

An assessment of the effects on forest birds of
fenitrothion, phosphamidon and matacil as applied
in northern New Brunswick in 1975.

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The forests of New Brunswick have long been a host for the spruce budworm (Choristoneura fumiferana), which poses a serious threat to fir (Aibes balsamea), red spruce (Picea rubens) and white spruce (Picea gluca) trees throughout the province. An area in the north of the province in which the trees were in great danger of survival as a result of past and future infestations, was designated by Forest Protection Limited, (FPL) to be aerially sprayed by two applications of matacil separated by an application of fenitrothion. A second area of timber, Block A, owned by J. D. Irving Limited, was scheduled to receive the standard FPL single applications of fenitrothion and phosphamidon as well as an application of fenitrothion by Irving. The Canadian Wildlife Service, concerned not only about the possible chemical effect on the avian population resulting from each individual application but also about the possibility of a synergistic effect, undertook a study of both areas to determine the possible resulting effects. This paper reports on the findings of that study.

Study Area

Three study areas were chosen in the northern part of Victoria County, New Brunswick in which census routes were marked. The first route was within Irving's Block A spray zone which was also to be sprayed by FPL. The route ran part way through FPL's Blocks 635 and 636 along a power line south of Highway 17 commencing 0.1 mile west of the point where the power lines cross Highway 17, 8 miles west of the St. Quentin town limits. The route was approximately 120 chains (1.5 miles) of which approximately 30 chains were contained in the western end of Block 635. The habitat was predominantly mixed forest of spruce and maple (Acer sp) except for the last 40 chains which were almost completely hardwoods.

Searching for sick or dead birds was usually done for at least two days following a spray. An effort was made to make as much noise as possible to flush sick birds from areas where they had secreted themselves. Sick birds which were captured were sacrificed, labelled, placed in whirl packs, or in the case of larger birds, plastic bags and frozen. Dead birds were handled in a similar manner. In one instance, the stomach contents of a bird was examined and then frozen in a whirl pack labelled with the same number as the host.

It is important to note that FPL assigned different prefixes to their block numbers for each chemical applied and that method will be maintained in this report. In the cases of Blocks 635, 636, and 637, the numbers were changed following the fenitrothion application to 1335, 1336 and 1337 for the phosphamidon application. Block 626 was changed to 1326 and 1426 following the first matacil application for the fenitrothion and second matacil applications respectively. Due to the number of areas under study, it was not possible to set up a control route.

Discussion

Of the three areas under study, Route 637 was the first to receive an application when on the morning of June 3, Irving applied fenitrothion at a dosage of 4 ounces per acre to his Blocks 63, 64, 110 and 111 which comprised the area which FPL had designated as Block 637. Five pre spray censuses were conducted on May 25, May 26, May 29, May 31, and June 2 prior to the application.

Three post spray censuses were done on June 4, June 5, and June 6 and examination of Table 1 indicates that following the application, a considerable number of stable birds were not observed except within the 0-20 chain segment, in any of the post spray censuses.

It is worth noting at this point that the loss of stable birds following a chemical application may or may not have any connection with a chemical application but must be interpreted under the conditions under which the study was done and by incorporating other significant data or findings where possible.

However, the possibility of an effect occurring on Route 637 is supported by the number of birds recorded on each of the pre and post spray censuses along each of the 20 chain segments of the route. Examination of Tables 7 and 8 shows that the total number of birds recorded on the post spray censuses, two of which were recorded under very good conditions, are equal only to the number of birds recorded under poor conditions of precipitation and high winds during the pre spray censuses. Only the first 20 chains of the route appear to have maintained the number of birds recorded prior to the application which is similar to the situation suggested in Table 1. Tables 7 and 8 also indicate that the total number of birds recorded in the 20-60 chain segment did not drop significantly but strongly suggests that a considerable chemical effect to the avian population did occur in the 60-120 chain half of the route.

Diligent searching following the spray resulted in a number of observations and collections of birds believed to have been effected by chemical poisoning. Only those birds collected will be discussed in this report. A total of five sick birds consisting of two White throated Sparrows (Zonotrichia albicollis), two Chipping Sparrows (Spizella passerina passerina), and a Dark Eyed Junco (Junco hyemalis), were sacrificed and collected. Also found were seven dead birds consisting of a Chipping Sparrow, a White Throated Sparrow, a Dark Eyed Junco, a Lincoln's Sparrow (Melospiza lincolni lincolni), a Pine Siskin (Spinus pinus pinus), and a Woodcock (Philohela minor). A glance at Figure 2 reinforces the suspicion that most of the effect of the chemical

was experienced between the 20-120 chain mark as only one casualty was found within the first 20 chains. Oddly enough, four casualties were collected between the 40 and 60 chain mark, an area in which the figures in Table 8 belie the obviously serious effect.

A complete list of all casualties collected during the entire project may be found on Table 20. Also listed is the field number assigned to each individual as well as the date of collection, location, and condition of the bird at the time of collection. If further information is required regarding the behaviour of the birds at the time of collection, it may be obtained by referring to my field notebook.

Inclement weather prevailed on June 6 and June 7 and Route 626 was censused on June 9 resulting in the absence of a recent pre spray census on Route 637 prior to FPL's 2.5 ounce per acre fenitrothion application on the morning of June 10. Consequently, the data obtained from the Irving post spray fenitrothion censuses were used as the FPL pre spray fenitrothion data.

Six post spray censuses were conducted on June 11, June 14, June 15, June 16, June 17 and June 18. A glance at Table 2 indicates that a number of the stable birds from the pre spray censuses were not recorded during any of the six post spray censuses. As was the case following the Irving fenitrothion application, the 0-20 chain segment retained a greater percentage of its original number of stable birds than did the remaining segments. The figures in Tables 9 and 10 add credence to that statement and also indicate that the number of birds recorded in each segment during the first four post spray censuses was generally lower than in the pre spray censuses and subsequently, the total for each post spray census was lower. However, only the first of

the first post spray censuses was done under excellent conditions as the remaining three were conducted under very poor conditions of high winds and cloudy skies. The last two of the six post spray censuses were done under good conditions and a rise in the total number of birds was recorded.

