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**Spruce Budworm Population
In Nova Scotia, 1985**

by

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SPRUCE BUDWORM POPULATIONS IN NOVA SCOTIA

I. INTRODUCTION

There are three major surveys of spruce budworm (Choristoneura fumiferana (Clemens, 1865)) in Nova Scotia. These surveys are both descriptive and predictive in nature. The three surveys are (1) aerial defoliation survey, (2) moth flight survey and (3) survey of overwintering larvae (L-2 survey). In 1984 the L-2 survey data were used in conjunction with those from the spruce budworm egg-mass survey. In 1985 the L-2 survey has replaced the egg-mass survey.

The spruce budworm egg-mass survey of 1984 detected a concentration and intensification of the spruce budworm infestation in Central Cumberland County and along the Northumberland Coast. Defoliation was noted in these areas during 1985.

II. AERIAL DEFOLIATION SURVEY

The aerial defoliation survey is conducted by the Forest Insect and Disease Survey Group of the Maritime Forest Research Centre with assistance from the Department of Lands and Forests.

In 1985 inclement weather hampered the aerial defoliation survey. In many areas heavy rain washed the discoloured needles from the trees prior to the survey. This year 26 394 ha of light, 32 114 ha of moderate and 6 644 ha of

severe defoliation, and 280 103 ha of severe with moderate patches were noted (Table 1, Figure 1) as compared to 26 355 ha of light, 32 777 ha of moderate, and 25 939 ha of severe defoliation in 1984 (Table 2, Figure 2).

Table 1. Areas of spruce budworm defoliation in Nova Scotia by County in 1985.

County	Light (ha)	Moderate (ha)	Severe with Moderate Patches (ha)	Severe (ha)	Total (ha)
Cape Breton Island	--	--	--	--	--
Antigonish	1 008	7 057	2 268	1 260	11 593
Pictou	--	--	127 532	1 512	129 044
Colchester	--	504	39 819	--	40 323
Cumberland	25 386	25 553	110 484	3 872	164 294
Annapolis Valley-Hants	--	--	--	--	--
South Shore	--	--	--	--	--
TOTAL	26 394	32 114	280 103	6 644	345 254

