart	0	0	0	0	0	0.0	0.0	0.1	+0.1
Rose-breasted Grosbeak	2	1	1	-1	-50	0.4	0.6	0.2	-0.2
Dark-eyed Junco	1	1	1	0	0	0.4	0.3	0.3	-0.1
White-throated Sparrow	2	1	2	0	0	0.6	0.6	0.5	-0.1
Totals	21	21	21	0	0	7.5	8.4	8.0	+0.5

* $\frac{\text{no. days observed}}{\text{total no. of observation days}}$

**change in number of territories over the study period

\+ $\frac{\text{absolute change}}{\text{no. of pre-spray territories}} \times 100$

++incalculable

BANDING STUDIES

Overall netting success was similar in all blocks (Tables 24 and 25). Details of the number of adult birds and fledglings caught in mist nets on various dates in each block are presented in Appendix III Tables 1-6.

In accordance with other banding studies (Ouellet 1981), most breeding and non-breeding adults caught were males. Non-breeding females were few in number, whereas non-breeding or subdominant males were quite numerous. The percentage of young captured was high for all blocks, indicating a healthy reproductive population.

It should be noted that young hermit thrush were netted on all blocks, demonstrating successful reproduction of this species despite the decline in territories documented in census results. Canopy feeders, species of potentially high exposure to aerial treatments, were not abundant, although some young of the golden-crowned kinglet and Cape May warbler were caught in Block 82. A larger proportion of the young sampled were shrub-feeding (e.g., the Tennessee, Nashville, parula, magnolia, and yellow-rumped warblers) or ground-feeding species (e.g., the hermit thrush, the ovenbird, and the white-throated sparrow).

The number of young caught in Block 82 was lower than in either Block 86 or the check block (Table 24) due to the later phenology of this area. Budworm populations in Block 82 were approximately a week behind the other blocks (Ed Kettela pers. comm.). This is supported by the lower proportions of fledglings in mist net catches from Block 82 than from catches from Block 86 or the check block near the same time. Only 5% of the birds caught on Block 82 on 29 June-1 July were fledglings, while 20% of the birds caught on the check block 2-3 July and 14% of the catch on Block 86 4-6 July was made up of young. The proportion of young had increased to 25% on Block 82 for 7-8 July, but this was still considerably lower than the 37% on the check block 9-10 July and 48% on Block 86 for 11-12 July. Fledgling weights on Block 82 were somewhat higher for almost all species than those of the check block, while fledglings on Block 86 were heavier than on the check block for five species and lighter for four species.

Table 24. Differences in weight of fledglings caught in mist nets between 29 June and 13 July, 1982, on Treatment blocks 82 and 86 and on the Untreated Check Block.

Species	Treatment Block 82			Treatment Block 86			Untreated Check Block	
	Number of Young	Ave. Weight (gms)	Diff.*	Number of Young	Ave. Weight (gms)	Diff.	Number of Young	Ave. Weight (gms)
Yellow-bellied Sapsucker	-	-		2	26.7 ± 0.4		-	-
Yellow-bellied Flycatcher	-	-		-	-		2	10.1 ± 0.0
Black-capped Chickadee	-	-		5	10.9 ± 0.3	1.1	2	9.8 ± 1.1
Boreal Chickadee	-	-		-	-		1	9.4
Wood Thrush	-	-		-	-	-	2	29.5 ± 3.6
Hermit Thrush	4	29.6 ± 2.3	0.3	1	26.8	-2.5	8	29.3 ± 1.2
Swainson's Thrush	-	-		1	22.7		-	-
Veery	-	-		3	29.0 ± 1.1		-	-
Golden-crowned Kinglet	2	5.5 ± 0.1	0.1	-	-		4	5.4 ± 0.7
Black-and-white Warbler	-	-		1	11.5	1.3	5	10.2 ± 0.8
Tennessee Warbler	5	12.1 ± 2.7	3.1	3	9.2 ± 1.0	0.2	2	9.0 ± 0.8
Nashville Warbler	5	8.3 ± 0.7	0.4	8	8.1 ± 0.6	0.2	9	7.9 ± 0.8
Parula Warbler	-	-		7	7.5 ± 0.7		-	-
Magnolia Warbler	4	9.0 ± 1.0	0.5	1	9.2	0.7	3	8.5 ± 0.5
Cape May Warbler	1	9.7		-	-		-	-
Yellow-rumped Warbler	7	11.4 ± 1.3	-1.5	6	11.6 ± 0.6	-1.3	5	12.9 ± 3.0
Black-throated green Warbler	-	-		1	10.8		-	-
Chestnut-sided Warbler	-	-		1	10.3		-	-
Palm Warbler	1	10.2		-	-		-	-
Ovenbird	-	-		5	19.3 ± 1.6	-1.1	4	20.4 ± 0.8
Northern Waterthrush	-	-		-	-		4	16.6 ± 0.6
Canada Warbler	-	-		1	10.5	-0.2	3	10.7 ± 0.1
American Redstart	-	-		2	8.2 ± 0.7		-	-
Rose-breasted Grosbeak	-	-		2	38.5 ± 2.6		-	-
Evening Grosbeak	-	-		-	-		1	52.1
Purple Finch	4	22.2 ± 0.9		-	-		-	-
Dark-eyed Junco	1	16.0		2	16.9 ± 1.6		-	-
White-throated Sparrow	5	24.3 ± 2.3		8	24.5 ± 1.9		-	-
Total number of young	39			60			55	

*Diff. = Ave. weight on Treatment - Ave. weight on the Check block.

Table 25. Comparison of the number of breeding and nonbreeding adult birds, and the number of young caught in mist nets* on Treatment Blocks 82 and 86, to that of the Untreated Check Block.

Species	Treatment Block 82						Treatment Block 86						Untreated Check Block					
	Adults					Young	Adults					Young	Adults					Young
	Breeding		Non-Breeding				Breeding		Non-Breeding				Breeding		Non-Breeding			
	♂	♀	♂	♀	Others**		♂	♀	♂	♀	Others**		♂	♀	♂	♀	Others**	
Sharp-shinned Hawk			1															
Common Flicker		1							1									
Yellow-bellied Sapsucker	1	3		1			2			1		2	1	1			1	
Yellow-bellied Flycatcher					3						5						8	2
Least Flycatcher											1							
Blue Jay		1															1	
Black-capped Chickadee		2						1		1		4	2	6			1	2
Boreal Chickadee														3				1
Brown Creeper		1																
Winter Wren													1					
Catbird														1				
American Robin													3	1				
Wood Thrush													1					2
Hermit Thrush	2	3	1			4	2	2				1	5					8
Swainson's Thrush	7	3	2				6	4				2	3	2	2		1	
Veery							4	1	2		2	3	1	3	3			
Golden-crowned Kinglet	1					2							3	1				4
Cedar Waxwing		1			2													
Solitary Vireo								2										
Red-eyed Vireo								1	1	1								
Black-and-white Warbler							2	2				1	1	1	1		1	5
Tennessee Warbler	3	12	4	1	1	5		1	1			3	1	2				2
Nashville Warbler	1	6	9			5	4	3	3			7		1	3			8
Parula Warbler								3	1			5		1	1			
Magnolia Warbler	11	10	12	1		4	10	7	8		1	1	4	4	8	2		2
Cape May Warbler		5	2			1	1	1								1		
Black-throated Blue Warbler	1	2						1										
Yellow-rumped Warbler	6	2				7	2	2	1			6	5	5				5
Black-throated Green Warbler	2	2					1	1	1			1						
Blackburnian Warbler	1	1	2				1								2	1		
Chestnut-sided Warbler							1	1	1		1	1						
Bay-breasted Warbler	1	3	3										1	1				
Blackpoll Warbler									1									
Palm Warbler						1												

Table 25. Comparison of the number of breeding and nonbreeding adult birds, and the number of young caught in mist nets* on Treatment Blocks 82 and 86, to that of the Untreated Check Block (Continued).

Species	Treatmnt Block 82						Treatmnt Block 86						Untreated Check Block					
	Adults					Young	Adults					Young	Adults					Young
	Breeding		Non-Breeding				Breeding		Non-Breeding				Breeding		Non-Breeding			
	♂	♀	♂	♀	Others**		♂	♀	♂	♀	Others**		♂	♀	♂	♀	Others**	
Ovenbird	4	1	3				3	10	2			5	8	13	9		1	4
Northern Waterthrush														1	1			4
Common Yellowthroat	5	2	1				2	2	1									
Canada Warbler	2	4	6				1	3	4	3		1	1	6	17	1		2
American Redstart							5	4	3			2	6	6	5	2		
Rose-breasted Grosbeak							1	1	1			2	6	3				
Evening Grosbeak									1									1
Purple Finch	2	1	1			4												
Dark-eyed Junco						1	1					2						
White-throated Sparrow	9	2				5	6	3	1			7	2		2	1	1	
Song Sparrow										1								
Total by sex	59	68	47	3	7	39	55	56	34	7	10	57	55	62	54	8	15	52
Total by breeding condition	127		57			39	111		51			57	117		77			52
Total for each block	223						219						246					
Number of species for each block	27						31						29					
Percentage of breeding adults (♂, ♀)	46.5		53.5				49.5		50.5				47.0		53.0			
Percentage of young***						30.7						51.4						44.4
Percentage of non-breeding adults (♂,♀, others)			82.5	5.3	12.3				66.7	13.7	19.6				70.1	10.4	19.5	

*expressed as the total number caught over the sampling period. Sampling dates were: 5, 6, 22, 23, 29 June, 1, 7, 8, 13 July on Treatmnt Block 82; 26-28 May, 10 12 June, 4, 6, 11, 12 July on Treatment Block 86; 30 May, 1, 15-17 June, 2, 3, 9, 10 July on the Untreated Check Block.