Many new birds, not observed in the pre spray censuses were recorded in the post spray censuses (as the number of stable birds recorded in Table 3 indicates) which suggests a recovery in the population following the second fenitrothion application. Diligent searching failed to result in a single observation of chemical poisoning following the FPL application which suggests that very little effect - if any at all - on the avian population was experienced and that the drop in numbers of birds as indicated by Tables 2 and 10 may have been largely a result of the weather rather than anything chemical in nature.

Due to the ambitious spraying program prepared by FPL and a considerable amount of poor weather in June which forced the spray planes to remain on the ground, an agreement was reached between FPL and Irving which resulted in Irving assisting in the spraying of the phosphamidon blocks. According to the agreement, Irving was to spray only specified blocks within his Block A zone following the boundaries as they appeared on FPL's pointer maps. The phosphamidon was to be supplied by FPL and applied at the prescribed dosage of 2.5 ounces per acre.

The post spray censuses following the FPL fenitrothion application was also used as the pre spray phosphamidon censuses. Necessary censusing of Route 1326 resulted in the last pre spray phosphamidon census being done three days prior to the 2.5 ounce per acre phosphamidon application on the morning of June 21.

Four post spray phosphamidon censuses were conducted on June 22, June 23, June 24 and June 25 under conditions ranging from fair to excellent. Examination of Table 3 indicates that following the phosphamidon application, nearly all the stable birds were never recorded again. As was the case with the two previous applications, the 0-20 chain segment continued to exhibit the highest number of stable birds after the spray but nearly two-thirds were missing. Table 3 suggests that a serious effect was manifest in the 20-120 chain area and examination of Tables 11 and 12 adds support to that as the numbers of birds recorded in each segment of each post spray census were below those recorded in the pre spray censuses, particularly in the 60-120 chain area.

Diligent searching for sick and dead birds following the application added testimony to the magnitude of the effect in the 60-120 chain segment. Of the seventeen casualties collected after the spray of which five were dead, fourteen were within the 60-120 chain area as Figure 2 indicates. The three found in the first half of the route near the 37 chain mark were three nestlings which I suspect died of starvation resulting from the death of their parents.

It is of interest to note that as well as the species such as White Throated Sparrows, Dark Eyed Juncos which were collected after the Irving fenitrothion application, an Eastern Kingbird (Tyrannus tyrannus), was also found sick as well as four Robins (Turdus migratorius) which suggests that a serious effect must have occurred to result in birds of that size being unable to fly and in the case of the Kingbird and two of the Robins, unable to hop.

The second area under study within Irving's Block A zone was Route 635/636 which was situated in two of FPL's spray blocks. The western end,

approximately from the 0-40 chain mark was in Block 635 and the 40-120 chain area was in Block 636. The purpose in setting up the route in such a manner was an attempt to study the "boundary effect". To be more specific, it was a means of attempting to determine if a chemical effect on the avian population resulting from an overspray occurred on the common boundary of both blocks if they were both sprayed on the same day.

The strip census method was used on Route 635/636 on which five pre spray censuses were conducted on May 25, May 26, May 29, May 31, and June 2 before the route was sprayed with fenitrothion at a dosage of 4 ounces per acre on the afternoon of June 3. Both blocks were contained within the area of Irving's Block 71.

Three post spray censuses on consecutive days of June 4, June 5, and June 6 resulted in data being collected which gave no indication that an effect had occurred. In fact, examination of Table 19 shows that the highest number of songs per minute recorded to date was recorded on June 4, the day following the application. However, it should be noted that that census was conducted under excellent conditions.

In view of the casualties found on Route 637 following Irving's fenitrothion application, it is somewhat surprising that no chemically effected birds were observed while searching Route 635/636. It should be mentioned however, that searching on Route 635/636 was not done in the conscientious manner as it was on Block 637 because all three blocks were sprayed the same day and more time was devoted to searching Route 637 where it was obvious an effect had occurred. However, in many cases, I have observed sick or dead birds while censusing a route and in no instance did I observe a bird effected chemically to any degree on Route 635/636 although it was not as good an area for searching as Route 637 as it was along a power line and the habitat was one of shrubs, young trees, raspberry bushes (Rubus sp.)

and grass.

One reason for the lack of casualties may have been that the first half of the route may not have received as heavy a coverage as did Route 637 for one reason or another which will be discussed later, or that as may have occurred on the last half of the route, no coverage at all. That is purely speculation on my part but the last half of the route was almost completely hardwood and somewhere within the Irving organization, a decision may have been made not to spray that particular area at all even though it was to my knowledge, within Irving's Block 71 as an area to be sprayed.

The FPL fenitrothion application at 2.5 ounces per acre was applied to Route 635/636 over a 24 hour period as Block 636 was sprayed on the morning of June 10 and Block 635 on the morning of June 11. Consequently, any attempt to study the boundary effect on this route was again, lost.

Examination of Table 19 indicates that the post spray censuses of June 10, June 11, June 15, June 16, June 17 and June 18 did not show that any apparent effect occurred following the application. The number of songs per minute recorded on the morning of June 11 was approximately one song per minute below what had been recorded on all previous censuses with the exception of May 31. However, examination of the census sheets for June 11 revealed that the song counts were also down in that part of the route occurring in Block 635 which was not sprayed until the following morning, thereby ruling out the application as a cause for the small drop in number. It is unlikely that my walking pace would have been quickened for some reason in the Block 635 section of the route which might explain the drop in song counts in that section as the time recorded for the complete route on that day was the longest recorded for any of the remaining censuses.

Searching was done for two days following the application on Block 636 and one day following the application to Block 635. At no time on either block was evidence of a chemical effect observed.

As was previously mentioned, FPL and Irving reached an agreement whereby Irving would aid in the application of the phosphamidon. Once again, the boundary effect study was not possible as Irving sprayed Block 1336 on the morning of June 21 and FPL sprayed Block 1335 on the morning of June 22.

