

THE IMPACT OF FOREST SPRAYING ON POPULATIONS OF SMALL FOREST SONGBIRDS,
SMALL MAMMALS AND HONEY BEES IN THE MENJOU DEPOT AREA OF QUEBEC

1973

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OTTAWA, ONTARIO
INFORMATION REPORT CC-X-84

December 1974

ABSTRACT

Studies of the ecological monitoring team of the Chemical Control Research Institute focused attention to the control operations for spruce budworm, Choristoneura fumiferana (Clem.) in the Menjou Depot Area of Quebec in 1973. The area was treated first with fenitrothion and with Matacil[®] about 10 days later. Bird and mammal populations, subjected to both applications, were not affected by the treatments. Honey bees were subjected only to the Matacil[®] treatment; moderate mortality occurred to the worker force but the hives recovered quickly and no long-term damage ensued.

RÉSUMÉ

En 1973, l'équipe de contrôle écologique de l'Institut de recherche en répression chimique a porté son attention sur la lutte menée contre la tordeuse des bourgeons de l'épinette, Choristoneura fumiferana (Clem.) dans la région du Dépôt Menjou, province de Québec. Cette région a d'abord été traitée avec du fénitrothion, puis, 10 jours plus tard, avec du matacil. Ce traitement n'a pas eu d'effet sur les oiseaux ni sur les mammifères. Quant aux abeilles, elles n'ont été soumises qu'au traitement par matacil; il s'est ensuivi un taux de mortalité modéré chez les ouvrières, mais les ruches se sont rapidement reconstituées et il n'y a eu aucun dommage à long terme.

INTRODUCTION

In 1973, large tracts of spruce budworm infested forest across western Quebec were treated with aerial applications of various chemical insecticides in an attempt to reduce defoliation and mortality to white spruce, Picea glauca (Moench) Voss and balsam fir, Abies balsamea (L.) Mill. The infested forests were treated first with an application of Fenitrothion followed by an application of Matacil[®] 10 days to 2 weeks later.

The Environmental Impact team from the Chemical Control Research Institute monitored the side effects of the second application (Matacil) upon small forest songbird populations, colonies of domestic honey bees Apis mellifera L. and upon the small mammal complex inhabiting a treatment area.

Populations of breeding birds and small mammals were censused using methods similar to those described by Buckner and Turnock (1965) and Buckner et al (1973). Due to difficulty of moving monitoring staff into the area only post spray data is available for birds.

Small mammal populations were censused 4 to 6 weeks after treatment to allow animals present as nestlings at the time of treatment to leave the nest and become available for sampling. Five colonies of domestic honey bees were transferred from the headquarters bee yard and placed in the treatment area just prior to the application of Matacil.

RESULTS

Breeding bird populations were monitored on the treatment (post Matacil treatment) plot and an ecologically similar control plot. Breeding

and foraging territories were well established by treatment time. Small forest songbirds occupy three broad ecological niches, in each of which insecticides have different effects. Upper crown, fringe and open areas fully expose the inhabitants to any application of an insecticide by aircraft. In the mid-crown area of the forest birds may be affected by the insecticide through poisoned foods as well as by direct contact, but for shorter periods of time than the upper crown inhabitants. In the lower crown and forest floor birds come in contact with the insecticide mainly through poisoned insects which fall from the upper and mid crowns to the lower habitat.

Populations of birds in the control and treatment plots were roughly the same with the exception of two species. The bay-breasted warbler Dendroica castanea (Wilson), and the evening grosbeak, Hesperiphona verpertina (Cooper) were recorded in fairly large numbers on the control plot but were found in much lower numbers on the treatment plot (Table I). Both species occupy the most exposed areas and would come in direct contact with the spray cloud. Breeding bay-breasted warblers nest near the ends of branches in the upper crown and appear to have been affected immediately, with some territories being re-established 4 days after treatment. The evening grosbeaks apparently abandoned the treated area and moved to other areas. Bent (1968) describes a report of evening grosbeaks leaving insecticide treated budworm infestations for adjacent areas which were not sprayed.