**birds whose breeding condition could not be determined

***calculated as a % of the breeding population: (# of young ÷ # of breeding adults) 100

SUMMARY AND CONCLUSIONS

Adult censusing results displayed a natural overall reduction in breeding activity as measured by the singing male technique. This was closely correlated with an increase in the number of young caught in mist nets. With adult censuses and banding studies combined, it appears that natural territorial breakdown in Block 86 occurred earlier than it did in the other blocks. Block 86 was further south and a week ahead in budworm development. In addition, a larger number of young were caught in Block 86, which typifies a more advanced breeding cycle. The large reduction in activity (singing) noted for area 1 of Block 86 may be attributed to a physiological response of the male to development of the young in the nest. A particularly interesting pattern was noted for the thrushes in Block 86 where reductions in breeding activity were correlated with increased observations of cloacal protuberance and redness, characteristic signs of renesting.

Although not presented in the tables, the breeding condition of the males and to a lesser extent, the females, changed over the season, with some species (later breeders) not showing signs of breeding until mid-June, and others finished breeding by the end of June. By consolidating information as to the number and species of adults singing and their breeding condition, as well as the number, species and weight of fledglings caught, it is apparent that the overall pattern of breeding was not visibly interrupted by treatment with MATACIL® on either treatment block.

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APPENDIX I

Common and scientific names of bird species referred to in the text.

Table 1. Common and Scientific names of bird species censused.

Scientific name	Common name	Scientific name	Common name
ACCIPITRIDAE		SYLVIIDAE	
Accipiter striata	Sharp-shinned Hawk	*Regulus satrapa*	Golden-crowned Kinglet
		Regulus calendula	Ruby-crowned Kinglet
PICIDAE			
		BOMBYCILLIDAE	
Colaptea auratus	Common Flicker		
Sphyrapicus varius	Yellow-bellied Sapsucker	*Bombycillia cedrorum*	Cedar Waxwing
TYRANNIDAE		VIREONIDAE	
Empidonax flaviventris	Yellow-bellied Flycatcher		
Empidonax traillii	Alder Flycatcher	*Vireo solitarius*	Solitary Vireo
Empidonax minimus	Least Flycatcher	*Vireo olivaceus*	Red-eyed Vireo
Contopus virens	Eastern Wood Pewee	*Vireo philadelphicus*	Philadelphia Vireo
Nuttallornis borealis	Olive-sided Flycatcher		
		PARULIDAE	
CORVIDAE			
		Mniotilta varia	Black-and-white Warbler
Cyanocitta cristata	Blue Jay	*Vermivora peregrina*	Tennessee Warbler
		Vermivora ruficapilla	Nashville Warbler
PARIDAE		*Parula americana*	Parula Warbler
Parus atricapillus	Black-capped Chickadee	*Dendroica petechia*	Yellow Warbler
Parus hudsonicus	Boreal Chickadee	*Dendroica magnolia*	Magnolia Warbler
		Dendroica tigrina	Cape May Warbler
CERTHIIDAE		*Dendroica caerulescens*	Black-throated Blue Warbler
		Dendroica coronata	Yellow-rumped Warbler
Certhia familiaris	Brown Creeper	*Dendroica virens*	Black-throated Green Warbler
		Dendroica fusca	Blackburnian Warbler
TROGLODYTIDAE		*Dendroica pensylvanica*	Chestnut-sided Warbler
		Dendroica castanea	Bay-breasted Warbler
Troglodytea troglodytea	Winter Wren	*Dendroica striata*	Blackpoll Warbler
		Dendroica palmarum	Palm Warbler
MIMIDAE		*Seiurus aurocapillus*	Ovenbird
		Seiurus noveboracensis	Northern Waterthrush
Dumetella carolinensis	Catbird	*Geothlypis trichas*	Common Yellowthroat
		Wilsonia canadensis	Canada Warbler
TURDIDAE		*Setophaga ruticilla*	American Redstart
Turdus migratorius	American Robin	FRINGILLIDAE	
Hylocichla mustelina	Wood Thrush		
Hylocichla guttata	Hermit Thrush	*Pheuticus ludovicianus*	Rose-breasted Grosbeak
Hylocichla ustulata	Swainson's Thrush	*Hesperiphona vespertina*	Evening Grosbeak
Hylocichla fuscenscens	Veery	*Carpodacus purpureus*	Purple Finch
		Junco hyemalis	Dark-eyed Junco
		Spizella passerina	Chipping Sparrow
		Zonotrichia albicollis	White-throated Sparrow
		Melospiza melodia	Song Sparrow

APPENDIX II

Population structure of bird communities on treatment and untreated check blocks.

Table 1. Forest bird population census, Block 82* Area 1 Transect Data, Fredericton, New Brunswick, 23 May-22 June, 1982.

		PRE-SPRAY													POST-SPRAY 1					
		May 23	May 24	May 26	May 27	May 28	May 29	May 30	May 31	June 1	June 2	June 3	June 4		June 5	June 6	June 7	June 8	June 9	
Family	Species	-12	-11	-9	-8	-7	-6	-5	-4	-3	-2	-1	-0	Daily Ave.	+1	+2	+3	+4	+5	Daily Ave.
Tyrannidae	Least Flycatcher	0	0	0	0	2	2	0	0	0	0	2	6	1.0	4	0	0	2	0	1.2
	Eastern Wood Pewee	0	0	0	0	0	0	0	0	0	2	0	0	0.2	0	0	0	0	0	0.0
	Olive-sided Flycatcher	0	0	2	0	0	4	4	2	2	4	0	0	1.5	0	0	0	2	0	0.4
Turdidae	American Robin	2	0	4	4	6	2	2	0	2	0	2	0	2.0	2	0	2	0	0	0.8
	Wood Thrush	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0	0	2	0.4
	Hermit Thrush	9	18	20	13	17	18	11	14	18	17	11	15	15.1	15	9	6	12	12	10.8
	Swainson's Thrush	6	6	6	7	3	2	3	4	4	4	5	0	4.2	2	0	0	2	0	0.8
Sylviidae	Golden-crowned Kinglet	2	6	10	8	4	8	2	4	10	4	4	4	5.5	4	2	4	4	6	4.0
	Ruby-crowned Kinglet	10	4	10	6	8	8	8	4	10	8	6	0	6.8	4	2	2	2	4	2.8
Vireonidae	Solitary Vireo	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0.0
	Red-eyed Vireo	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	2	4	0	1.2
Parulidae	Black-and-white Warbler	2	4	6	4	4	0	2	4	4	4	2	0	3.0	0	0	0	0	0	0.0
	Tennessee Warbler	18	34	37	34	36	22	26	16	30	32	28	20	27.8	18	22	12	13	12	15.4
	Nashville Warbler	2	2	0	0	0	4	4	0	2	0	6	6	2.2	12	8	8	8	4	8.0
	Parula Warbler	0	0	2	0	0	2	0	2	2	0	0	2	0.8	2	4	4	0	0	2.0
	Yellow Warbler	0	0	0	0	0	0	0	0	2	0	0	0	0.2	0	0	0	0	0	0.0
	Magnolia Warbler	20	26	26	22	24	18	17	14	16	12	30	22	20.6	20	30	20	22	18	22.0
	Cape May Warbler	18	6	14	20	18	12	8	14	18	10	8	12	13.2	10	14	6	10	14	10.8
	Black-throated Blue Warbler	2	6	2	4	4	6	4	2	4	2	4	2	3.5	2	2	2	4	2	2.4
	Yellow-rumped Warbler	4	2	4	2	2	2	6	4	2	2	6	4	3.3	6	4	2	4	2	3.6
	Black-throated Green Warbler	0	4	0	0	8	4	4	6	6	6	6	4	4.0	6	4	4	4	2	4.0
	Blackburnian Warbler	0	2	8	10	10	10	6	4	6	8	6	4	6.2	4	6	2	12	2	5.2
	Chestnut-sided Warbler	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	3	0	2	1.0
	Bay-breasted Warbler	2	0	2	0	2	2	6	2	4	6	19	12	4.8	10	6	6	10	14	9.2
	Blackpoll Warbler	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0	2	0	0.4
	Ovenbird	20	16	14	20	24	16	20	16	22	20	20	20	19.0	28	20	14	18	18	19.6
	Common Yellowthroat	8	6	4	6	4	2	0	0	6	6	2	8	4.3	6	2	4	6	2	4.0
	Canada Warbler	2	2	0	0	0	2	2	0	2	2	4	6	1.8	2	2	0	2	0	1.2
	American Redstart	0	0	0	0	0	0	0	0	0	0	0	0	0.0	4	0	4	0	6	2.8
Fringillidae	Rose-breasted Grosbeak	0	1	2	0	8	2	2	0	6	2	2	2	2.3	2	0	4	2	0	1.6
	Purple Finch	0	0	0	0	0	0	0	0	0	0	0	0	0.0	2	0	0	2	0	0.8
	Dark-eyed Junco	2	0	0	0	0	0	2	0	4	4	20	10	3.5	16	14	14	14	18	15.2
	Chipping Sparrow	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0.0
	White-throated Sparrow	10	15	23	25	17	24	22	21	32	28	25	19	21.8	16	16	17	21	13	16.6
Unidentified Birds		0	1	2	0	0	0	0	0	0	0	0	0	0.3	0	1	0	0	1	0.4
Totals		139	161	198	185	201	172	161	133	214	183	218	178	178.9	197	168	142	182	154	168.6
No. of Species		18	19	20	15	19	22	21	17	24	21	23	19	19.7	24	19	22	24	20	21.6

*treated with MATACIL® 180F + Insecticide Diluent 585 at 0630 ADT on 4 June, 0550 ADT on 9 June and 1709 ADT on 17 June, 1982.

Table 1. Forest bird population census, Block 82* Area 1 Transect Data, Fredericton, New Brunswick, 23 May-22 June, 1982.