Four post spray censuses were done on the mornings of June 22, June 23, June 24, and June 25. Table 19 indicates that no serious effect occurred but a very minor effect may have been the reason for the drop in the number of songs per minute recorded on June 22, June 23, and June 24. compared to the four previous censuses with the exception of the one recorded on June 16 under windy conditions. It is difficult to evaluate a small statistical drop such as that near the end of June as the song counts drop off as avian vocal behaviour declines. The data recorded on the morning of June 25 (see Table 19) suggests that a recovery from any small effect which may have occurred had resulted but it must be remembered that that census was done under excellent conditions.

Searching for sick or dead birds along the census route did not yield any results but casualties were found in other areas of both blocks. A Dark Eyed Junco was located along Highway 17 within Block 1335. However, it is possible that it was a road kill although it did not exhibit any previous injuries. A Parula Warbler (Parula americana), was also found along Highway 17 near the 0 chain mark of the census route. It did not appear to be a road kill and is not a species that would likely be a victim

of a road kill by virtue of its habitat preference. Found on a private Irving road in Block 1336 was a Tennessee Warbler (Vermivora peregrina). However, its condition was such that it appeared to have been dead prior to the application and was likely a victim of a road kill or a previous application. A sick Robin was sacrificed and collected on the same road and also seen was a sick unidentified species which evaded capture.

On the morning of June 21, I encountered Brian Wilson, a pointer for FPL, at the Boston Brook airstrip. As he was not working out of Boston Brook, I inquired about his reason for being there. He informed me that he had just completed at FPL's request, an observation of an Irving spray team as it applied phosphamidon to FPL's Block 1339 as part of an agreement between the two organizations.

The observation was done from an FPL pointer plane which was flown above the Irving spray planes and from which Wilson had marked the spray planes' flight patterns on an FPL 1:50,000 pointer map. He also monitored the conversations between the spray planes by switching to their radio frequency.

Wilson was not impressed with the procedures used by the Irving team. From the radio conversations he learned that at times, the spray planes had lost sight of the pointer plane and that at the start of the block, the boom pressure was 38 lbs. which was reduced to 30 lbs after most of the load had been released. He suggested that this was done to stall for time before returning to reload. He observed that booms were on at all times which included passes over rivers and swamps as well as on turns. At least on one occasion, he reported that the flight pattern was poor as the Number 1 plane was too close to the Number 2 plane.

Wilson reported that two loads were sprayed by the Irving team over Block 1339 and that he had difficulty in determining which block a third load was sprayed in although he did notice that one plane circled around Irving's Black Brook depot three times with booms on. He also reported that the Irving team tended to fly over some areas on more than one occasion and completely avoided others. From examining the map he gave me on which he marked the flight patterns, it was evident that the team had ignored the areas of high elevation which would be largely hardwood and that the low flying areas which would be predominantly spruce and fir, were sprayed on more than one occasion. An attempt to search the area of Block 1339 which was heavily sprayed was unsuccessful as the area was inaccessible.

Wilson's observations suggest that the speculation on my part of Irving not spraying the last half of Route 635/636 which was mostly hardwood, may have been correct. They also suggest that casualties in an Irving sprayed area may in some instances, not be a matter of the dosage applied but the manner in which it was applied.

It should be mentioned at this point that no communications existed between the FPL and Irving spraying operations which could have developed into a situation with serious detrimental effects to the environment. For example, the possibility existed that both FPL and Irving could have applied fenitrothion at dosages of 2.5 and 4 ounces per acre to the same block on the same morning. This would have been followed 7 days later by a 2.5 ounce per acre application of phosphamidon which would have resulted in a total of 9 ounces per acre of insecticide having been applied to one block within a 7 day period.

The final area under study was Block 626 which was outside of Irving's Block A zone and designated to receive two applications of matacil separated by an application of fenitrothion. Unfortunately, that area did not receive the attention it should have been given in terms of censuses being taken as I felt that the situations which evolved out of the other two areas under study required more of my time with the result that with all three applications, a gap of at least six days transpired between the last pre spray census and the first post spray census. Another problem encountered was that in two of the three applications, a total of at least eighteen days expired between the first pre spray census and the last post spray census. The problem with a situation such as that is it is difficult to accurately determine the pre spray population immediately prior to the application much less compare it to the resulting post spray population. Changes in the population over a time period of eighteen days may result from factors other than a chemical one which presents difficulty in determining if a chemical effect actually occurred.

Five pre spray censuses were conducted on May 30, June 1, June 3, June 9 and June 10 before the first application of matacil at a dosage of $\frac{3}{4}$ of an ounce per acre was applied on the evening of June 10.

Unfortunately, after the first post spray census was conducted on June 12, seven days elapsed before three others were done on June 19, June 20, and June 21. Examination of Table 4 indicates that the loss of stable birds in each segment of the route following the application was very high. However, consideration must be given to the fact that a total of twenty-two days elapsed between the first pre spray census and the last post spray census. A glance at Tables 13 and 14 indicate that despite the fact that many stable

birds were missing, the total number of birds on the post spray censuses, considering the conditions under which they were done, were not out of line with the pre spray censuses. Particularly important, are the good results achieved on June 12 (see Table 14), probably the most meaningful of the post spray censuses. If an effect of the magnitude suggested by Table 4 had occurred, it would be highly unlikely that the avian population of the area would have been able to produce the post spray numbers of birds which were recorded.

Searching on Route 626 was done on June 11 and June 12 but did not result in the observation of any bird showing signs of any degree of chemical poisoning.

Eight days after the matacil application, the fenitrothion application at a dosage of 2.5 ounces per acre was applied to Block 1326 on the morning of June 18. As only one census conducted on June 12, was done in the route during the eight day interval, it was necessary to combine the last three pre spray matacil censuses of June 3, June 9 and June 10 with the June 12 census to determine the status of the pre spray fenitrothion avian population.