Pendrel, Smith and Magasi, 1985

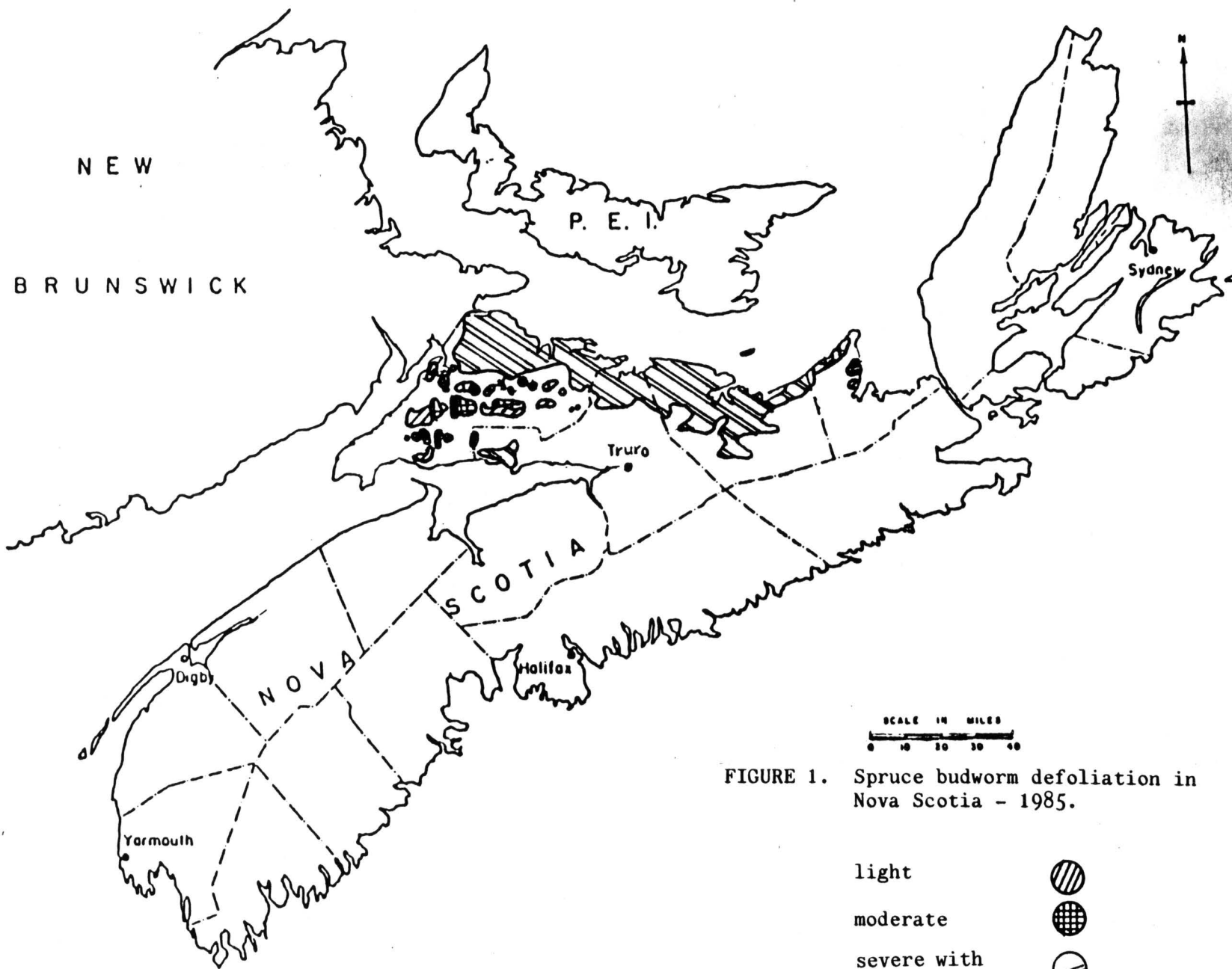


FIGURE 1. Spruce budworm defoliation in Nova Scotia - 1985.





- light 
- moderate 
- severe with moderate patches 
- severe 

Table 2. Areas of spruce budworm defoliation by region since 1982.

Region of Province	Year	(hectares x 1000)			Total
		Light	Moderate	Severe	
Cumberland and Colchester	1982	13.6	92.0	48.9	154.5
	1983	6.4	18.9	158.6	183.9
	1984	15.9	23.5	13.7	53.1
	1985	25.6	25.5	154.2*	205.3
Pictou, Antigonish and Guysborough	1982	11.0	28.7	0.8	40.5
	1983	21.8	16.5	38.2	76.5
	1984	4.2	9.3	12.2	25.7
	1985	0.7	6.5	132.6*	139.8
Annapolis Valley and Hants County	1982	0.0	4.1	0.0	4.1
	1983	34.7	14.4	29.9	79.0
	1984	6.3	0.0	0.0	6.3
	1985	0.0	0.0	0.0	0.0
Cape Breton Island	1982	12.3	0.4	0.0	12.7
	1983	0.5	2.2	15.5	18.2
	1984	0.0	0.0	0.0	0.0
	1985	0.0	0.0	0.0	0.0
Total	1982	36.9	125.2	49.7	211.8
	1983	63.4	52.0	242.2	357.6
	1984	26.4	32.8	25.9	85.1
	1985	26.3	32.0	286.8*	345.1