		POST-SPRAY II								POST-SPRAY III					
		June 10	June 11	June 12	June 13	June 15	June 16	June 17	Daily	June 18	June 19	June 20	June 21	June 22	Daily
Family	Species	+1	+2	+3	+4	+6	+7	+8	Ave.	+1	+2	+3	+4	+5	Ave.
Tyrannidae	Least Flycatcher	0	2	0	0	0	0	0	0.3	0	0	0	0	0	0.0
	Eastern Wood Pewee	0	0	0	0	0	0	1	0.1	0	0	0	0	0	0.0
	Olive-sided Flycatcher	0	0	2	0	0	2	2	0.9	2	2	2	0	0	1.2
Turdidae	American Robin	0	0	0	0	2	0	2	0.6	2	0	0	0	0	0.4
	Wood Thrush	0	0	0	2	2	0	0	0.6	0	2	0	0	2	0.8
	Hermit Thrush	8	8	12	6	6	9	15	9.1	14	6	10	12	10	10.4
	Swainson's Thrush	7	3	2	1	3	3	2	3.0	3	3	2	1	0	1.8
Sylvidae	Golden-crowned Kinglet	6	4	6	6	4	4	0	4.3	4	4	4	4	4	4.0
	Ruby-crowned Kinglet	0	4	6	4	6	4	2	3.7	6	4	0	4	0	2.8
Vireonidae	Solitary Vireo	0	2	0	0	0	0	2	0.6	0	0	0	0	0	0.0
	Red-eyed Vireo	0	0	0	0	0	0	0	0.0	0	0	0	0	4	0.8
Parulidae	Black-and-white Warbler	0	0	2	2	0	0	0	0.6	0	0	0	2	0	0.4
	Tennessee Warbler	17	18	6	10	10	16	15	13.1	13	14	7	6	8	9.6
	Nashville Warbler	8	6	8	4	6	0	8	5.7	6	8	4	6	6	6.0
	Parula Warbler	2	4	2	2	2	2	4	2.6	2	0	4	2	0	1.6
	Yellow Warbler	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0.0
	Magnolia Warbler	18	22	18	14	18	16	16	17.4	14	16	8	6	12	11.2
	Cape May Warbler	16	14	14	8	6	8	18	12.0	18	10	0	10	8	9.2
	Black-throated Blue Warbler	2	4	2	2	2	2	2	2.3	2	4	4	2	2	2.8
	Yellow-rumped Warbler	0	2	0	4	2	0	0	1.1	2	2	2	4	0	2.0
	Black-throated Green Warbler	4	2	0	0	2	2	2	1.7	2	2	2	4	2	2.4
	Blackburnian Warbler	6	8	8	8	0	2	4	5.1	0	2	0	4	0	1.2
	Chestnut-sided Warbler	0	2	4	0	0	0	0	0.9	0	0	0	2	2	0.8
	Bay-breasted Warbler	12	10	12	6	8	14	14	10.9	10	16	10	12	8	11.2
	Blackpoll Warbler	0	0	0	0	0	2	0	0.3	0	0	0	0	0	0.0
	Ovenbird	18	18	20	16	16	20	16	17.7	16	20	14	14	12	15.2
	Common Yellowthroat	2	4	8	4	4	2	2	3.7	2	6	4	2	4	3.6
	Canada Warbler	4	2	2	0	0	2	2	1.7	0	2	2	2	2	1.6
	American Redstart	8	4	8	8	6	4	4	6.0	8	10	8	6	6	7.6
Fringillidae	Rose-breasted Grosbeak	5	2	2	2	4	2	2	2.7	6	6	0	6	0	3.6
	Purple Finch	0	0	0	0	0	0	2	0.3	2	2	0	2	0	1.2
	Dark-eyed Junco	18	16	14	14	12	10	10	13.4	8	4	4	8	6	6.0
	Chipping Sparrow	0	2	0	0	0	0	0	0.3	0	0	0	0	0	0.0
	White-throated Sparrow	15	17	13	11	10	17	16	14.1	18	14	8	12	15	13.4
Unidentified Birds		0	0	0	0	0	0	0	0.0	0	0	0	0	0	0.0
Totals		176	180	171	134	131	143	163	156.9	160	159	99	133	113	132.8
No. of Species		19	25	22	20	21	21	24	21.7	22	23	18	24	18	21

*treated with MATACIL® 180F + Insecticide Diluent 585 at 0630 ADT on 4 June, 0550 ADT on 9 June and 1709 ADT on 17 June, 1982.

Table 2. Forest bird population census, Block 82* Area II Spot Data, Fredericton, New Brunswick, 24 May-22 June, 1982.

		PRE-SPRAY											POST-SPRAY I					
		May 24	May 26	May 27	May 28	May 29	May 30	May 31	June 1	June 2	June 3	Daily	June 4	June 5	June 6	June 7	June 8	Daily
Family	Species	-11	-9	-8	-7	-6	-5	-4	-3	-2	-1	Ave.	+0	+1	+2	+3	+4	Ave.
Tyrannidae	Least Flycatcher	0	0	0	0	0	0	2	0	2	0	0.4	0	0	0	0	0	0.0
	Eastern Wood Pewee	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0.0
Turdidae	American Robin	2	0	2	0	0	0	0	0	0	0	0.4	0	0	2	0	0	0.4
	Hermit Thrush	0	0	2	4	0	0	3	2	2	2	1.5	6	4	2	1	0	2.6
	Swainson's Thrush	0	0	0	2	2	0	0	0	0	0	0.4	0	0	0	2	4	1.2
Sylviidae	Golden-crowned Kinglet	0	2	2	2	0	0	0	0	0	0	0.6	0	0	0	0	0	0.0
	Ruby-crowned Kinglet	2	0	0	2	2	0	2	2	2	0	1.2	2	2	0	2	2	1.6
Vireonidae	Solitary Vireo	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0	0	2	0.4
	Red-eyed Vireo	0	0	0	0	0	0	0	0	0	0	0.0	2	0	0	0	0	0.4
Parulidae	Black-and-white Warbler	0	2	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0.0
	Tennessee Warbler	4	6	6	6	4	6	6	6	4	2	5.0	4	6	2	2	0	2.8
	Nashville Warbler	0	0	0	2	0	0	0	0	0	0	0.2	0	0	0	0	0	0.0
	Parula Warbler	0	0	0	0	2	0	0	0	0	2	0.4	0	0	0	0	0	0.0
	Magnolia Warbler	2	6	6	4	4	2	6	2	2	4	3.8	0	2	0	2	2	1.2
	Cape May Warbler	4	4	2	0	0	2	0	2	2	2	1.8	2	4	4	2	4	3.2
	Yellow-rumped Warbler	0	0	0	0	0	2	2	2	0	2	0.8	0	2	0	0	0	0.4
	Black-throated Green Warbler	0	0	0	0	2	0	0	0	0	0	0.2	2	2	0	0	0	0.8
	Blackburnian Warbler	2	0	0	0	0	0	0	0	4	2	0.8	4	0	0	0	0	0.8
	Bay-breasted Warbler	0	0	0	0	0	0	0	2	0	4	0.6	4	2	0	2	0	1.6
	Ovenbird	10	6	6	6	8	6	4	4	4	10	6.4	6	8	6	6	8	6.8
	Canada Warbler	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0.0
	American Redstart	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0.0
Fringillidae	Rose-breasted Grosbeak	2	2	2	0	2	4	0	2	2	0	1.6	0	0	0	2	0	0.4
	Purple Finch	0	2	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0.0
	Dark-eyed Junco	0	0	0	0	0	0	0	0	0	2	0.2	0	0	0	0	2	0.4
	Chipping Sparrow	0	0	0	0	0	0	0	0	0	0	0.0	0	2	0	0	0	0.4
	White-throated Sparrow	0	2	0	2	0	0	2	2	4	1	1.3	0	2	0	1	0	0.6
Unidentified Birds		0	0	0	0	0	0	0	0	0	0	0.0	0	0	0	0	4	0.8
Totals		28	32	28	30	26	22	27	26	28	33	28.0	32	36	16	22	28	26.8
No. of species		8	9	8	9	8	6	8	10	10	11	8.7	9	11	5	10	8	8.6

*treated with MATACIL® 180F + Insecticide Diluent 585 at 0630 ADT on 4 June, 0550 ADT on 9 June, and 1709 ADT on 17 June, 1982.

Table 2. Forest bird population census, Block 82* Area II Spot Data, Fredericton, New Brunswick, 24 May-22

		POST-SPRAY II									POST-SPRAY III					
		June 9	June 10	June 11	June 12	June 13	June 15	June 16	June 17	Daily	June 18	June 19	June 20	June 21	June 22	Daily
Family	Species	+0	+1	+2	+3	+4	+6	+7	+8	Ave.	+1	+2	+3	+4	+5	Ave.
Tyrannidae	Least Flycatcher	0	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0.0
	Eastern Wood Pewee	0	0	0	0	0	0	0	0	0.0	0	2	0	0	0	0.4
Turdidae	American Robin	0	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0.0
	Hermit Thrush	6	3	1	3	6	2	2	2	3.1	4	4	6	4	4	4.4
	Swainson's Thrush	0	2	0	0	0	0	0	0	0.3	0	0	0	0	1	0.2
Sylvidae	Golden-crowned Kinglet	0	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0.0
	Ruby-crowned Kinglet	0	0	2	4	2	0	0	0	1.0	0	0	0	0	0	0.0
Vireonidae	Solitary Vireo	0	2	0	0	0	0	0	0	0.3	0	0	2	0	0	0.4
	Red-eyed Vireo	0	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0.0
Parulidae	Black-and-white Warbler	0	0	0	0	0	0	2	0	0.3	0	0	0	0	0	0.0
	Tennessee Warbler	4	2	2	4	0	0	2	2	2.0	2	2	2	0	0	1.2
	Nashville Warbler	0	0	0	0	0	2	0	0	0.3	0	0	0	0	0	0.0
	Parula Warbler	0	0	0	0	2	0	0	0	0.3	2	0	0	0	0	0.4
	Magnolia Warbler	4	4	2	2	0	0	2	2	2.0	0	2	0	2	0	0.8
	Cape May Warbler	6	4	4	4	4	6	4	4	4.5	4	2	2	4	6	3.6
	Yellow-rumped Warbler	0	0	0	2	0	0	0	0	0.3	0	0	0	0	0	0.0
	Black-throated Green Warbler	0	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0.0
	Blackburnian Warbler	0	0	0	0	0	4	0	0	0.5	0	0	0	0	0	0.0
	Bay-breasted Warbler	0	0	0	2	0	0	0	0	0.3	2	0	0	0	0	0.4
	Ovenbird	8	4	6	0	4	4	6	4	4.5	6	6	4	4	4	4.8
	Canada Warbler	0	0	0	2	2	0	0	2	0.8	0	0	0	0	0	0.0
	American Redstart	2	0	0	0	0	0	0	0	0.3	0	0	4	0	2	1.2
Fringillidae	Rose-breasted Grosbeak	0	0	2	2	2	0	0	0	0.8	0	2	0	2	0	0.8
	Purple Finch	0	0	0	0	0	0	0	0	0.0	2	0	0	0	0	0.4
	Dark-eyed Junco	2	4	0	2	2	0	2	0	1.5	2	0	0	2	2	1.2
	Chipping Sparrow	0	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0.0
	White-throated Sparrow	0	0	1	0	2	0	0	2	0.6	0	0	0	0	0	0.0
Unidentified Birds		0	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0.0
Totals		32	25	20	27	26	18	20	18	23.3	24	20	20	18	19	20.2
No. of species		7	8	8	10	9	5	7	7	7.6	8	7	6	6	6	6.6

*treated with MATACIL® 180F + Insecticide Diluent 585 at 0630 ADT on 4 June, 0550 ADT on 9 June, and 1709 ADT on 17 June, 1982.