Three post spray censuses were done on June 19, June 20 and June 21 which again presents the situation of trying to evaluate any chemical effect which may have occurred in a particular population where a considerable period of time, in this case eighteen days, has elapsed between the first pre spray census and the final post spray census. Compounding the problem is the fact that the last pre spray census was conducted six days before the chemical was applied. In an attempt to reduce the number of variables which may effect a population, census sheets were examined so

that birds recorded on at least two of the final three censuses were identified. Those birds have been recorded in the total number of stable birds in Table 5 but their numerical status in each segment of the route had been presented in a bracketed form.

Examination of Table 5 indicates that a large portion of stable birds were missing following the application. It is interesting to note that 58% of the birds not appearing on two of the final three censuses were missing compared to 40% of those found on two of the final three censuses. However, a glance at Table 16 indicates that two of the three post spray censuses were conducted under windy conditions which may have been a factor in the failure to record a higher total of stable birds following the application. The final post spray census on June 21 was done under excellent conditions and the total number of birds recorded compares favourably with the pre spray census results as Tables 15 and 16 indicate. Again, if an effect as serious as is suggested by Table 5 had occurred, it is unlikely that such a high number of birds would have been recorded on June 21 or on either of the two previous censuses.

Searching for two days after the application also suggests no effect occurred as at no time was any bird suspected of suffering from chemical poisoning observed.

The second matacil application to Block 1426 was applied on the morning of June 26. Unfortunately, no censuses were conducted on that block between the last post spray fenitrothion census on June 21 and the matacil application. As a result, the three post spray fenitrothion censuses were the source of the pre spray matacil data which resulted in the last "pre spray" census having been conducted 5 days before the application.

Three post spray censuses were conducted on June 27, June 28 and June 29, all under excellent conditions. Examination of Table 6 indicates

that many of the stable birds were not recorded during the post spray censuses. A slight drop in the total number of birds was experienced following the application as can be seen from examining Tables 17 and 18 despite the fact that more favourable conditions prevailed during the pre spray censuses. However, a factor which must be considered when evaluating a possible chemical effect at that time in June is that the avian vocal behaviour begins to drop off rapidly. Searching for two days following the application did not result in the observation of any birds exhibiting characteristics of chemical poisoning which suggests that the drop in the total numbers of birds recorded in the post spray censuses was due to seasonal factors rather than a chemical influence. Consequently, the loss of stable birds recorded after the application was probably a result of factors other than anything chemical in nature.

Conclusions

Problems encountered during the study indicate that the censusing of two blocks at one time in an attempt to study the boundary effect should not be undertaken unless assurance is given by the organization responsible for the spray program that both blocks will be sprayed within several hours of each other. If that assurance cannot be given, then the census route should be restricted to one block to avoid having to contend with having part of the route sprayed on one day and the remaining section done at some other time which brings variables such as time and weather into the evaluation of the results.

It was evident that the mapping method of censusing should ideally be limited to situations in which 4 or 5 pre and post spray censuses can be conducted within 9 or 10 days. Long periods of time between the first pre

spray census and last post spray census or gaps of 6 or 7 days between two pre or post spray censuses can result in changes within the avian population resulting from natural causes rather than chemical causes which makes evaluation of a possible chemical effect difficult.

Results obtained from the census data as well as the observation of sick and dead birds following the Irving application of fenitrothion to Route 637 indicate that a serious chemical effect occurred and that subsequently, under the conditions of application during the study, a 4 ounce per acre application of fenitrothion has a deleterious effect on the song bird population.

Route 637 received the FPL fenitrothion application at 2.5 ounces per acre seven days after the Irving application. Unfortunately, the final pre spray census occurred eight days prior to the application and consequently, the status of the population immediately prior to the application was not evaluated. However, as the first post spray census on June 11, the day following the date of the application was done under excellent conditions yet produced a lower total number of birds than what I expected, I suggest that a very minor effect may have been experienced by the avian population. Diligent searching on June 10 and June 11 failed to result in the observation of any bird exhibiting signs of chemical poisoning which supports the suggestion that if an effect occurred, it was a very minor one. Therefore, under the conditions of application during the study it may be said that an application of fenitrothion at a dosage of 2.5 ounces per acre may possibly produce a minor chemical effect on the avian population.

The final application to Block 1337, phosphamidon at 2.5 ounces per acre, was applied on June 21, eleven days after the second fenitrothion application. Results obtained from the census data and searching indicate

that under the conditions of application during the study, an application of phosphamidon at 2.5 ounces per acre has a serious injurious effect on the songbird population. As no casualties were found following the second fenitrothion application, I suggest that the effect following the phosphamidon application was a result only of that particular application and not as a result of a synergistic effect.

As a result of Wilson's observations of Irving's spraying procedures, it is obvious that Irving does not always attempt to spray the blocks in an organized manner. Consequently, it is not definitely known if the problems reported on Block 637 (1337) were a result of the dosages applied, the manner in which the micronairs expel the insecticide, the disorganized flight patterns of the planes or a combination of any of those factors.

Results from the pre and post spray Irving applied fenitrothion censuses for Route 635/636 indicate that no evidence of a chemical effect manifested itself after June 3, the date on which these blocks were sprayed. Considering the results which occurred and Wilson's observations of Irving's spraying operations, I suggest that the area in which the route was located, particularly the last half of the route which was almost completely hardwoods, may not have received application. If such were the case, then the results were of no value in the evaluation of fenitrothion at 4 ounces per acre on the avian population.

Problems such as that would be minimized if sufficient pressure could be applied to the Irving organization to present pointer reports showing the outline of the blocks and the flight paths of the spray teams to organizations having a legitimate reason for viewing those reports.

An attempt to study the boundary effect on Route 635/636 was unsuccessful as the two blocks were sprayed on different days. However, results obtained during the study on that route indicate that under the conditions of application a 2.5 ounce per acre dosage of fenitrothion does not have a detrimental effect on the avian population.