Small mammal populations were censused approximately 5 weeks after the Matacil treatment. Two lines were established on each plot and were trapped three consecutive nights. A total of 14 mammals were taken in 270 trap nights on the control plot and 7 mammals in 272.5 trap nights on the treatment plot. All mammals were identified and sexed and age and

Table I

Small song bird population census, control and treatment plots Menjou Depot, Quebec

June 12-16, 1973

Family	Species	Treatment Plot				Daily Average	Control Plot					Daily Average
		Number of birds on June					Number of birds on June					
		12th	13th	14th	15th		12th	13th	14th	15th	16th	
Picidae	Yellow-shafted Flicker	0	0	0	0	0	6	0	24	0	0	6
Tyrannidae	Least Flycatcher	0	12	18	12	10	0	12	12	6	6	7
	Olive-sided Flycatcher	0	6	6	0	3	0	0	0	0	0	0
Hirundinidae	Barn Swallow	0	0	6	0	1	0	0	0	0	0	0
Corvidae	Blue Jay	0	0	24	12	9	6	0	6	6	0	4
Sittidae	Red-breasted Nuthatch	0	0	0	0	0	0	0	0	0	6	1
	White-breasted Nuthatch	0	0	0	0	0	0	0	6	0	0	1
Troglodytidae	Winter Wren	0	0	6	0	1	6	12	24	6	6	11
Turdidae	American Robin	0	0	3	0	1	6	0	0	12	6	5
Sylviidae	Swainson's Thrush	0	12	0	12	6	0	15	0	0	0	3
	Wood Thrush	0	0	0	6	1	0	0	0	0	0	0
	Veery	0	12	0	12	6	12	0	24	18	12	13
Sylviidae	Ruby-crowned Kinglet	12	12	6	0	7	0	0	0	12	0	2
Vireonidae	Red-eyed Vireo	6	0	6	12	6	24	6	6	12	0	10
Parulidae	Bay-breasted Warbler	18	60	60	132	67	0	0	6	0	24	6
	Blackburnian Warbler	0	6	6	12	6	6	0	0	0	0	1
	Black and White Warbler	0	12	12	18	10	6	0	0	0	0	1
	Canada Warbler	0	0	12	18	9	0	0	18	18	6	8
	Nashville Warbler	6	24	12	70	28	18	18	12	6	0	10
	Ovenbird	12	6	12	12	10	18	12	6	12	12	12
	Yellow Warbler	6	0	0	0	1	0	0	0	0	0	0
	Yellowthroat	6	12	6	0	6	0	0	0	0	0	0
Fringillidae	White-throated Sparrow	6	18	0	18	10	6	12	42	18	12	17
	Chipping Sparrow	0	0	0	6	1	6	0	12	0	0	4
	Song Sparrow	6	9	6	6	7	0	0	0	0	0	0
	Evening Grosbeak	18	30	39	70	39	0	12	0	0	0	2
	Rose-breasted Grosbeak	0	12	0	0	3	0	0	0	0	0	0
	American Goldfinch	0	0	0	6	1	0	9	0	6	0	3
Unidentified	Species	6	18	0	0	6	12	0	6	6	12	7
Totals		102	267	234	428	257	132	114	210	138	108	140

breeding conditions were recorded. All adult females were dissected to record the presence of embryos and placental scars (evidence of a recent litter) (Table II and III).

The juveniles and sub-adults of a small mammal population are the first groups to be affected by an application of a Chemical insecticide into the environment. A very low population level was encountered in the treatment and control areas but the age and breeding conditions of animals from both plots are similar. The data suggest that the combined fenitrothion and Matacil[®] treatments did not affect adversely populations of small mammals inhabiting the area.