Table 3. Forest bird population census, Acadia Untreated Check Block[a], Transect Data, Fredericton, New Brunswick, 23 May-22 June, 1982.

		PRE-SPRAY													POST-SPRAY 1					
		May 23	May 24	May 26	May 27	May 28	May 29	May 30	May 31	June 1	June 2	June 3	June 4	Daily	June 5	June 6	June 7	June 8	June 9	Daily
Family	Species	-12	-11	-9	-8	-7	-6	-5	-4	-3	-2	-1	-0	Ave.	+1	+2	+3	+4	+5	Ave.
Tyrannidae	Yellow-bellied Flycatcher	0	0	0	0	0	2	2	0	4	0	0	0	0.7	2	0	0	2	2	1.2
	Alder Flycatcher	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0	2	0	0.4
	Least Flycatcher	0	0	4	2	0	2	2	4	2	0	2	4	1.8	4	2	8	5	2	4.2
	Eastern Wood Pewee	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0.0
Troglodytidae	Winter Wren	0	0	0	0	0	0	0	0	0	0	0	2	0.2	0	0	0	0	0	0.0
Turdidae	American Robin	2	2	4	2	2	0	1	0	0	0	6	2	1.8	3	5	2	1	3	2.8
	Wood Thrush	0	6	4	4	8	6	6	4	6	6	8	4	5.2	6	6	4	4	2	4.4
	Hermit Thrush	14	6	8	2	0	6	5	4	4	6	1	6	5.2	10	2	8	6	8	6.8
	Swainson's Thrush	3	3	3	2	6	6	1	2	4	3	3	5	3.4	6	2	4	5	9	5.2
	Veery	0	4	0	2	0	0	0	2	2	2	4	2	1.5	6	4	4	5	6	5.0
Sylvidae	Golden-crowned Kinglet	4	6	6	8	4	4	6	4	4	4	4	8	5.2	4	4	4	2	0	2.8
	Ruby-crowned Kinglet	4	4	2	0	2	4	2	2	2	4	4	8	3.2	2	2	2	1	2	1.8
Vireonidae	Solitary Vireo	2	0	2	0	0	0	0	0	0	0	0	0	0.3	0	0	0	0	0	0.0
	Red-eyed Vireo	0	0	0	0	0	0	0	0	0	0	0	2	0.2	0	4	0	4	4	2.4
	Philadelphia Vireo	0	0	0	0	0	0	0	0	2	0	2	2	0.5	0	0	0	0	0	0.0
Parulidae	Black-and-white Warbler	4	4	2	2	2	2	0	0	2	2	0	2	1.8	0	2	2	8	6	3.6
	Tennessee Warbler	12	20	14	22	20	18	18	18	20	10	16	14	16.8	20	14	10	17	12	14.6
	Nashville Warbler	0	0	0	2	0	4	2	4	0	0	2	2	1.3	2	2	4	6	4	3.6
	Parula Warbler	6	6	10	4	4	8	2	10	6	0	2	2	5.0	4	0	6	0	4	2.8
	Yellow Warbler	0	0	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0.0
	Magnolia Warbler	12	22	22	10	12	18	18	16	14	12	12	10	14.8	16	12	14	18	12	14.4
	Cape May Warbler	2	0	6	6	6	2	10	4	4	4	2	0	3.8	4	0	0	0	2	1.2
	Black-throated Blue Warbler	8	4	4	2	4	8	2	8	6	8	6	6	5.5	0	8	8	2	6	4.8
	Yellow-rumped Warbler	5	7	4	2	6	4	8	6	6	4	12	4	5.3	4	0	6	2	2	2.8
	Black-throated Green Warbler	8	10	2	8	4	0	4	4	4	0	4	4	4.3	4	0	4	4	6	3.6
	Blackburnian Warbler	9	10	12	4	4	4	8	8	8	12	8	6	7.8	4	10	10	10	20	10.8
	Chestnut-sided Warbler	0	0	2	4	2	2	0	0	0	0	0	0	0.8	0	0	0	0	0	0.0
	Bay-breasted Warbler	6	8	6	2	0	4	8	10	8	4	14	12	6.8	10	10	8	10	9	9.4
	Ovenbird	28	26	28	24	26	18	24	25	24	22	22	20	23.9	26	26	24	30	28	26.8
	Northern Waterthrush	0	0	0	0	0	0	0	0	0	0	0	2	0.2	2	2	2	2	0	1.6
	Common Yellowthroat	0	0	0	2	0	2	0	0	0	0	0	0	0.3	0	0	0	0	0	0.0
	Canada Warbler	6	6	6	0	4	2	4	0	0	2	4	6	3.3	6	10	6	8	12	8.4
	American Redstart	0	0	0	0	0	0	0	0	0	2	0	2	0.3	0	0	2	2	2	1.2
Fringillidae	Rose-breasted Grosbeak	8	4	6	10	12	10	16	14	12	14	12	10	10.7	12	8	1	6	4	6.2
	Purple Finch	2	2	0	2	4	0	0	0	0	0	0	2	1.0	4	0	0	3	0	1.4
	Dark-eyed Junco	0	0	0	0	0	0	0	0	0	0	0	0	0.0	2	0	0	0	2	0.8
	White-throated Sparrow	6	2	8	11	2	3	6	5	3	10	9	6	5.9	3	1	0	2	1	1.4
Unidentified Birds		2	2	2	4	4	3	2	2	2	3	0	0	2.2	0	0	2	1	1	0.8
Totals		153	164	167	143	138	142	157	156	149	134	159	155	151.3	166	136	145	168	171	157.2
No. of Species		22	22	24	25	21	24	23	21	23	20	23	28	23.0	25	21	24	28	27	25.0

[a]untreated check block for Treatment Block 82

Table 3. Forest bird population census, Acadia Untreated Check Block*, Transect Data, Fredericton, New Brunswick, 23 May-22 June, 1982.

		POST-SPRAY II								POST-SPRAY III					
		June 10	June 11	June 12	June 13	June 15	June 16	June 17	Daily	June 18	June 19	June 20	June 21	June 22	Daily
Family	Species	+1	+2	+3	+4	+6	+7	+8	Ave.	+1	+2	+3	+4	+5	Ave.
Tyrannidae	Yellow-bellied Flycatcher	2	0	0	0	0	0	2	0.6	2	0	0	0	2	0.8
	Alder Flycatcher	2	2	2	2	0	0	0	1.1	0	0	0	0	0	0.0
	Least Flycatcher	2	6	2	2	2	2	2	2.6	2	2	4	4	2	2.8
	Eastern Wood Pewee	0	0	0	0	0	2	2	0.6	0	0	4	2	2	1.6
Troglodytidae	Winter Wren	0	0	0	0	0	0	0	0.0	0	0	0	2	2	0.8
Turdidae	American Robin	4	0	6	3	3	1	0	2.4	2	4	2	2	1	2.2
	Wood Thrush	2	6	2	2	4	6	2	3.4	4	4	4	2	2	3.2
	Hermit Thrush	8	8	10	8	8	10	6	8.3	16	10	14	8	10	11.6
	Swainson's Thrush	14	12	9	10	10	2	0	8.1	6	4	0	2	0	2.4
	Veery	5	4	4	2	0	2	4	3.0	3	0	0	2	5	2.0
Sylviidae	Golden-crowned Kinglet	2	2	2	0	4	2	2	2.0	2	2	2	0	2	1.6
	Ruby-crowned Kinglet	2	2	2	2	2	2	2	2.0	2	4	2	0	0	1.6
Vireonidae	Solitary Vireo	0	0	0	0	2	0	0	0.3	0	0	0	0	0	0.0
	Red-eyed Vireo	0	2	4	4	2	2	2	2.3	4	2	4	2	2	2.8
	Philadelphia Vireo	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0.0
Parulidae	Black-and-white Warbler	10	6	6	6	4	8	6	6.6	6	8	6	4	0	4.8
	Tennessee Warbler	10	14	12	12	12	6	2	9.7	2	2	0	6	4	2.8
	Nashville Warbler	8	6	6	4	6	6	4	5.7	4	4	4	0	4	3.2
	Parula Warbler	2	2	4	4	8	2	4	3.7	4	10	2	8	6	6.0
	Yellow Warbler	0	0	0	1	0	0	0	0.1	0	0	0	0	0	0.0
	Magnolia Warbler	16	16	22	14	8	14	4	13.4	14	10	8	14	8	10.8
	Cape May Warbler	4	0	2	0	0	0	2	1.1	0	0	2	0	2	0.8
	Black-throated Blue Warbler	4	4	8	2	4	4	4	4.3	2	2	2	6	4	3.2
	Yellow-rumped Warbler	2	2	0	2	0	2	0	1.1	2	2	4	2	2	2.4
	Black-throated Green Warbler	0	4	4	0	2	0	4	2.0	2	0	0	0	0	0.4
	Blackburnian Warbler	10	12	8	6	10	6	6	8.3	14	12	10	14	10	12.0
	Chestnut-sided Warbler	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0.0
	Bay-breasted Warbler	12	10	14	10	16	18	14	13.4	14	12	16	12	6	12.0
	Ovenbird	26	22	30	34	26	26	26	27.1	28	26	20	24	22	24.0
	Northern Waterthrush	2	2	2	2	0	0	0	1.1	2	0	0	0	0	0.4
	Common Yellowthroat	0	0	0	0	0	2	0	0.3	2	0	0	0	2	0.8
	Canada Warbler	12	10	10	8	8	8	10	9.4	8	6	10	8	8	8.0
	American Redstart	4	2	6	0	4	2	4	3.1	2	0	4	8	4	3.6
Fringillidae	Rose-breasted Grosbeak	5	4	4	4	4	7	4	4.6	4	2	6	9	6	5.4
	Purple Finch	2	0	2	0	2	2	2	1.4	0	2	0	2	4	1.6
	Dark-eyed Junco	4	2	0	0	2	0	4	1.7	2	0	0	0	2	0.8
	White-throated Sparrow	3	2	6	2	3	0	0	2.3	2	0	2	2	2	1.6
Unidentified Birds		0	0	0	0	0	0	0	0.0	0	0	0	0	0	0.0
Totals		179	169	189	146	156	144	124	157.4	157	130	132	145	126	138.0
No. of Species		28	26	27	24	25	25	25	25.7	28	21	22	23	27	24.2

*untreated check block for Treatment Block 82

Table 4. Forest bird population census, Acadia Untreated Check Block[a], Spot data, Fredericton, New Brunswick, 24 May-22 June, 1982.

