Bird responses to forest sprays in New Brunswick, 1974

P.A. Pearce
Canadian Wildlife Service
Fredericton, N.B.

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Introduction

An investigation was undertaken in northeastern New Brunswick in 1974 by N. Garrity for the Canadian Wildlife Service to assess the influence of forest spraying on resident birds. Where possible, his field activities were integrated with those of the Chemical Control Research Institute so as to benefit from the advantages of pooled resources and to permit a comparison of different appraisal techniques. The study was conducted in areas which were sprayed once with fenitrothion in larviciding operations and which were subsequently re-sprayed twice with phosphamidon during a large-scale budworm adulticiding program.

This report in part briefly reviews the salient features and conclusions of that study and also attempts to set it in a broader context by presenting other information of relevance.

Bird mortality from natural causes

Because it took place at a time when fenitrothion larviciding operations against spruce budworm were in full swing in New Brunswick, a natural event which caused considerable bird mortality deserves some comment.

It was unseasonably cold in the province throughout much of May, light falls of snow being reported three times. Average temperatures were four to ten degrees below normal during the third week and up to 14 degrees below normal in the last week of the month. Seasonable conditions prevailed from early June onward. The prolonged cold weather deprived many birds of their natural food sources at a time when their migratory flights had left them without body fat reserves, and resulted in grounding and a subsequent major die off. Under those conditions, increased vulnerability to predation

undoubtedly was a contributing mortality factor. The phenomenon was widespread, being noteworthy throughout much of New England and the Maritime Provinces. The event went unnoticed in northern New Brunswick, perhaps because the major migratory thrust had not then penetrated that far. It is not possible to estimate total mortality, although "hundreds of thousands" of casualties were reported from Maine. Casualties were reported from many southern localities in New Brunswick, from the middle of May through to the end of the month. Of those specimens examined, all of which were emaciated, most were insectivorous birds such as swallows, flycatchers and warblers. Omnivorous and granivorous species appeared to be relatively little affected. About three dozen species representing ten families were identified.

Forest spraying began on May 18 in the early phenological zones, and by the end of that month one quarter of the total provincial larviciding program had been completed. The early spraying took place precisely in the region where forest birds were under the severest stress from inclement weather. In that region, however, treatment blocks were widely scattered and in relatively small aggregations. In such fairly restricted areas, insecticide application may possibly have compounded the problem of bird starvation and lessened the likelihood of survival. The matter may be clarified after examination of the presently-unavailable results of analysis for residual fenitrothion in representative bird carcasses recovered from some of those areas.

Monitoring program

Bird census transects were established in three spray blocks, 197, 195 and 193 (Figure 3) near Newcastle which were sprayed in early June by TBM

aircraft with fenitrothion at 3 oz/acre. A control route was set up in a nearby zone which remained unsprayed. All four areas were subsequently sprayed twice with phosphamidon at 1 oz/acre in mid-July. At that time, as a result of block re-designation, routes 197 and 195 were in block 12 and routes 193 and control were in block 13. Phosphamidon was applied by TBM rather than by DC-6, as had been hoped.

Bird censuses were made almost daily from late May to late July. Indices to species abundance, based largely on counts of singing males, were derived in a manner previously explained at this forum. Fourteen captive birds were exposed in phosphamidon-treated zones, and breeding success was determined by following activity at thirteen nests. Population indices are shown in Figure 1. Warblers constituted the largest avifaunal component in the areas studied: total numbers noted along each transect are given in Figure 2.

(a) Fenitrothion larviciding

Block 193 was sprayed on June 5, and blocks 197 and 195 on June 7. At that time, because of the preceding cold weather, most locally breeding birds had just established on territory. However, it was felt that an adequate pre-spray population "fix" was obtained. Census data did not indicate any depression of local bird populations that could be attributed to exposure to fenitrothion, day-to-day apparent fluctuations being related to the influence of wind and other factors on bird activity. Three birds - a Tennessee, a Magnolia, and a Bay-breasted Warbler - exhibited typical symptoms of organophosphate poisoning. Those individuals were sacrificed and are currently being analysed.