* Severe with some moderate patches

Pendrel, Smith and Magasi, 1985

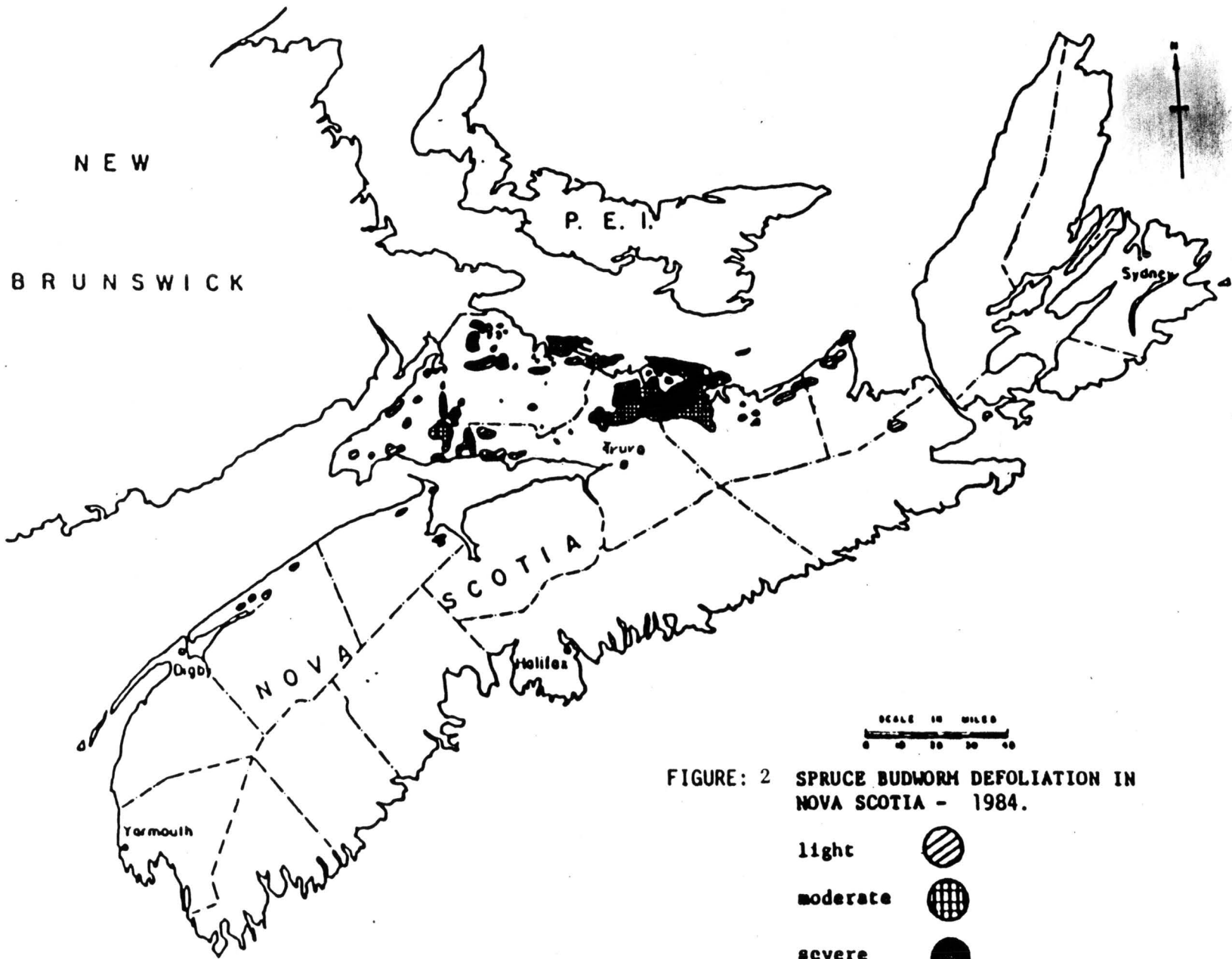





FIGURE: 2 SPRUCE BUDWORM DEFOLIATION IN NOVA SCOTIA - 1984.

- light 
- moderate 
- severe 

III. MOTH FLIGHT SURVEY

The Department in conjunction with Agriculture Canada, Environment Canada, Ministry of State-Forestry, Transport Canada, Nova Scotia Agriculture and Marketing operate a system of light traps to sample photopositive night flying insect species. Failure of the Department's light traps hindered the efforts of this year's survey. However, no major adult migrations of spruce budworm adults were observed this year.

IV. L-2 SURVEY

The objective of the L-2 survey is predictive in nature. The data from this survey are used to forecast expected population densities and define areas of risk. The spruce budworm larvae migrate after eclosion and before hibernation. For this reason the L-2 data are better estimators of the current population than are those data of the egg-mass survey. This year the L-2 survey has replaced the egg-mass survey for Nova Scotia.

A. Methods

1. Field

There were 420 L-2 sample points within the Province. Field samples from 362 locations were collected by Lands and Forests personnel (331), Bwoater-Mersey personnel (31) (Table 3).

Table 3. Number of sample locations for L-2 Survey, Nova Scotia, 1985.

<u>Agency</u>	<u>Sample location</u>			
	<u>Assigned</u>	<u>Collected</u>	<u>Uncollected</u>	<u>Late</u>
Lands & Forests	369	331	25	15
Bowater-Mersey	51	31	5	15
Total	420	362	30	30

2. Laboratory

The Insectary at Debert has been modified to process L-2 samples. Hibernating coiferophagus larvae are removed from foliage by treating softwood foliage with a hot (66°C) solution (1.5 percent volume) of sodium hydroxide. Larvae were separated from plant debris by differential wetting technique using hexane. Larvae were enumerated on gridded filterpapers under a Wild-Leitz M5 stereo microscope (Miller et al 1971, Miller and Kettela 1982, Dorais and Kettela 1982, and Trail 1984).

3. Results

In the Maritimes the population levels are expressed as number of larvae per 45 cm branch tip (Table 4).

Table 2. Population assessment and infestation levels of second instar spruce budworm larvae.

Regions	Population Assessment		Infestation Level
	Larvae/branch	Larvae/10 m ²	
Maritimes	1-6	-	Low
	7-20	-	Medium
	21-40	-	High
	41+	-	Extreme
Ontario	1-25	-	Low
	26-65	-	Medium
	66	-	High
Maine	-	0	None
Quebec	-	1-100	Low
Newfoundland	-	101-300	Medium
	-	301-650	High
	-	651	Extreme

(Dorais and Kettela 1982)

In general the current spruce budworm infestation remains intensified and concentrated in Central Cumberland County and along the Northumberland Coast. Sample areas with similar population densities were mapped to produce the G-2 map (Figure 3). The egg-mass map of 1984 is included for general comparison (Figure 2). L-2 data for 1984 and 1985 are presented in Appendices 1 and 2 respectively. The mean population densities of the 1985 data are presented in Appendix 3.