		PRE-SPRAY											POST-SPRAY 1					
		May 24	May 26	May 27	May 28	May 29	May 30	May 31	June 1	June 2	June 3	Daily	June 4	June 5	June 6	June 7	June 8	Daily
Family	Species	-11	-9	-8	-7	-6	-5	-4	-3	-2	-1	Ave.	+0	+1	+2	+3	+4	Ave.
Tyrannidae	Least Flycatcher	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0.0
Turdidae	American Robin	0	2	4	2	0	0	0	2	0	2	1.2	0	2	0	0	0	0.4
	Wood Thrush	0	0	0	0	0	0	0	0	0	0	0.0	2	0	0	0	0	0.4
	Hermit Thrush	2	0	0	0	0	0	1	4	0	0	0.7	2	2	2	2	4	2.4
	Swainson's Thrush	0	0	0	0	1	2	0	2	2	0	0.7	2	0	0	0	0	0.4
Sylviidae	Golden-crowned Kinglet	0	0	0	0	0	0	0	0	0	0	0.0	2	2	0	0	0	0.8
Vireonidae	Solitary Vireo	2	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0.0
Parulidae	Tennessee Warbler	0	0	2	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0.0
	Nashville Warbler	0	0	0	0	0	0	0	0	0	0	0.0	2	0	0	2	0	0.8
	Parula Warbler	0	6	0	0	2	2	0	2	2	2	1.6	0	0	0	0	0	0.0
	Magnolia Warbler	2	4	0	2	0	2	0	0	2	2	1.4	0	2	0	2	0	0.8
	Cape May Warbler	2	0	2	0	0	0	0	0	2	2	0.8	0	2	0	2	2	1.2
	Black-throated Blue Warbler	2	2	2	2	4	2	4	2	2	4	2.6	2	4	0	0	0	1.2
	Yellow-rumped Warbler	3	0	0	0	0	0	0	0	0	0	0.3	2	0	0	0	0	0.4
	Black-throated Green Warbler	4	4	0	0	2	0	0	0	2	2	1.4	0	2	0	0	0	0.4
	Blackburnian Warbler	2	2	0	2	2	2	4	6	2	2	2.4	0	0	2	2	4	1.6
	Bay-breasted Warbler	0	2	0	0	0	4	0	2	2	4	1.4	4	4	2	0	0	2.0
	Ovenbird	10	6	8	8	6	6	6	6	8	8	7.2	6	8	4	6	4	5.6
	Common Yellowthroat	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0.0
	American Redstart	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0.0
Fringillidae	Rose-breasted Grosbeak	4	0	0	0	2	2	2	0	2	0	1.2	2	0	2	2	0	1.2
	Purple Finch	0	0	0	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0.0
	Dark-eyed Junco	0	0	2	0	0	2	2	0	0	4	1.0	0	0	2	0	1	0.6
	White-throated Sparrow	0	5	0	4	5	1	4	3	2	1	2.5	0	0	0	2	0	0.4
Unidentified Birds		0	0	0	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0.0
Totals		33	33	20	20	24	25	23	29	28	33	26.8	26	28	14	20	15	20.6
No. of species		10	9	6	6	8	10	7	9	11	11	8.7	10	9	6	8	5	7.6

[a]untreated check block for Treatment Block 82

Table 4. Forest bird population census, Acadia Untreated Check Block[a], Spot data, Fredericton, New Brunswick, 24 May-22 June, 1982.

		POST-SPRAY II									POST-SPRAY III					
		June 9	June 10	June 11	June 12	June 13	June 15	June 16	June 17		June 18	June 19	June 20	June 21	June 22	
Family	Species	+0	+1	+2	+3	+4	+6	+7	+8	Daily Ave.	+1	+2	+3	+4	+5	Daily Ave.
Tyrannidae	Least Flycatcher	0	0	0	0	0	0	0	0	0.0	4	0	0	0	0	0.8
Turdidae	American Robin	0	0	0	0	0	0	0	0	0.0	0	0	2	0	0	0.4
	Wood Thrush	0	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0.0
	Hermit Thrush	2	2	4	2	2	4	2	2	2.5	2	2	2	2	2	2.0
	Swainson's Thrush	0	0	0	0	0	0	0	0	0.0	0	2	0	0	0	0.4
Sylviidae	Golden-crowned Kinglet	0	2	0	2	0	0	0	0	0.5	2	0	0	0	0	0.4
Vireonidae	Solitary Vireo	0	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0.0
Parulidae	Tennessee Warbler	0	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0.0
	Nashville Warbler	0	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0.0
	Parula Warbler	0	0	0	0	2	2	0	0	0.5	0	2	0	2	0	0.8
	Magnolia Warbler	0	0	0	0	6	2	0	0	1.0	2	0	0	0	0	0.4
	Cape May Warbler	4	0	2	2	0	2	0	2	1.5	2	2	2	0	0	1.2
	Black-throated Blue Warbler	0	2	2	0	0	0	2	2	1.0	0	0	2	0	2	0.8
	Yellow-rumped Warbler	0	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0.0
	Black-throated Green Warbler	2	0	0	2	2	0	2	0	1.0	2	0	0	2	0	0.8
	Blackburnian Warbler	4	2	0	0	2	2	2	0	1.5	0	0	2	0	0	0.4
	Bay-breasted Warbler	0	2	2	4	4	4	4	2	2.8	2	0	0	0	2	0.8
	Ovenbird	6	6	8	8	6	6	6	8	6.8	6	8	4	6	6	6.0
	Common Yellowthroat	0	0	0	0	0	0	0	0	0.0	0	2	0	0	0	0.4
	American Redstart	0	0	0	0	0	0	0	0	0.0	2	0	0	0	0	0.4
Fringillidae	Rose-breasted Grosbeak	2	0	2	0	0	0	0	0	0.5	0	0	0	0	2	0.4
	Purple Finch	0	2	0	2	0	0	0	0	0.5	0	2	0	2	0	0.8
	Dark-eyed Junco	2	0	0	0	0	0	2	0	0.5	0	2	0	0	2	0.8
	White-throated Sparrow	4	2	1	2	0	2	2	3	2.0	2	0	2	0	0	0.8
Unidentified Birds		0	0	0	1	0	0	0	0	0.1	0	0	0	0	0	0.0
Totals		26	20	21	25	24	24	22	19	22.6	26	22	16	14	16	18.8
No. of species		8	8	7	9	7	8	8	6	7.6	10	8	7	5	6	7.2

[a]untreated check block for Treatment Block 82

Table 5. Forest bird population census, Block 86* Area 1 Transect Data, Fredericton, New Brunswick, 23 May-18 June, 1982.