One report came to hand concerning avian mortality in a fenitrothion spray zone elsewhere.. That was at Breau Creek, near Sackville, in a locality precisely on the border between two contiguous spray blocks both of which were sprayed on the same morning by the same team of spray aircraft. A "considerable" number of dead and dying birds were found, a few of which were obtained for chemical analysis. It seems most probable that they were victims of an overspray.

In Appendix 1 are shown some representative levels of residual fenitrothion which proved lethal to some birds and which caused no observable effects in others. Samples were taken in 1970-73.

(b) Phosphamidon larviciding

Extensive tracts of forest in northern and northwestern New Brunswick were sprayed with phosphamidon at a dosage of 2 oz/acre during budworm larviciding operations. No monitoring activities were conducted there by CWS but several isolated reports came to hand, mostly from field staff of the New Brunswick Department of Natural Resources, concerning the finding of dead birds during mid-June. Those reports were received too late after the event for on-the-spot investigations to have been very fruitful. Apparently "hundreds" of carcasses were found along the Benjamin River and small numbers of dead and dying birds were noted in the vicinity of the Jacquet and Serpentine Rivers and at Riley Brook. Another report of bird deaths from the watershed of the Southeast Upsalquitch River may have been at or near the crash site of a spray aircraft. A later examination of spray schedules suggested quite strongly that those events were related to spraying activity. If errors in formulation can be discounted, it seems likely that oversprays may have been the causal factor.

(c) Phosphamidon adulticiding

Censusing was continued throughout the summer in spray blocks 197, 195, 193 and in the control area, subsequently re-designated, respectively as blocks 12, 12, 13 and 13. By mid-July singing activity by birds had begun to decline noticeably, as reflected in Figures 1 and 2. Two applications of phosphamidon were made - at an interval of seven days in block 12, and at an interval of four days in block 13. Census data, of the kind admittedly of limited value at that time of year, indicated no untoward effects. Thorough post-spray searches revealed no obvious casualties. All but one of 14 captive adult birds (Evening Grosbeaks, Purple Finches, Brown-headed Cowbird), exposed to the sprays in block 13, survived without displaying symptoms of poisoning and were released a week later. Of thirteen nests located only a few were active at the time of spraying. They were mostly of ground-nesting Swainson's Thrushes and White-throated Sparrows, whose breeding success did not appear to be jeopardized by the sprays. That little evidence notwithstanding, a major initial objective of the study - to determine the influence of phosphamidon on nestling and fledgeling survival - was for various reasons most inadequately met. Possibly very young birds would come into less contact with contaminated surfaces than adults, being less mobile. It remains undetermined whether they would be seriously vulnerable to secondary poisoning through ingestion of contaminated food.

Other activities

Monitoring of DDT levels in breast muscle of woodcock has continued in New Brunswick. Concentrations of that chemical in fall-shot birds from two areas with similar spray histories are shown for general interest in Appendix 2. A gradual decline of contamination is indicated, the apparent

reversal of the trend in the Bettsburg samples in 1973 being attributed to one or two extremely "hot" birds. In order that those levels of contamination may be appraised in a wider context a five-year program, terminating in 1975, is being conducted to determine DDT concentration in the wings of woodcock from New Brunswick and from other parts of that species' range in Canada.

Conclusions

In light of the findings reported here and of previous experience with the two chemicals involved, emphasis being on identification of acute effects, the following tentative conclusions are drawn:

(a) birds of the New Brunswick forest suffered more from the elements in 1974 than from man in his attempts to protect that forest against other natural hazards;

(b) no widespread avian mortality is attributable to the influence of applied insecticides;

(c) fenitrothion approaches a threshold level toxic to birds when applied at 3 oz/acre;

(d) phosphamidon is near a threshold level toxic to birds when sprayed at 2 oz/acre;

(e) when those operational dosages of fenitrothion and phosphamidon are significantly, however inadvertently, exceeded, as in the case of oversprays, lethal effects are more readily discernible;

(f) summer applications of phosphamidon at 1 oz/acre are not toxic to adult birds, the influence on young birds not being adequately assessed.

Figure 1. Bar chart showing total birds noted per minute along census lines in spray zones.