The phosphamidon application to Route 1335/1336 was also done in different days again ruling out an evaluation of the boundary effect. Results from the censuses suggest that a minor effect may have occurred in the census route area but searching failed to result in the observation of a sick or dead bird. However, two sick birds were observed in another area of Block 1336 which was predominantly softwood which indicates that a chemical effect did occur in that section of the block and also supports the suggestion that Irving ignored the hardwood areas in favour of giving more coverage to the softwood areas. A dead bird not believed to be a road kill, was found on the side of the road near the start of Route 635/636 which suggests that a minor effect also occurred in that section of Block 1335. Consequently, under the conditions of application on that route during the study, an application of phosphamidon at a dosage of 2.5 ounces per acre has a detrimental effect on the songbirds of the area.

Results from the pre and post spray censuses on Routes 626, 1326 and 1426 indicate that under the conditions of application during the study, applications of matacil at a dosage of $\frac{3}{4}$ of an ounce per acre and fenitrothion at 2.5 ounces per acre do not have a deleterious effect on the avian population. The results subsequently indicate that under the conditions of application during the study, those applications will not develop a synergistic effect causing chemical harm to the avian fauna.

FIGURE 1: LOCATION OF 1975 SONG BIRD CENSUS ROUTES

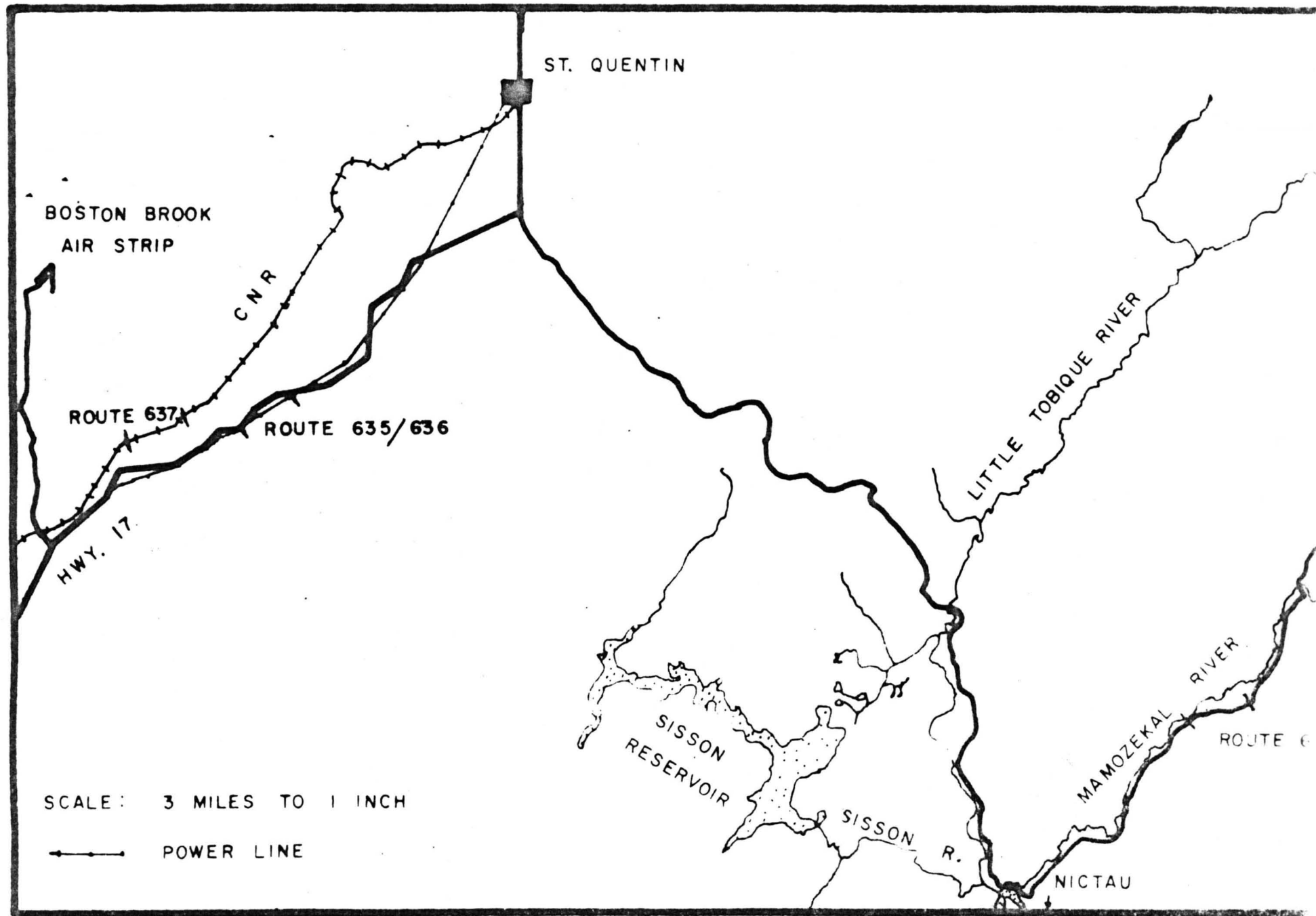
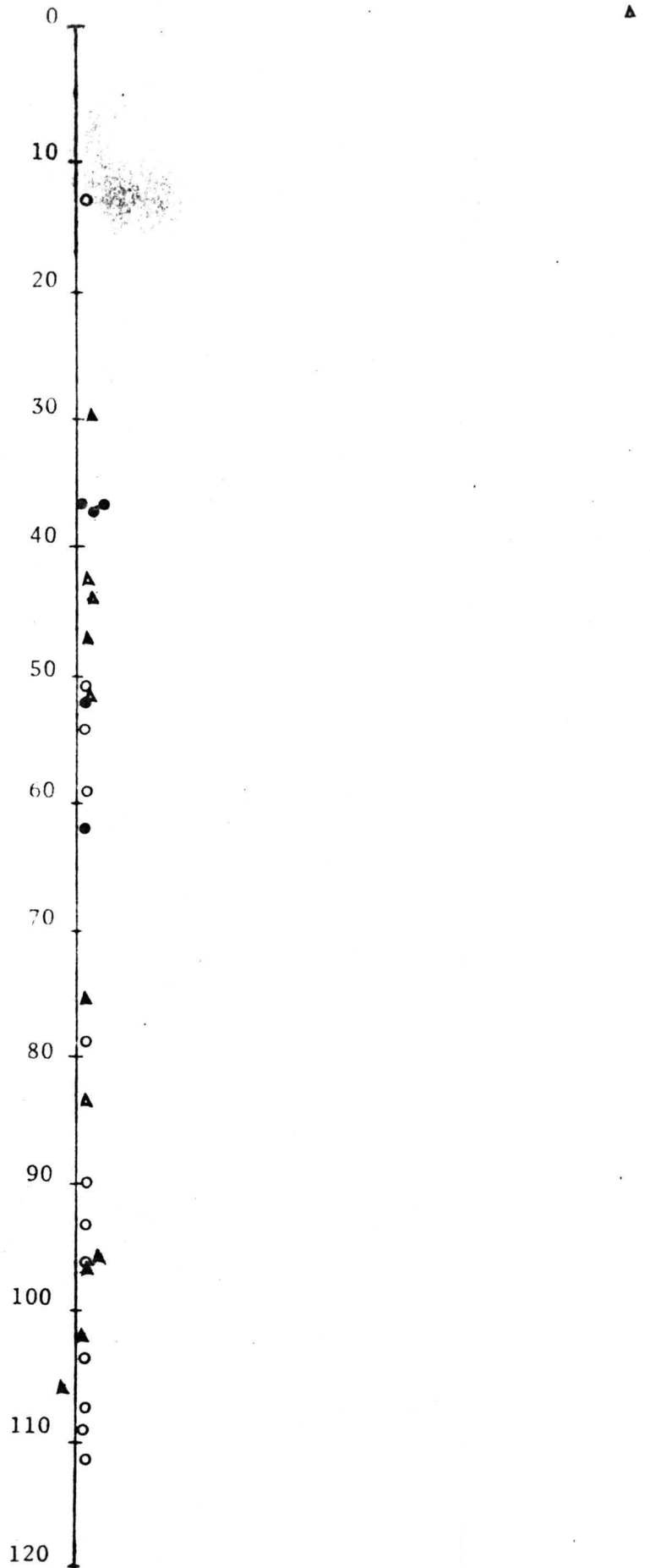