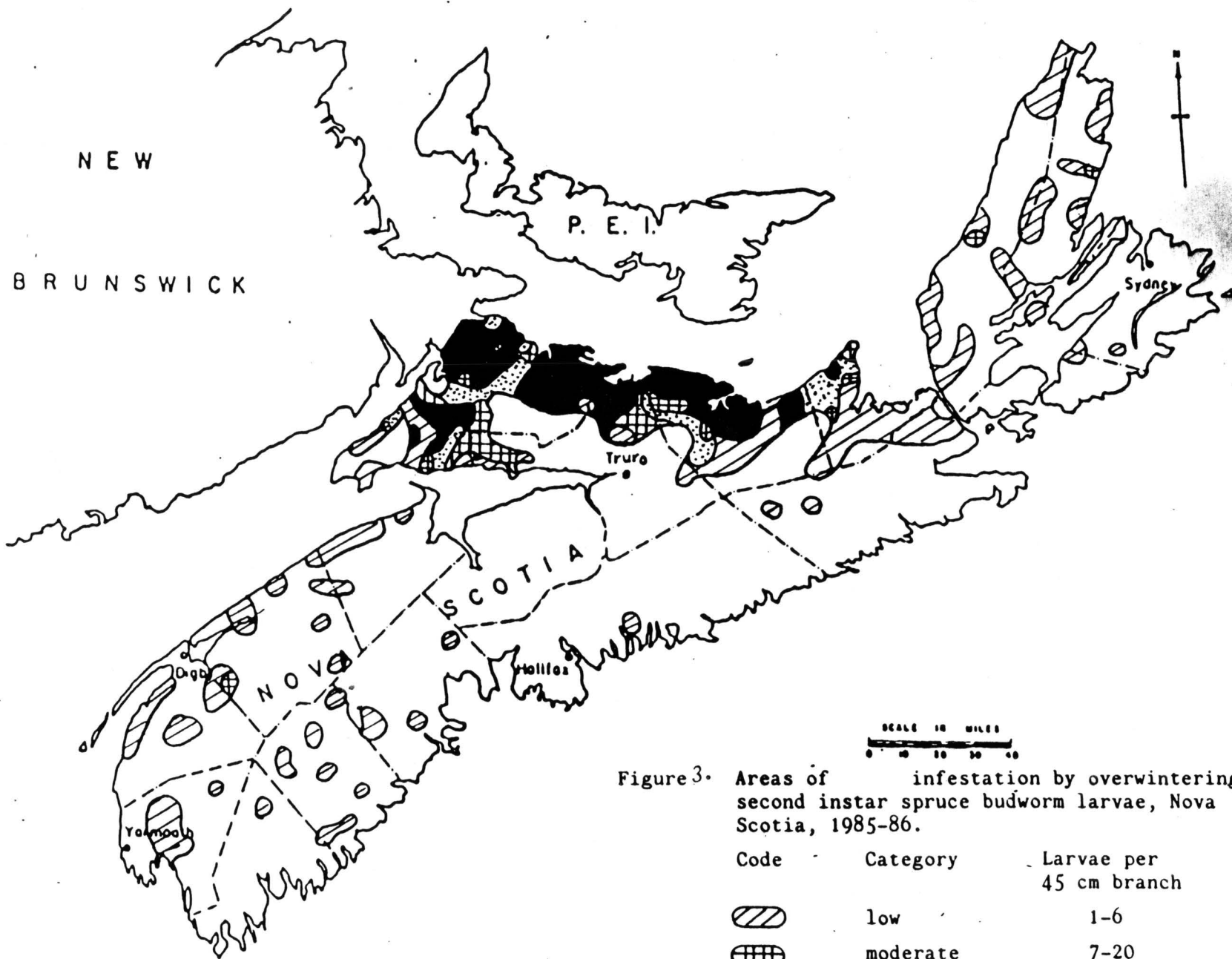






Figure 3. Areas of infestation by overwintering second instar spruce budworm larvae, Nova Scotia, 1985-86.

Code	Category	Larvae per 45 cm branch
	low	1-6
	moderate	7-20
	high	21-40
	extreme	41+

A. Cape Breton

There has been an increase in the frequency of low populations on the Cape Breton Highlands (Figures 3 and 4) as compared to those areas in 1984. This year moderate populations were noted at Little River in Victoria County and again as in 1984 at Southwest Margaree in Inverness County. Low populations have noted in the McEvays Barren area, Mabou and Creignish Hills area.

B. Mainland Nova Scotia

(i) Southern Counties

There has been a shift in populations. The areas of moderate populations in 1984 have collapsed in particular those at the Head of St. Margaret's Bay. There is, however, an area of moderate populations near Digby. Low populations have been noted in Kings, Annapolis, Digby, Yarmouth, Shelburne, queens, Lunenburg and Halifax counties. Summaries of the frequencies of occurrence of L-2 category classes for each county are presented in Appendix 4.

(ii) Northern Counties

The spruce budworm infestation is continuing to persist in Cumberland County along the Northumberland Coast, and the Cape George area of Antigonish County. There is a general decline in the intensity of the number of second instar larvae