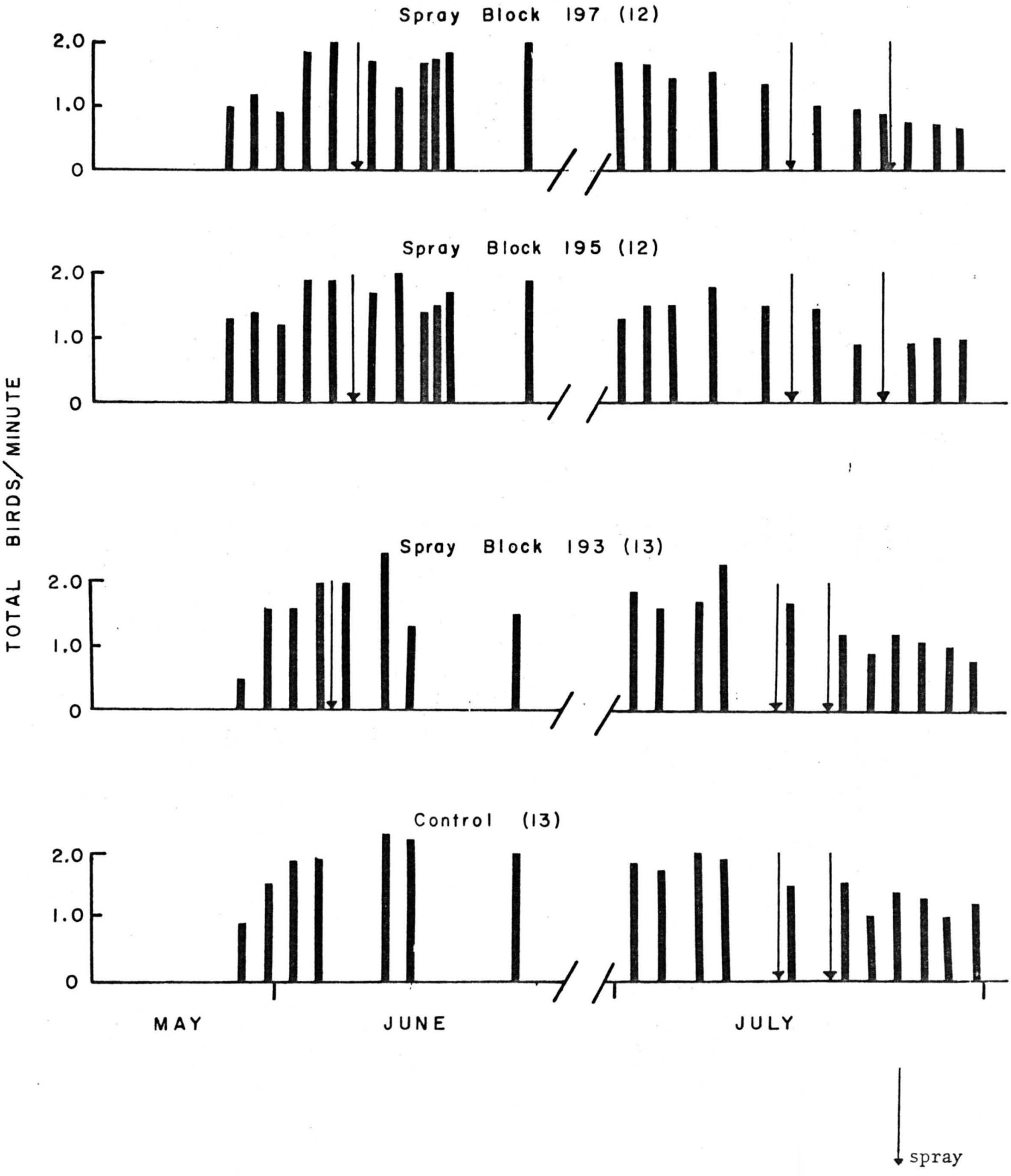


Figure 2. Bar chart showing number of warblers noted along census lines in spray zones.