Figure 2 Location of sick and dead birds following the Irving Fenitrothion and Irving for FPL Phosphamidon applications on Route 637 (1337) in Victoria County, New Brunswick, 1975.



- ▲ Sick bird - Fenitrothion
- ▲ Dead bird - Fenitrothion
- Sick bird - Phosphamidon
- Dead bird - Phosphamidon

Table 1 - Total number of stable and individual birds recorded on the pre and post spray censuses of the Irving applied fenitrothion application on Route 637 in Victoria County, New Brunswick, 1975.

Location in chains along route	No. of stable birds on		No. of stable birds observed at least		No. of individuals observed only once		No. of stable birds missing from	
	Pre Spray	Post Spray	twice on Post Spray	or once on Post Spray	on Pre Spray	and once on Post Spray	Post Spray	Post Spray
0-20	22		12	5	4		4	5
20-40	24		7	2	1		1	13
40-60	31		9	7	1		1	15
60-80	24		6	6	2		2	12
80-100	24		6	1	0		0	17
100-120	22		5	3	1		1	14

Table 2 - Total number of stable and individual birds recorded on the pre and post spray censuses of the FPL applied fenitrothion application on Route 637 in Victoria County, New Brunswick, 1975.

Location in chains along route	No. of stable birds on		No. of stable birds observed at least		No. of individuals observed only once		No. of stable birds missing from	
	Pre Spray	Post Spray	twice on Post Spray	or once on Post Spray	on Pre Spray	and once on Post Spray	Post Spray	Post Spray
0-20	18		13	2	1		1	3
20-40	15		6	2	0		0	7
40-60	16		6	2	2		2	8
60-80	6		1	4	2		2	1
80-100	10		5	1	0		0	4
100-120	8		4	1	3		3	3

Table 3 - Total number of stable and individual birds recorded on the pre and post spray censuses of the Irving applied FPL phosphamidon application on Route 1337 in Victoria County, New Brunswick, 1975.

Location in chains along route	No. of stable birds on Pre Spray	No. of stable birds observed at least twice on Post Spray or once on Post Spray	No. of individuals observed only once on Pre Spray and once on Post Spray	No. of stable birds missing from Post Spray		
0-20	31	8	3	0	0	20
20-40	21	1	1	0	0	19
40-60	15	1	3	2	2	11
60-80	11	0	1	1	1	10
80-100	16	1	0	0	0	15
100-120	16	0	2	1	1	14

Table 4 - Total number of stable and individual birds recorded on the pre and post spray censuses of the first matacil application on Route 626 in Victoria County, New Brunswick, 1975.

Location in chains along route	No. of stable birds on Pre Spray	No. of stable birds observed at least twice on Post Spray or once on Post Spray	No. of individuals observed only once on Pre Spray and once on Post Spray	No. of stable birds missing from Post Spray		
0-20	31	9	16	2	2	25
20-40	32	6	10	2	2	16
40-60	24	6	12	0	0	6
60-80	26	4	9	4	4	13
80-100	22	2	1	3	3	19
100-120	23	6	6	4	4	11

Table 5 - Total number of stable and individual birds recorded on the pre and post spray censuses of the fenitrothion application on Route 1326 in Victoria County, New Brunswick, 1975.

Location in chains along route	No. of stable birds on Pre Spray	No. of stable birds observed at least twice on Post Spray ^{or} once on Post Spray	No. of individuals observed only once on Pre Spray	and	observed at least once on Post Spray	No. of stable birds missing from Post Spray
0-20	19 (13)	7 (7) 7 (4)	4		4	5 (2)
20-40	27 (17)	5 (3) 7 (3)	2		2	15 (11)
40-60	18 (12)	5 (5) 6 (4)	0		0	7 (3)
60-80	19 (12)	7 (6) 5 (1)	1		1	10 (5)
80-100	10 (4)	1 (0) 2 (0)	2		2	8 (4)
100-120	17 (16)	6 (6) 3 (3)	3		3	6 (5)

Table 6 - Total number of stable and individual birds recorded on the pre and post spray censuses of the second matacil application on Route 1426 in Victoria County, New Brunswick, 1975.