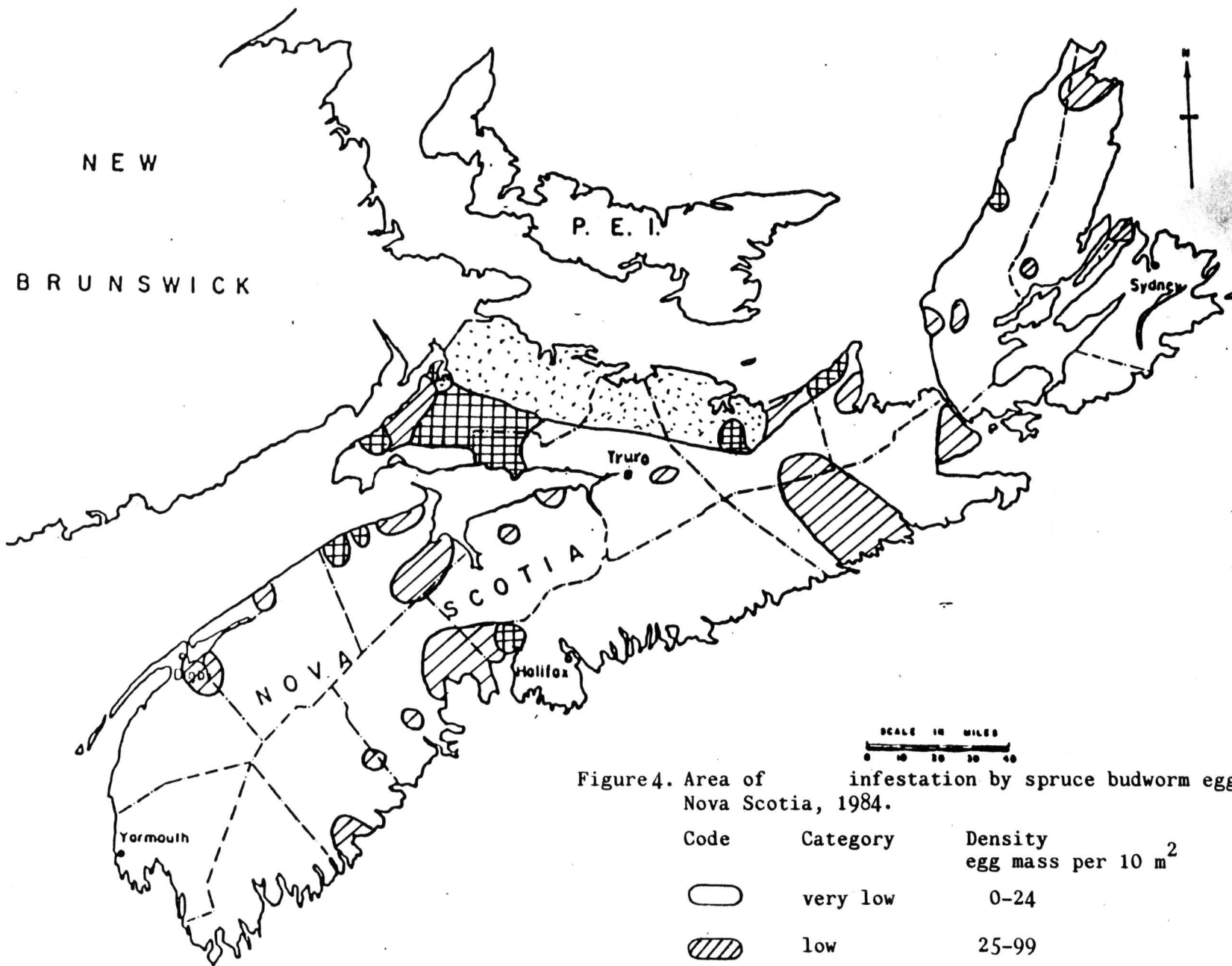






Figure 4. Area of infestation by spruce budworm egg-masses Nova Scotia, 1984.

Code	Category	Density egg mass per 10 m ²
	very low	0-24
	low	25-99
	moderate	100-239
	high	240+

per 45 cm branch tip of about 56 percent (Tables 3 to 6). The magnitude of this reduction should be tempered with caution as the data for the 1984 L-2 survey are restricted to the infested zone whereas the data for the 1985 L-2 survey include samples from outside the infestation. For Antigonish County the mean number of larvae per 45 cm branch is 24.8 ± 20.0 . Thus the reduction in population in the infested area is 43.8 percent as compared to a county reduction of 64.0 percent (Tables 4,5,6 and 7). The populations of spruce budworm continue to pose a serious threat to our softwood forests in Central Cumberland County, on the Maritime Plain along the Northumberland Coast and the Cape George Peninsula of Antigonish County. Noticable defoliation can be expected to occur in these areas. Populations in the rest of the Province should be carefully monitored next year. Care must be taken to monitor possible range overlaps and combined defoliation of spruce budworm with spruce cone worm (Dioryetria reniculelloides Mut. & Mun.) in Colchester County, spruce budmoth Zeiraphera canadensis Mut. & Free. in Antigonish County. White marked tussock moth (Orgyia leucostigma J.E. Smith) in Antigonish, Guysborough and Halifax counties and hemlock looper (Lambdina fiscellaria fiscellaria (Guen) in Cumberland and Yarmouth counties.

Table 3. Comparison of the frequency and relative frequency of the numbers of occurrences of L-2 class categories for Antigonish County.