	PRE-SPRAY									POST-SPRAY I								POST-SPRAY II										
	May 23	May 24	May 26	May 27	May 28	May 29	May 30	May 31		June 1	June 2	June 3	June 4	June 5	June 6	June 7		June 8	June 9	June 10	June 11	June 12	June 13	June 15	June 16	June 17	June 18	
Family and Species	-8	-7	-5	-4	-3	-2	-1	-0	Daily Ave.	+1	+2	+3	+4	+5	+6	+7	Daily Ave.	+0	+1	+2	+3	+4	+5	+7	+8	+9	+10	Daily Ave.
Tyrannidae																												
Yellow-bellied Flycatcher	0	0	0	0	0	0	2	0	0.3	2	0	0	4	2	2	2	1.7	4	6	4	4	2	0	6	4	0	2	3.2
Least Flycatcher	4	8	6	8	6	6	10	6	6.8	10	12	6	6	10	8	8	8.6	4	6	8	8	6	8	10	12	12	8	8.2
Olive-sided Flycatcher	0	0	0	0	0	0	2	4	0.8	4	4	4	8	4	4	4	4.6	3	2	2	2	0	2	0	2	2	2	1.7
Troglodytidae																												
Winter Wren	0	0	0	0	2	4	0	0	0.8	0	0	0	0	2	0	0	0.3	0	0	0	0	0	0	0	0	0	0	0.0
Turdidae																												
Wood Thrush	0	0	0	0	0	0	2	0	0.3	0	0	2	0	0	2	0	0.6	0	0	0	0	0	0	0	0	0	0	0.0
Hermit Thrush	8	8	10	4	6	4	2	4	5.8	6	6	6	4	6	6	8	6.0	0	4	0	0	2	2	2	4	0	2	1.6
Swainson's Thrush	0	1	8	2	10	12	6	6	5.6	9	9	8	13	12	6	1	8.3	5	3	9	9	0	2	4	11	11	8	6.2
Sylviidae																												
Golden-crowned Kinglet	2	0	4	2	2	2	10	8	3.8	6	4	6	4	6	4	4	4.9	2	2	6	2	4	0	0	0	2	2	2.0
Ruby-crowned Kinglet	0	0	0	0	0	2	0	2	0.5	0	0	0	0	2	0	0	0.3	2	2	0	0	0	0	0	0	0	2	0.6
Vireonidae																												
Solitary Vireo	0	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0	0	0.0	2	0	0	0	0	0	0	0	0	0	0.2
Philadelphia Vireo	2	0	2	0	2	0	0	0	0.8	0	0	2	2	2	0	0	0.9	0	2	2	2	2	0	2	0	0	0	1.0
Parulidae																												
Black-and-white Warbler	2	6	4	0	2	8	4	6	4.0	6	6	6	4	6	8	2	5.4	6	0	2	0	4	4	4	2	2	8	3.2
Tennessee Warbler	60	51	54	38	36	32	38	42	43.9	40	30	36	36	32	28	26	32.6	25	18	18	18	20	12	12	8	10	6	14.7
Nashville Warbler	0	0	0	0	0	0	0	0	0.0	0	2	2	4	0	4	2	2.0	4	6	10	4	2	4	2	8	8	4	5.2
Parula Warbler	0	0	2	0	0	2	0	0	0.5	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0.0
Magnolia Warbler	23	30	30	28	28	20	30	22	26.4	20	16	16	24	26	20	24	20.9	18	12	18	18	14	8	18	12	18	16	15.2
Cape May Warbler	2	4	8	14	16	10	2	8	8.0	6	4	4	10	4	10	6	6.3	2	8	2	6	0	2	2	4	6	4	3.6
Yellow-rumped Warbler	0	0	0	0	0	6	12	0	2.3	4	6	0	0	4	2	6	3.1	4	8	6	4	2	0	4	6	4	2	4.0
Black-throated Green Warbler	0	2	4	6	8	2	2	4	3.5	8	2	4	6	0	2	0	3.1	2	0	2	0	4	0	2	0	0	0	1.0
Blackburnian Warbler	0	0	2	0	0	0	0	0	0.3	0	0	0	0	0	2	0	0.3	2	2	0	2	2	0	0	2	0	4	1.4
Bay-breasted Warbler	0	1	0	0	0	0	0	0	0.1	4	6	0	8	6	10	6	5.7	12	6	10	10	4	8	6	8	2	4	7.0
Ovenbird	14	10	6	6	8	8	8	6	8.3	14	12	12	10	14	12	8	11.7	6	10	4	12	8	12	10	10	6	6	8.4
Common Yellowthroat	12	10	14	10	6	4	16	16	11.0	20	12	14	20	18	12	10	15.1	7	6	10	8	4	6	8	6	8	4	6.7
Canada Warbler	0	0	0	0	2	4	0	0	0.8	8	8	4	4	2	6	10	6.0	6	6	6	6	4	4	4	4	6	8	5.4
Fringillidae																												
Rose-breasted Grosbeak	2	0	10	0	10	0	0	0	2.8	6	0	0	0	2	2	0	1.4	0	0	0	0	0	0	0	0	0	0	0.0
Purple Finch	0	0	0	0	0	0	0	0	0.0	0	0	2	0	0	0	2	0.6	0	0	0	0	0	0	2	0	0	0	0.2
Dark-eyed Junco	0	0	0	0	0	4	4	2	1.3	4	4	2	5	4	1	0	2.9	0	0	0	0	0	3	0	2	2	5	1.2
White-throated Sparrow	14	8	13	7	9	7	9	7	9.3	10	7	11	9	7	3	0	6.7	2	3	4	2	4	4	4	3	2	0	2.8
Unidentified Birds	0	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0	0	0.0	0	0	0	0	0	2	0	0	0	0	0.2
Totals	145	139	177	125	153	137	159	149	148.0	187	150	147	181	171	154	129	159.9	118	112	123	117	88	83	102	108	101	97	104.9
No. of Species	12	12	16	11	16	18	17	15	14.6	19	18	19	19	21	22	17	19.3	20	19	18	17	17	16	18	18	16	19	17.8

*treated with MATACIL® 180F + ATLOX 3409F + water at 1908 ADT on 31 May and 0554 ADT on 8 June, 1982.

Table 6. Forest bird population census, Block 86[a] Area II Spot Data, Fredericton, New Brunswick, 24 May-18 June, 1982.

	PRE-SPRAY								POST-SPRAY I								POST-SPRAY II										
	May 24	May 26	May 27	May 28	May 29	May 30	May 31		June 1	June 2	June 3	June 4	June 5	June 6	June 7		June 8	June 9	June 10	June 11	June 12	June 13	June 15	June 16	June 17	June 18	
Family and Species	-7	-5	-4	-3	-2	-1	-0	Daily Ave.	+1	+2	+3	+4	+5	+6	+7	Daily Ave.	+0	+1	+2	+3	+4	+5	+7	+8	+9	+10	Daily Ave.
Tyrannidae																											
Yellow-bellied Flycatcher	0	0	0	0	0	0	0	0.0	0	0	0	0	2	2	2	0.9	0	0	0	2	0	0	0	0	0	0	0.2
Least Flycatcher	4	2	2	0	4	2	2	2.3	2	4	2	2	2	0	0	1.7	0	0	0	2	0	0	0	0	0	2	0.4
Troglodytidae																											
Winter Wren	0	2	0	2	4	2	0	1.4	4	4	0	2	2	2	0	2.0	2	2	4	2	2	2	2	0	2	0	1.8
Turdidae																											
Hermit Thrush	0	0	0	0	4	0	0	0.6	4	0	0	0	2	0	0	0.9	1	2	1	0	0	4	0	0	2	0	1.0
Swainson's Thrush	0	0	0	4	0	0	0	0.6	4	0	0	0	1	0	0	0.7	0	0	2	2	0	0	2	0	0	2	0.8
Sylviidae																											
Golden-crowned Kinglet	2	0	0	0	0	0	0	0.3	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0.0
Vireonidae																											
Solitary Vireo	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0	0	0.0	0	0	0	0	2	2	2	2	2	2	1.2
Philadelphia Vireo	0	0	0	0	2	4	2	1.1	4	2	0	0	0	0	0	0.9	0	0	0	0	0	0	0	0	0	0	0.0
Parulidae																											
Black-and-white Warbler	0	0	2	2	0	0	2	0.9	0	0	0	0	0	4	0	0.6	2	2	0	2	0	2	0	2	2	0	1.2
Tennessee Warbler	2	8	4	8	6	2	6	5.1	6	6	2	6	2	0	4	3.7	5	4	2	2	4	0	0	0	0	2	1.9
Nashville Warbler	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0	0	0.0	1	2	0	0	2	0	4	2	0	0	1.1
Parula Warbler	2	4	0	2	4	6	0	2.6	0	2	4	2	0	0	0	1.1	2	2	2	4	0	2	2	0	2	2	1.8
Magnolia Warbler	2	0	2	2	4	4	4	2.6	4	2	6	6	8	0	4	4.3	2	0	2	2	4	4	2	0	0	0	1.6
Cape May Warbler	2	0	0	2	2	0	0	0.9	2	4	2	2	0	0	2	1.7	4	0	0	0	0	0	0	0	0	0	0.4
Black-throated Blue Warbler	2	2	0	0	0	0	0	0.6	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0.0
Yellow-rumped Warbler	2	0	0	0	0	0	0	0.3	0	0	0	0	0	2	0	0.3	2	2	2	0	0	0	2	0	2	2	1.2
Black-throated Green Warbler	6	4	4	4	0	4	2	3.4	2	4	2	2	2	4	2	2.6	0	2	2	0	2	2	2	0	2	0	1.2
Blackburnian Warbler	2	2	2	0	0	0	0	0.9	0	0	0	0	0	0	2	0.3	0	0	2	0	2	0	2	2	2	0	1.0
Bay-breasted Warbler	2	2	0	0	2	2	0	1.1	0	0	4	2	2	4	4	2.3	4	2	4	0	2	0	2	2	2	2	2.0
Ovenbird	6	6	4	2	4	0	6	4.0	4	4	2	2	6	4	2	3.4	2	2	2	4	2	2	0	2	0	4	2.0
Canada Warbler	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0	0	0.0	2	2	0	0	0	0	0	0	0	0	0.4
Fringillidae																											
Rose-breasted Grosbeak	4	2	0	0	2	0	0	1.1	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0.0
Dark-eyed Junco	0	0	0	0	0	0	0	0.0	0	0	0	0	0	2	0	0.3	0	0	0	0	0	0	0	0	0	0	0.0
White-throated Sparrow	2	0	2	2	4	0	0	1.4	2	0	0	0	0	0	0	0.3	0	0	0	0	0	0	0	0	0	0	0.0
Unidentified Birds	0	0	0	0	0	0	0	0.0	0	4	0	0	0	0	0	0.6	0	0	0	0	0	0	0	0	0	0	0.0
Totals	40	34	22	30	42	26	24	31.1	38	36	24	26	29	24	22	28.4	29	24	25	22	22	20	22	12	18	18	21.2
No. of Species	14	10	8	10	12	8	7	9.9	11	10	8	9	10	8	8	9.1	12	11	11	9	9	8	10	6	9	8	9.3

[a]treated with MATACIL® 180F + ATLOX 3409F + water at 1908 ADT on 31 May and 0554 ADT on 8 June, 1982.

Table 7. Forest bird population census, Yoho Untreated Check Block*, Transect Data, Fredericton, New Brunswick, 23 May-18 June, 1982.