Location in chains along route	No. of stable birds on Pre Spray	No. of stable birds observed at least twice on Post Spray ^{or} once on Post Spray	No. of individuals observed only once on Pre Spray	and	observed at least once on Post Spray	No. of stable birds missing from Post Spray
0-20	16	6 6	2		2	4
20-40	17	4 2	2		2	11
40-60	12	1 1	3		3	10
60-80	17	4 3	2		2	10
80-100	7	1 1	0		0	5
100-120	16	3 5	2		2	8

() refers to stable birds observed at least two of the pre spray censuses of June 9, 10, and 11.

Table 7 - Total number of birds recorded on the pre spray censuses for the Irving fenitrothion application on Route 637 in Victoria County, New Brunswick, 1975.

Date	0-20	20-40	40-60	60-80	Location in chains along the route		Total	Weather
					80-100	100-120		
May 25	28	30	29	25	27	25	164	Excellent
May 26	25	21	24	16	16	15	92	Poor
May 29	25	15	27	21	19	21	128	Good
May 31	19	18	14	20	15	15	101	Poor
June 2	19	14	20	19	20	17	109	Poor

Table 8 - Total number of birds recorded on the post spray censuses for the Irving fenitrothion application on Route 637 in Victoria County, New Brunswick, 1975.

Date	0-20	20-40	40-60	60-80	Location in chains along the route		Total	Weather
					80-100	100-120		
June 4	22	19	21	9	10	14	95	V. Good
June 5	28	19	17	14	12	14	104	V. Good
June 6	19	18	25	9	15	14	100	Poor

Table 9 - Total number of birds recorded on the pre spray censuses for the FPL fenitrothion application on Route 637 in Victoria County, New Brunswick, 1975.

Date	0-20	20-40	40-60	60-80	Location in chains along the route		Total	Weather
					80-100	100-120		
June 4	22	19	21	9	10	14	95	V. Good
June 5	28	19	17	14	12	14	104	V. Good
June 6	19	18	25	9	15	14	100	Poor

Table 10 - Total number of birds recorded on the post spray censuses for the FPL fenitrothion application on Route 637 in Victoria County, New Brunswick, 1975.

Date	0-20	20-40	40-60	60-80	Location in chains along the route		Total	Weather
					80-100	100-120		
June 11	21	15	16	8	15	12	87	Excellent
June 14	20	22	16	9	8	9	84	Poor
June 15	26	16	13	6	16	10	87	Poor
June 16	20	13	12	9	19	12	85	Poor
June 17	22	19	14	9	16	17	97	Good
June 18	21	19	10	16	20	14	100	Good

Table 11 - Total number of birds recorded on the pre spray Irving applied FPL phosphamidon application on Route 1337 in Victoria County, New Brunswick, 1975.

Date	0-20	20-40	40-60	60-80	Location in chains along the route		Total	Weather
					80-100	100-120		
June 11	21	15	16	8	15	12	87	Excellent
June 14	20	22	16	9	8	9	84	Poor
June 15	26	16	13	6	16	10	87	Poor
June 16	20	13	12	9	19	12	85	Poor
June 17	22	19	14	9	16	17	97	Good
June 18	21	19	10	16	20	14	100	Good

Table 12 - Total number of birds recorded on the post spray Irving applied FPL phosphamidon application on Route 1337 in Victoria County, New Brunswick, 1975.

Date	0-20	20-40	40-60	60-80	Location in chains along the route		Total	Weather
					80-100	100-120		
June 22	13	7	7	5	2	6	40	Excellent
June 23	16	5	8	6	4	6	45	Good
June 24	15	3	7	4	4	7	40	Fair
June 25	19	9	9	7	5	5	54	Excellent

Table 13 - Total number of birds recorded on the pre spray censuses for the first matacil application on Route 626 in Victoria County, New Brunswick, 1975.

Date	0-20	20-40	40-60	60-80	Location in chains along the route		Total	Weather
					80-100	100-120		
May 30	27	34	26	27	26	25	165	Excellent
June 1	25	25	24	25	18	19	136	V. Good
June 3	27	26	27	26	18	17	141	Excellent
June 9	28	30	24	27	15	24	148	V. Good
June 10	33	34	25	31	16	27	136	Excellent

Table 14 - Total number of birds recorded on the post spray censuses for the first Matacil application on Route 626 in Victoria County, New Brunswick, 1975.

Date	0-20	20-40	40-60	60-80	Location in chains along the route		Total	Weather
					80-100	100-120		
June 12	29	24	26	30	12	24	145	Excellent
June 19	22	23	19	24	14	21	123	Windy
June 20	31	24	26	18	13	23	135	Windy
June 21	34	30	21	26	13	23	147	Excellent

Table 15 - Total number of birds recorded on the pre spray fenitrothion censuses on Route 626 in Victoria County, New Brunswick, 1975.

Date	0-20	20-40	40-60	60-80	Location in chains along the route		Total	Weather
					80-100	100-120		
June 3	27	26	27	26	18	17	141	Excellent
June 9	28	30	24	27	15	24	148	V. Good
June 10	33	34	25	31	16	27	136	Excellent
June 12	29	24	26	30	12	24	145	Excellent

Table 16 - Total number of birds recorded on the post spray fenitrothion censuses on Route 1326 in Victoria County, New Brunswick, 1975.

Date	0-20	20-40	40-60	60-80	Location in chains along the route		Total	Weather
					80-100	100-120		
June 19	22	23	19	24	14	21	123	Windy
June 20	31	24	26	18	13	23	135	Windy
June 21	34	30	21	26	13	23	147	Excellent

Table 17 - Total number of birds recorded on the pre spray censuses for the second application of matacil on Route 1426 in Victoria County, New Brunswick, 1975.