Class Category	Frequency of Occurrence			
	1984	%	1985	%
Zero	0	0	2	11
Low	0	0	7	37
Moderate	1	17	5	26
High	3	50	4	21
Extreme	2	33	1	5
Σ	6	100	19	100

Mean number of larvae

County $\bar{x} \pm 1sd.$ 44.2 \pm 33.9 15.9 \pm 20.0

Infestation $\hat{x} \pm 1sd$ 44.2 \pm 33.9 24.8 \pm 28.0

Relative Change from 1984 to 1985

% Change County $(100 - ((\bar{x}_{85} \div \bar{x}_{84}) \cdot 100)) = 64.0$

% Change Infestation $(100 - ((\hat{x}_{85} \div \bar{x}_{84}) \cdot 100)) = 43.8$

Table 6. Comparison of the frequency and relative frequency of the numbers of occurrences of L-2 class categories for Colchester County.

Class Category	Frequency of Occurrence			
	1984	%	1985	%
Zero	0	0	7	24
Low	0	0	10	33
Moderate	3	19	5	17
High	4	25	1	3
Extreme	9	56	7	23
Σ	16	100	30	100

Mean number of larvae

County $\bar{x} \pm 1sd$ 57.0 \pm 50.8 20.1 \pm 31.8

Infestation $\hat{x} \pm 1sd$ 57.0 \pm 50.8 30.1 \pm 35.9

Relative Change from 1984 to 1985

% Change County (100 - ((\bar{x} 85 \div \bar{x} 84) \cdot 100)) = 64.9

% Change Infestation (100 - ((\hat{x} 85 \div \bar{x} 84) \cdot 100)) = 47.2

Table Comparison of the frequency and relative frequency of the numbers of occurrences of L-2 class categories for Cumberland County.

Class Category	Frequency of Occurrence			
	1984	%	1985	%
Zero	0	0	11	14
Low	5	14	23	29
Moderate	11	31	18	23
High	5	14	9	12
Extreme	15	41	17	22
Σ	36	100	78	100

Mean number of larvae

County $\bar{x} \pm 1sd$ 47.6 \pm 49.2 22.7 \pm 29.6

Infestation $\hat{x} \pm 1sd$ 47.6 \pm 49.2 31.6 \pm 33.9

Relative Change from 1984 to 1985

% Change County $(100 - ((\bar{x}_{85} \div \bar{x}_{84}) \cdot 100)) = 52.3$

% Change Infestation $(100 - ((\hat{x}_{85} \div \bar{x}_{84}) \cdot 100)) = 33.6$

Table 8. Comparison of the frequency and relative frequency of the numbers of occurrences of L-2 class categories for Pictou County.

Class Category	Frequency of Occurrence			
	1984	%	1985	%
Zero	0	0	3	12
Low	1	5	4	15
Moderate	0	0	4	15
High	6	27	3	12
Extreme	15	68	12	46
Σ	22	100	26	100

Mean number of larvae

County $\bar{x} \pm 1sd$ 84.0 \pm 60.0 46.7 \pm 51.2

Infestation $\hat{x} \pm 1sd$ 84.0 \pm 60.0 63.3 \pm 50.6

Relative Change from 1984 to 1985

% Change County $(100 - ((\bar{x}_{85} \div \bar{x}_{84}) \cdot 100)) = 44.4$

% Change Infestation $(100 - ((\hat{x}_{85} \div \bar{x}_{84}) \cdot 100)) = 24.6$