	PRE-SPRAY									POST-SPRAY I								POST-SPRAY II										
	May 23	May 24	May 26	May 27	May 28	May 29	May 30	May 31	Daily	June 1	June 2	June 3	June 4	June 5	June 6	June 7	Daily	June 8	June 9	June 10	June 11	June 12	June 13	June 15	June 16	June 17	June 18	Daily
Family and Species	-8	-7	-5	-4	-3	-2	-1	-0	Ave.	+1	+2	+3	+4	+5	+6	+7	Ave.	+0	+1	+2	+3	+4	+5	+7	+8	+9	+10	Ave.
Tyrannidae																												
Yellow-bellied Flycatcher	0	0	0	0	0	2	2	0	0.5	4	0	0	0	2	0	0	0.9	2	2	2	0	0	0	0	0	2	2	1.0
Alder Flycatcher	0	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0	0	0.0	2	0	2	2	2	2	0	0	0	0	1.0
Least Flycatcher	0	0	4	2	0	2	2	4	1.8	2	0	2	4	4	2	8	3.1	5	2	2	6	2	2	2	2	2	2	2.7
Eastern Wood Pewee	0	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0	0	2	2	0	0.4
Troglodytidae																												
Winter Wren	0	0	0	0	0	0	0	0	0.0	0	0	0	2	0	0	0	0.3	0	0	0	0	0	0	0	0	0	0	0.0
Turdidae																												
American Robin	2	2	4	2	2	0	1	0	1.6	0	0	6	2	3	5	2	2.6	1	3	4	0	6	3	3	1	0	2	2.3
Wood Thrush	0	6	4	4	8	6	6	4	4.8	6	6	8	4	6	6	4	5.7	4	2	2	6	2	2	4	6	2	4	3.4
Hermit Thrush	14	6	8	2	0	6	5	4	5.6	4	6	1	6	10	2	8	5.3	6	8	8	8	10	8	8	10	6	16	8.8
Swainson's Thrush	3	3	3	2	6	6	1	2	3.3	4	3	3	5	6	2	4	3.9	5	9	14	12	9	10	10	2	0	6	7.7
Veery	0	4	0	2	0	0	0	2	1.0	2	2	4	2	6	4	4	3.4	5	6	5	4	4	2	0	2	4	3	3.5
Sylvidae																												
Golden-crowned Kinglet	4	6	6	8	4	4	6	4	5.3	4	4	4	8	4	4	4	4.6	2	0	2	2	2	0	4	2	2	2	1.8
Ruby-crowned Kinglet	4	4	2	0	2	4	2	2	2.5	2	4	4	8	2	2	2	3.4	1	2	2	2	2	2	2	2	2	2	1.9
Vireonidae																												
Solitary Vireo	2	0	2	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0	2	0	0	0	0.2
Red-eyed Vireo	0	0	0	0	0	0	0	0	0.0	0	0	0	2	0	4	0	0.9	4	4	0	2	4	4	2	2	2	4	2.8
Philadelphia Vireo	0	0	0	0	0	0	0	0	0.0	2	0	2	2	0	0	0	0.9	0	0	0	0	0	0	0	0	0	0	0.0
Parulidae																												
Black-and-white Warbler	4	4	2	2	2	2	0	0	2.0	2	2	0	2	0	2	2	1.4	8	6	10	6	6	6	4	8	6	6	6.6
Tennessee Warbler	12	20	14	22	20	18	18	18	17.8	20	10	16	14	20	14	10	14.9	17	12	10	14	12	12	12	6	2	2	9.9
Nashville Warbler	0	0	0	2	0	4	2	4	1.5	0	0	2	2	2	2	4	1.7	6	4	8	6	6	4	6	6	4	4	5.4
Parula Warbler	6	6	10	4	4	8	2	10	6.3	6	0	2	2	4	0	6	2.9	0	4	2	2	4	4	8	2	4	4	3.4
Yellow Warbler	0	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0	0	0.0	0	0	0	0	0	1	0	0	0	0	0.1
Magnolia Warbler	12	22	22	10	12	18	18	16	16.3	14	12	12	10	16	12	14	12.9	18	12	16	16	22	14	8	14	4	14	13.8
Cape May Warbler	2	0	6	6	6	2	10	4	4.5	4	4	2	0	4	0	0	2.0	0	2	4	0	2	0	0	0	2	0	1.0
Black-throated Blue Warbler	8	4	4	2	4	8	2	8	5.0	6	8	6	6	0	8	8	6.0	2	6	4	4	8	2	4	4	4	2	4.0
Yellow-rumped Warbler	5	7	4	2	6	4	8	6	5.3	6	4	12	4	4	0	6	5.1	2	2	2	2	0	2	0	2	0	2	1.4
Black-throated Green Warbler	8	10	2	8	4	0	4	4	5.0	4	0	4	4	4	0	4	2.9	4	6	0	4	4	0	2	0	4	2	2.6
Blackburnian Warbler	9	10	12	4	4	4	8	8	7.4	8	12	8	6	4	10	10	8.3	10	20	10	12	8	6	10	6	6	14	10.2
Chestnut-sided Warbler	0	0	2	4	2	2	0	0	1.3	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0.0
Bay-breasted Warbler	6	8	6	2	0	4	8	10	5.5	8	4	14	12	10	10	8	9.4	10	9	12	10	14	10	16	18	14	14	12.7
Ovenbird	28	26	28	24	26	18	24	25	24.9	24	22	22	20	26	26	24	23.4	30	28	26	22	30	34	26	26	26	28	27.6
Northern Waterthrush	0	0	0	0	0	0	0	0	0.0	0	0	0	2	2	2	2	1.1	2	0	2	2	2	2	0	0	0	2	1.2
Common Yellowthroat	0	0	0	2	0	2	0	0	0.5	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0	0	2	0	2	0.4
Canada Warbler	6	6	6	0	4	2	4	0	3.5	0	2	4	6	6	10	6	4.9	8	12	12	10	10	8	8	8	10	8	9.4
American Redstart	0	0	0	0	0	0	0	0	0.0	0	2	0	2	0	0	2	0.9	2	2	4	2	6	0	4	2	4	2	2.8
Fringillidae	8	4	6	10	12	10	16	14	10.0	12	14	12	10	12	8	1	9.9	6	4	5	4	4	4	4	7	4	4	4.6
Rose-breasted Grosbeak	2	2	0	2	4	0	0	0	1.3	0	0	0	2	4	0	0	0.9	3	0	2	0	2	0	2	2	2	0	1.3
Purple Finch	0	0	0	0	0	0	0	0	0.0	0	0	0	0	2	0	0	0.3	0	2	4	2	0	0	2	0	4	2	1.6
Dark-eyed Junco	0	0	0	0	0	0	0	0	0.0	0	0	0	0	2	0	0	0.3	0	2	4	2	0	0	2	0	4	2	1.6
White-throated Sparrow	6	2	8	11	2	3	6	5	5.4	3	10	9	6	3	1	0	4.6	2	1	3	2	6	2	3	0	0	2	2.1
Unidentified Birds	2	2	2	4	4	3	2	2	2.6	2	3	0	0	0	0	2	1.0	1	1	0	0	0	0	0	0	0	0	0.2
Totals	153	164	167	143	138	142	157	156	152.5	149	134	159	155	166	136	145	149.1	168	171	179	164	189	146	156	144	124	157	159.8
No. of species	22	22	24	25	21	24	23	21	22.8	23	20	23	28	25	21	24	23.4	28	27	28	26	27	24	25	25	25	28	26.3

*untreated check block for Treatment Block 86

Table 8. Forest bird population census, Yoho Untreated Check Block*, Spot Data, Fredericton, New Brunswick, 24 May-18 June, 1982.

	PRE-SPRAY								POST-SPRAY I								POST-SPRAY II										
	May 24	May 26	May 27	May 28	May 29	May 30	May 31		June 1	June 2	June 3	June 4	June 5	June 6	June 7		June 8	June 9	June 10	June 11	June 12	June 13	June 15	June 16	June 17	June 18	
Family and Species	-7	-5	-4	-3	-2	-1	-0	Daily Ave.	+1	+2	+3	+4	+5	+6	+7	Daily Ave.	+0	+1	+2	+3	+4	+5	+7	+8	+9	+10	Daily Ave.
Tyrannidae																											
Least Flycatcher	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0	0	0	0	4	0.4
Turdidae																											
American Robin	0	2	4	2	0	0	0	1.1	2	0	2	0	2	0	0	0.9	0	0	0	0	0	0	0	0	0	0	0.0
Wood Thrush	0	0	0	0	0	0	0	0.0	0	0	0	2	0	0	0	0.3	0	0	0	0	0	0	0	0	0	0	0.0
Hermit Thrush	2	0	0	0	0	0	1	0.4	4	0	0	2	2	2	2	1.7	4	2	2	4	2	2	4	2	2	2	2.6
Swainson's Thrush	0	0	0	0	1	2	0	0.4	2	2	0	2	0	0	0	0.9	0	0	0	0	0	0	0	0	0	0	0.0
Sylvidae																											
Golden-crowned Kinglet	0	0	0	0	0	0	0	0.0	0	0	0	2	2	0	0	0.6	0	0	2	0	2	0	0	0	0	2	0.6
Vireonidae																											
Solitary Vireo	2	0	0	0	0	0	0	0.3	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0.0
Parulidae																											
Tennessee Warbler	0	0	2	0	0	0	0	0.3	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0	0	0	0	0	0.0
Nashville Warbler	0	0	0	0	0	0	0	0.0	0	0	0	2	0	0	2	0.6	0	0	0	0	0	0	0	0	0	0	0.0
Parula Warbler	0	6	0	0	2	2	0	1.4	2	2	2	0	0	0	0	0.9	0	0	0	0	0	2	2	0	0	0	0.4
Magnolia Warbler	2	4	0	2	0	2	0	1.4	0	2	2	0	2	0	2	1.1	0	0	0	0	0	6	2	0	0	2	1.0
Cape May Warbler	2	0	2	0	0	0	0	0.6	0	2	2	0	2	0	2	1.1	2	4	0	2	2	0	2	0	2	2	1.6
Black-throated Blue Warbler	2	2	2	2	4	2	4	2.6	2	2	4	2	4	0	0	2.0	0	0	2	2	0	0	0	2	2	0	0.8
Yellow-rumped Warbler	3	0	0	0	0	0	0	0.4	0	0	0	2	0	0	0	0.3	0	0	0	0	0	0	0	0	0	0	0.0
Black-throated Green Warbler	4	4	0	0	2	0	0	1.4	0	2	2	0	2	0	0	0.9	0	2	0	0	2	2	0	2	0	2	1.0
Blackburnian Warbler	2	2	0	2	2	2	4	2.0	6	2	2	0	0	2	2	2.0	4	4	2	0	0	2	2	2	0	0	1.6
Bay-breasted Warbler	0	2	0	0	0	4	0	0.9	2	2	4	4	4	2	0	2.6	0	0	2	2	4	4	4	4	2	2	2.4
Ovenbird	10	6	8	8	6	6	6	7.1	6	8	8	6	8	4	6	6.6	4	6	6	8	8	6	6	6	8	6	6.4
American Redstart	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0	0	0	0	2	0.2
Fringillidae																											
Rose-breasted Grosbeak	4	0	0	0	2	2	2	1.4	0	2	0	2	0	2	2	1.1	0	2	0	2	0	0	0	0	0	0	0.4
Dark-eyed Junco	0	0	2	0	0	2	2	0.9	0	0	4	0	0	2	0	0.9	1	2	0	0	0	0	0	2	0	0	0.5
White-throated Sparrow	0	5	0	4	5	1	4	2.7	3	2	1	0	0	0	2	1.1	0	4	2	1	2	0	2	2	3	2	1.8
Unidentified Birds	0	0	0	0	0	0	0	0.0	0	0	0	0	0	0	0	0.0	0	0	0	0	1	0	0	0	0	0	0.1
Totals	33	33	20	20	24	25	23	25.4	29	28	33	26	28	14	20	25.4	15	26	18	21	23	24	24	22	19	26	21.8
No. of species	10	9	6	6	8	10	7	8.0	9	11	11	10	9	6	8	9.1	5	8	7	7	8	7	8	8	6	10	7.4