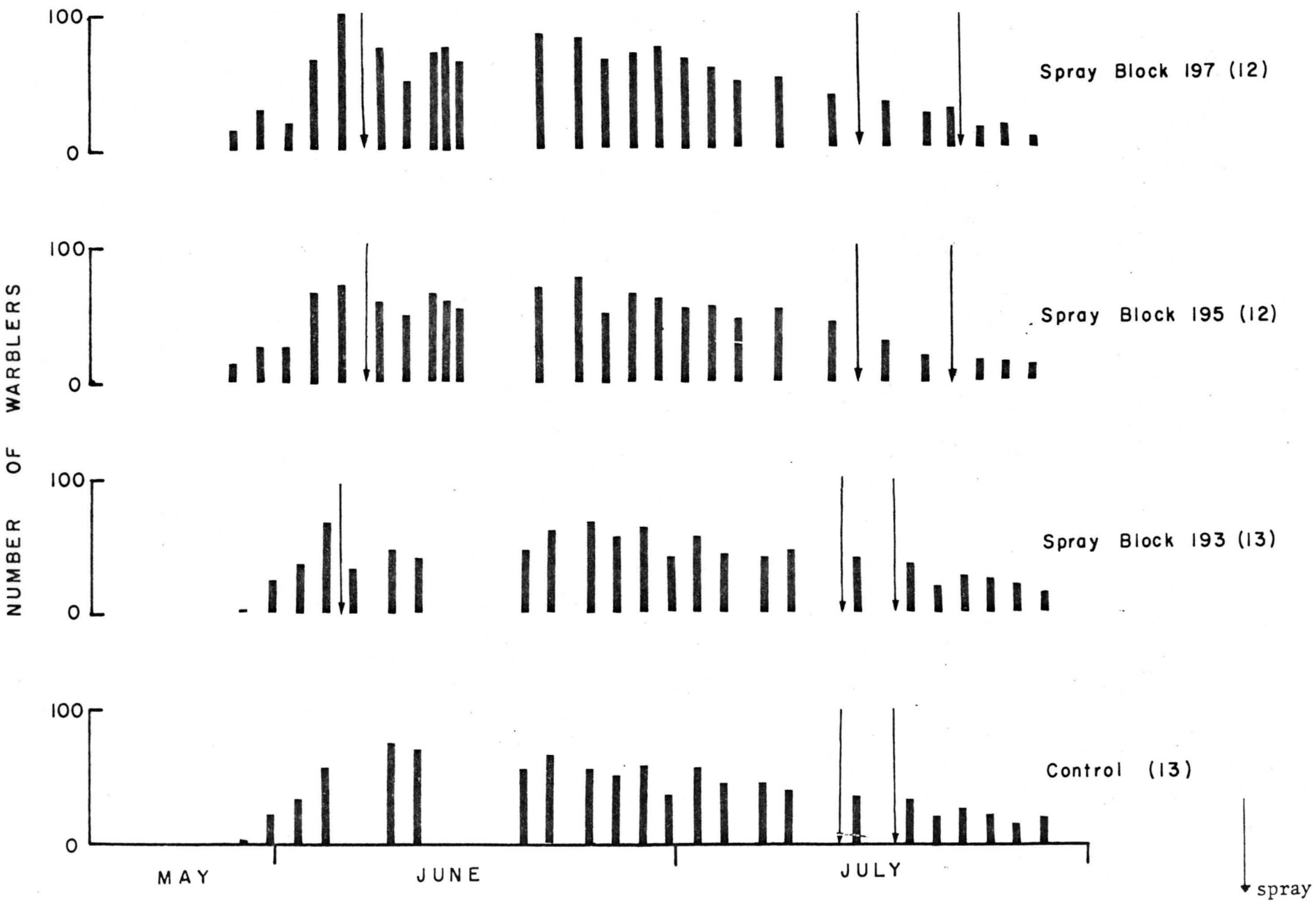
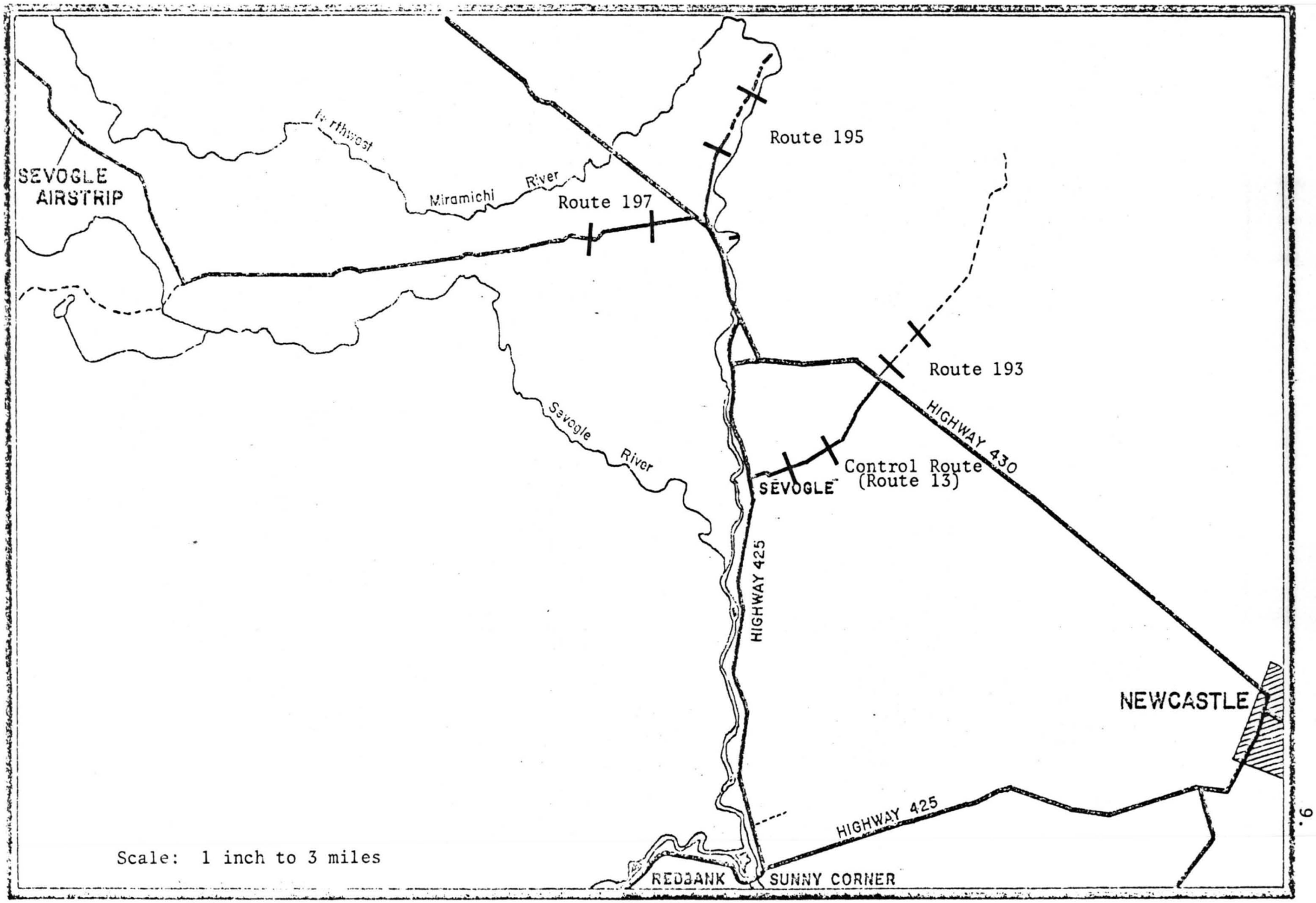


Figure 3. Location of Fenitrothion and Phosphamidon Census Routes.



Appendix 1. Fenitrothion levels in representative samples of forest birds exposed to operational spraying.

Species	Fenitrothion (ppm fresh weight - whole body less head)
Magnolia Warbler *	1.98
" " *	2.07
" " *	3.48
Blackburnian Warbler *	2.31
" " *	4.42
" " *	5.22
American Redstart *	1.11
" " *	1.48
" " *	2.54
Bay-breasted Warbler **	0.047
" " **	0.150
" " **	0.192
White-throated Sparrow **	0.028
" " **	0.033
" " **	0.183

* birds found dead in spray zone

** apparently normally-behaving birds in spray zone

Appendix 2. DDT levels in breast muscle of New Brunswick woodcock.

Year	Number of analyses	Number of birds	Total DDT* (ppm lipid weight)
		Bettsburg	
1970	14	45	75
1971	21	80	58
1972	3	22	40
1973	7	18	74
		Zionville	
1970	8	8	72
1971	5	34	50
1972	4	21	40
1973	5	10	37

* Weighted arithmetic mean