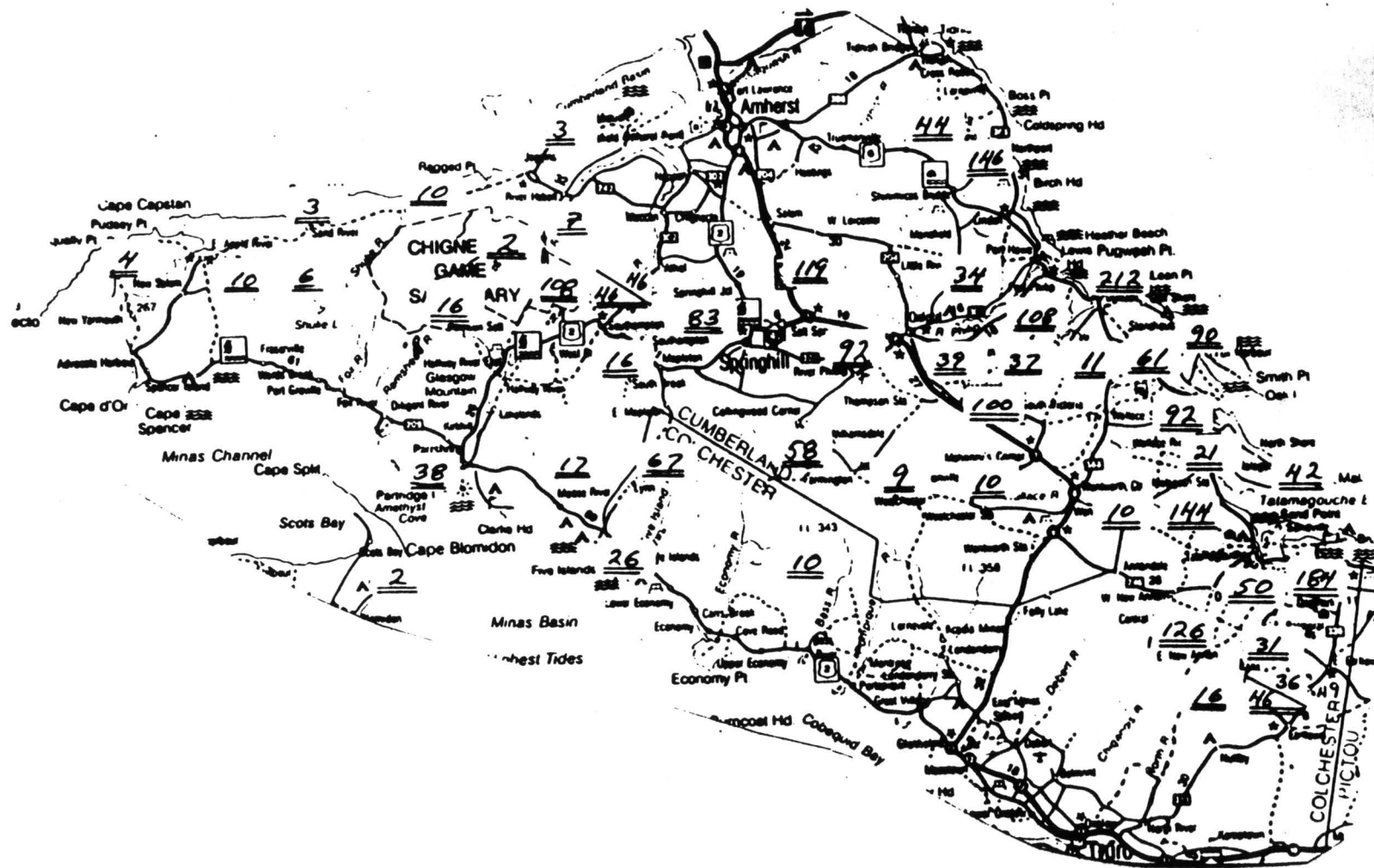
V. SUMMARY

The spruce budworm infestations are persisting, still at high levels, in the Province principally in Cumberland County and along the Northumberland Coast. Noticeable defoliation can be expected through this infested area in 1986. Low populations have been noted on the Cape Breton Highlands and in the Southern counties, trace to light defoliation may occur in these areas in 1986.