*untreated check block for Treatment Block 86

APPENDIX III

Adult and fledgling birds caught in mist nets during banding studies in the treatment and untreated check blocks.

Table 1. Numbers of adult birds caught by mist netting in Treatment Block 82*, Fredericton, New Brunswick, 1982.

Species	June 5	June 6	June 22	June 23	June 29	July 1	July 7	July 8	July 13
Sharp-shinned Hawk						1			
Common Flicker									1
Yellow-bellied Sapsucker				3	1			1	
Yellow-bellied Flycatcher		1			2				
Blue Jay	1								
Black-capped Chickadee			1	1					
Brown Creeper									1
Hermit Thrush	1	1			1	1(1)**	2	1	
Swainson's Thrush	2		3(1)	3(1)	1		2	4(1)	
Golden-crowned Kinglet									1
Cedar Waxwing						3			
Tennessee Warbler		4	1		8		4(1)	6(1)	1(1)
Nashville Warbler	3				2		5	3	4(1)
Magnolia Warbler	7	1(1)	1	3	7	7(1)	6(3)	8(5)	8(4)
Cape May Warbler					2	2	1	1	1
Black-throated Blue Warbler			2	1(1)			1(1)	1	
Yellow-rumped Warbler			1		2			3	2
Black-throated Green Warbler			2	2					
Blackburnian Warbler		1	2	1					
Baybreasted Warbler				1	1	2		1	2
Ovenbird		1	2	1	1		2		1
Common Yellowthroat	1				3	3(2)	4(2)	2(1)	1(1)
Canada Warbler			2	3	2	2	1	1	2(1)
Purple Finch						1		1	2
White-throated Sparrow					3	4(2)	7(1)	1(1)	1(1)
Totals	15	9	17	18	36	26	35	34	28

*treated with MATACIL® 180F + Insecticide Diluent 585 at 0630 ADT on 4 June, 0550 ADT on 9 June, and 1709 ADT on 17 June, 1982.

**the number in brackets ( ) is the number of recaptures.

Table 2. Numbers of fledglings caught by mist netting in Treatment Block 82*, Fredericton, New Brunswick, 1982.

Species	June 29	July 1	July 7	July 8	July 13
Hermit Thrush	1			1	2
Golden-crowned Kinglet				2	
Tennessee Warbler	2		1	1	1
Nashville Warbler			1	3	1(1)**
Magnolia Warbler				3	1
Cape May Warbler			1		
Yellow-rumped Warbler			4	2	1
Palm Warbler				1	
Purple Finch			2		2(1)
Dark-eyed Junco				1	
White-throated Sparrow					5
Totals	3	0	9	14	13

*treated with MATACIL® 180F + Insecticide Diluent 585 at 0630 ADT on 4 June, 0550 ADT on 9 June, and 1709 ADT on 17 June, 1982.

**the number in brackets ( ) is the number of recaptures.

Table 3. Numbers of adult birds caught by mist netting in Treatment Block 86*, Fredericton, New Brunswick, 1982.

Species	May 26	May 27	May 28	June 10	June 11	June 12	July 4	July 6	July 11	July 12
Common Flicker									1	
Yellow-bellied Sapsucker					1				1	1
Yellow-bellied Flycatcher					2		2	1		
Least Flycatcher						1				
Black-capped Chickadee				1					1	
Hermit Thrush		1					1	1	1	
Swainson's Thrush	1		3(1)*			1	3	2	1(1)	2(1)
Veery		4	3(1)		1	3(3)			1	1
Solitary Vireo						1		1		
Red-eyed Vireo				2	1					
Black-and-white Warbler			1		2(1)	1	1			1(1)
Tennessee Warbler				1	1					1(1)
Nashville Warbler		4		1	2(1)		2		2(1)	1
Parula Warbler									1	3
Magnolia Warbler	1	1	1	10(1)	3(3)	4(2)	5	6(4)	4(2)	4(1)
Cape May Warbler							1	1		
Black-throated Blue Warbler										1
Yellow-rumped Warbler				2		2(1)			2	
Black-throated Green Warbler				1					1	1
Blackburnian Warbler										1
Chestnut-sided Warbler			1	2	1				1(1)	1(1)
Blackpoll Warbler		1								
Ovenbird		3		2		1	1	1	6(1)	2
Common Yellowthroat		2	1				1		2(2)	1
Canada Warbler		1	5					1	4	1(1)
American Redstart		5	2	3(2)	3(1)				1	1
Rose-breasted Grosbeak		1							1	1
Evening Grosbeak				1						
Dark-eyed Junco								1		
White-throated Sparrow	1	1	2(1)		2(1)		3	3(2)	2(1)	1
Song Sparrow			1							
Totals	3	24	20	26	18	15	20	18	33	25

*treated with MATACIL® 180F + ATLOX 3409F + water at 1908 ADT on 31 May, 0554 ADT on 8 June, 1982.

**the number in brackets ( ) is the number of recaptures.

Table 4. Numbers of fledglings caught by mist netting in Treatment Block 86*, Fredericton, New Brunswick, 1982.

Species	July 4	July 6	July 11	July 12
Yellow-bellied Sapsucker			2	
Black-capped Chickadee			2	3(1)
Hermit Thrush			1	
Swainson's Thrush	2			
Veery			1	2
Black-and-white Warbler				1
Tennessee Warbler			1	2
Nashville Warbler			3	5(1)
Parula Warbler			2	4(1)
Magnolia Warbler				1
Yellow-rumped Warbler			2	4
Black-throated Green Warbler				1
Chestnut-sided Warbler				1
Ovenbird			3	2
Canada Warbler			1	
American Redstart			1	1
Rose-breasted Grosbeak				2
Dark-eyed Junco		2		
White-throated Sparrow		2	5	1(1)*
Totals	2	4	24	30

*treated with MATACIL® 180F + ATLOX 3409F + water at 1908 ADT on 31 May, and 0554 ADT on 8 June, 1982.

**the number in brackets ( ) is the number of recaptures.

Table 5. Numbers of adult birds caught by mist netting in Untreated Check Block*, Fredericton, New Brunswick, 1982.

Species	May 30	June 1	June 15	June 16	June 17	July 2	July 3	July 9	July 10
Yellow-bellied Sapsucker						1		1	1
Yellow-bellied Flycatcher	1	1			1	2		3(1)	2(1)
Blue Jay							1		
Black-capped Chickadee	1	1(1)				7	1		
Boreal Chickadee						3			
Winter Wren			1						
Catbird								1	
American Robin			2			2			
Wood Thrush		1							
Hermit Thrush							3	1	1
Swainson's Thrush	2		2			1	3(1)		1
Veery	1		1		2				3
Golden-crowned Kinglet						1	1	2	
Black-and-white Warbler			1				1	2	
Tennessee Warbler	2				2(1)				
Nashville Warbler						1	1	2(1)	1
Parula Warbler								1	1
Magnolia Warbler	4	2(1)	1(1)		1(1)	7	4(2)	7(4)	2(1)
Black-throated Blue Warbler	1								
Yellow-rumped Warbler	1	1	1(1)			6	2(1)	2(1)	
Black-throated Green Warbler		1(1)							
Blackburnian Warbler	1					1		1	
Bay-breasted Warbler						1	3(2)		
Ovenbird	5	1(1)		2	2(2)	7	3(1)	6	10(2)
Northern Waterthrush			1			1			
Canada Warbler	3		1	1	1	8	6(2)	5(1)	4(1)
American Redstart	4	2(1)	4		3	1	1	2	
Rose-breasted Grosbeak		4	2	1	1				1
White-throated Sparrow	4				1				1
Totals	30	14	17	4	14	50	30	36	28

*untreated check block for Treatment Blocks 82 and 86.
**the number in brackets ( ) is the number of recaptures.

Table 6. Numbers of fledglings caught by mist netting in the Untreated Check Block*, Fredericton, New Brunswick, 1982.

Species	July 2	July 3	July 9	July 10
Yellow-bellied Flycatcher	1	1	1(1)**	
Black-capped Chickadee	1			1
Boreal Chickadee	1			
Wood Thrush			1	1
Hermit Thrush		3	2	3
Golden-crowned Kinglet	1	1	2	
Black-and-white Warbler			4	1
Tennessee Warbler			2	
Nashville Warbler	1	1	7(1)	
Magnolia Warbler	2		1(1)	
Yellow-rumped Warbler	2	4(1)		
Ovenbird			3	1
Northern Waterthrush			1	3
Canada Warbler	1		2(1)	
Evening Grosbeak				1
Totals	10	10	26	11

*untreated check block for Treatment Block 82 and 86

**the number in brackets ( ) is the number of recaptures