Five colonies of domestic honey bees were placed in the treatment area about 10 days after the fenitrothion spray and just prior to the application of Matacil[®]. All colonies were made up of fresh 3 lb packages of bees with a mated queen. Each hive contained monitoring equipment to measure flight activity of foraging bees, pollen collection and adult bee mortality. Observations were also made on the young brood.

All colonies had been set up and examined on June 9 and the area was sprayed with Matacil[®] at 1330 EDT on June 10. The data collected from the treatment area is compared to the Control Plot in the experimental area in Larose forest near Ottawa, Table IV.

Mortality of foraging bees was observed soon after the spray planes passed over the hives. Counts of bees collected from the dead bee trap attached to the hive entrance were taken three hours after the spray planes passed over the area (16:30 EDT) and between 12:00 and 13:00 daily until June 16, Table V. Destruction of two of the colonies by black bears prompted the removal of all equipment to the headquarters bee yard on June 17.

Table II

Age and Breeding Condition of Small Mammals on Treatment and Control Plots

Menjou Depot Area, Quebec
July, 1973

Plot No.	Males				Females						
	Adult	Sub Adults	Juv.	Total Males	Adults			Sub Adults	Juv.	Total Females	Total Adult Animals
					Pregnant	Pregnant With Scars	Placental Scars Only				
Spray Plot Line 1	1	0	1	2	0	0	0	0	2	2	4
Spray Plot Line 2	2	0	0	2	0	0	1	0	0	1	3
Control Line 1	3	0	0	3	2	0	2	0	0	4	7
Control Line 2	3	1	2	6	0	0	1	0	0	1	7

TABLE IV

Measurements of honey bee colonies located on
 a Matacil[®] treatment and control plot
 (average of 5 colonies placed in each area)

Date	Control			Matacil Treatment		
	Adult Bee mortality	Adult activity (trips/day)	Pollen collected (gms)	Adult bee mortality	Adult activity	Pollen collected (gms)
June 9	3	72586	13.6	0	97648	16.8
June 10	1	115968	18.4	3	34038	19.8
June 11	4	40704	3.8	505	55040	1.2
June 12	3	79588	31.0	46	77314	9.6
June 13	1	82560	32.7	1	97048	33.9
June 14	3	80104	35.4	5	33152	10.2

The highest mortality occurred within the first 3 hours and after 24 hours started to decline rapidly until it reached the prespray norm after 72 hours. Heavy rains occurred on the night of June 11-12th and this is reflected in the one-day decrease in pollen collection on the Control Plot while the treatment plot pollen collections did not return to normal for 72 hours. Activity of hives on the Control Plot declined on June 11, no doubt reflecting adverse weather for at least part of the day, but activity on the treatment plot increased slightly. This increased activity is attributed to removal from the hive of the large number of dead bees killed by the treatment rather than foraging activities. Observations of the young brood within the hive did not reveal any mortality.

The data obtained from the treatment plot shows an almost immediate impact upon the foraging component of the colonies. Mortality started to decline within 24 hours and returned to normal after 72. Very little pollen was collected in the 48 hours after treatment sparing the young brood contact with insecticide when it was at the highest concentration. All hives suffered initial impact but returned to normal very quickly.

CONCLUSIONS

The application of fenitrothion followed about 10 days later with an application of Matacil ^(R) caused some mortality amongst those species inhabiting and foraging in exposed habitat.

Bay-breasted warblers were sharply reduced and data suggest that evening grosbeaks abandoned the treatment area to forage in locations containing higher insect populations. Small mammal populations were too low to effectively measure the impact of these treatments but the data suggests that there was no effect on this component of the environment. Colonies of domestic honey bees were adversely affected immediately after the treatment but returned to normal after 72 hours. Brood was not affected and each colony was back to normal strength within two weeks.

ACKNOWLEDGEMENTS

The authors wish to thank Y. Payette, J. Umpherson and R. Lough who assisted in the collection of field data.

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