Date	0-20	20-40	40-60	60-80	Location in chains along the route		Total	Weather
					80-100	100-120		
June 19	22	23	19	24	14	21	123	Windy
June 20	31	24	26	18	13	23	135	Windy
June 21	34	30	21	26	13	23	147	Excellent

Table 18 - Total number of birds recorded on the post spray censuses for the second application of matacil on Route 1426 in Victoria County, New Brunswick, 1975.

Date	0-20	20-40	40-60	60-80	Location in chains along the route		Total	Weather
					80-100	100-120		
June 27	26	21	17	21	13	24	122	Excellent
June 28	23	26	21	16	15	18	119	Excellent
June 29	29	24	20	18	13	23	127	Excellent

Table 19 - Pre and post spray fenitrothion and phosphamidon census data of
Route 635/636 (1335/1336) in Victoria County, New Brunswick, 1975.

Date	Total Birds	Total Songs	Time	Songs/ Minute	Birds/ Minute	Total Species	Weather
May 25	150	1578	99	15.94	1.52	35	Good
May 26	125	1270	85	14.94	1.47	34	Windy
May 29	140	1505	90	16.72	1.56	35	Good
May 31	79	1149	80	14.36	0.99	27	Windy
June 2	97	1386	82	16.90	1.18	31	Windy
June 3		Fenitrothion applied to Blocks 635 and 636 p.m. (Irving)					
June 4	132	1544	85	18.16	1.55	24	Excellent
June 5	123	1256	82	15.31	1.50	28	V. Good
June 6	124	1169	75	15.59	1.65	33	Windy
June 10		Fenitrothion applied to Block 636 a.m. (FPL).					
June 11	114	1200	83	14.46	1.37	35	Excellent
		Fenitrothion applied to Block 635 a.m. (FPL).					
June 15	110	1280	77	16.62	1.43	34	Windy
June 16	117	1127	71	15.87	1.65	33	Windy
June 17	114	1279	68	18.81	1.68	29	Fair
June 18	120	1369	75	18.25	1.60	32	Good
June 21		Phosphamidon applied to Block 1336 a.m. (Irving for FPL).					
June 22	94	1209	77	15.70	1.22	30	Good
		Phosphamidon applied to Block 1335 a.m. (FPL)					
June 23	105	1153	77	14.97	1.36	33	Good
June 24	89	1032	65	15.88	1.37	25	Good
June 25	107	1268	77	16.47	1.39	34	Excellent

Table 20 - Birds collected following chemical applications in Victoria County, New Brunswick, 1975.

Number	Species	Date	Block No.	Location	Condition	Application
MG-75-01	C. Sparrow	4 June	637	St. Quentin	Sick	Fenitrothion
MG-75-02	W. T. Sparrow	4 June	637	St. Quentin	Sick	Fenitrothion
MG-75-03	C. Sparrow	4 June	637	St. Quentin	Sick	Fenitrothion
MG-75-04	C. Sparrow	4 June	637	St. Quentin	Sick	Fenitrothion
MG-75-05	D. E. Junco	4 June	637	St. Quentin	Sick	Fenitrothion
MG-75-06	Pine Siskin	4 June	637	St. Quentin	Dead	Fenitrothion
MG-75-07	Wilson's Warbler	5 June	637	St. Quentin	Dead	Fenitrothion
MG-75-08	Woodcock	5 June	637	St. Quentin	Dead	Fenitrothion
MG-75-09	Lin. Sparrow	5 June	637	St. Quentin	Dead	Fenitrothion
MG-75-10	Blackpoll Warbler	5 June	637	St. Quentin	Dead	Fenitrothion
MG-75-12	Chipping Sparrow	6 June	637	St. Quentin	Dead	Fenitrothion
MG-75-13	D. E. Junco	6 June	637	St. Quentin	Dead	Fenitrothion
MG-75-14-I**	Tennessee Warbler	10 June	637	St. Quentin	Dead	Fenitrothion
MG-75-14	Kingbird	21 June	1337	St. Quentin	Sick	Phosphamidon
MG-75-15	W. T. Sparrow	21 June	1337	St. Quentin	Sick	Phosphamidon
MG-75-16	Robin	21 June	1337	St. Quentin	Sick	Phosphamidon
MG-75-17	Robin	21 June	1337	St. Quentin	Sick	Phosphamidon
MG-75-18	Robin	21 June	1337	St. Quentin	Sick	Phosphamidon
MG-75-19	D. E. Junco	22 June	1337	St. Quentin	Sick	Phosphamidon
MG-75-20	D. E. Junco	22 June	1337	St. Quentin	Sick	Phosphamidon
MG-75-21	W. T. Sparrow	22 June	1337	St. Quentin	Sick	Phosphamidon
MG-75-22	D. E. Junco	22 June	1337	St. Quentin	Sick	Phosphamidon
MG-75-23	D. E. Junco	22 June	1337	St. Quentin	Sick	Phosphamidon
MG-75-24	W. T. Sparrow	22 June	1337	St. Quentin	Sick	Phosphamidon
MG-75-25	Tennessee Warbler	22 June	1336	St. Quentin	Dead*	Phosphamidon
MG-75-26	Robin	22 June	1336	St. Quentin	Sick	Phosphamidon
MG-75-27	D. E. Junco	22 June	1335	St. Quentin	Dead*	Phosphamidon
MG-75-28	W. T. Sparrow	23 June	1337	St. Quentin	Dead	Phosphamidon
MG-75-29	Robin	23 June	1337	St. Quentin	Sick	Phosphamidon
MG-75-30	W. T. Sparrow	23 June	1337	St. Quentin	Dead	Phosphamidon
MG-75-31	W. T. Sparrow (?)	23 June	1337	St. Quentin	Dead	Phosphamidon
MG-75-32	W. T. Sparrow (?)	23 June	1337	St. Quentin	Dead	Phosphamidon
MG-75-33	W. T. Sparrow (?)	23 June	1337	St. Quentin	Dead	Phosphamidon
MG-75-34	Robin	23 June	1336	St. Quentin	Sick	Phosphamidon
MG-75-35	Parula Warbler	24 June	1335	St. Quentin	Dead*	Phosphamidon

* Possible Road Kill.

** Discarded after collection.