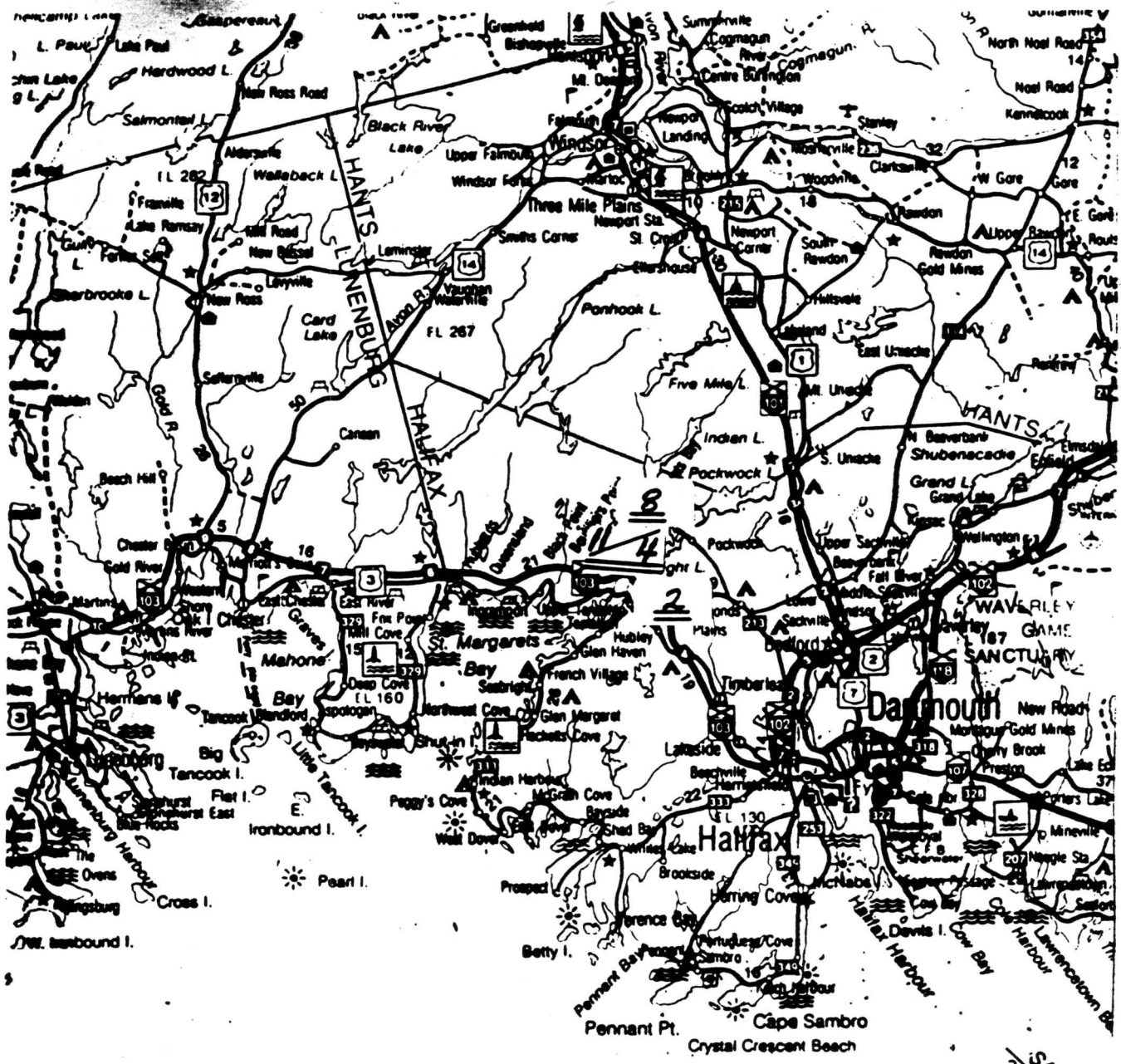
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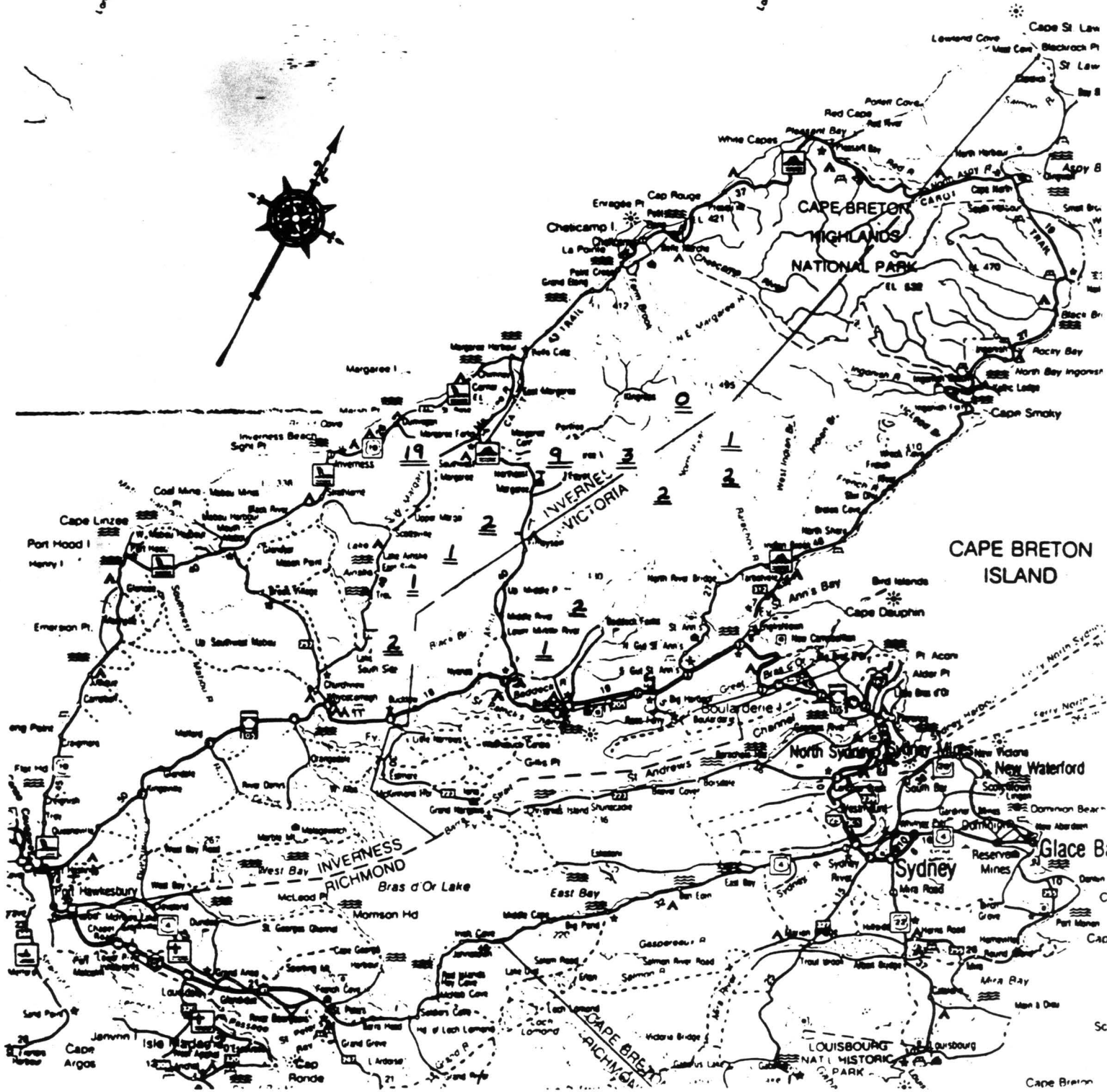
Appendix 1.



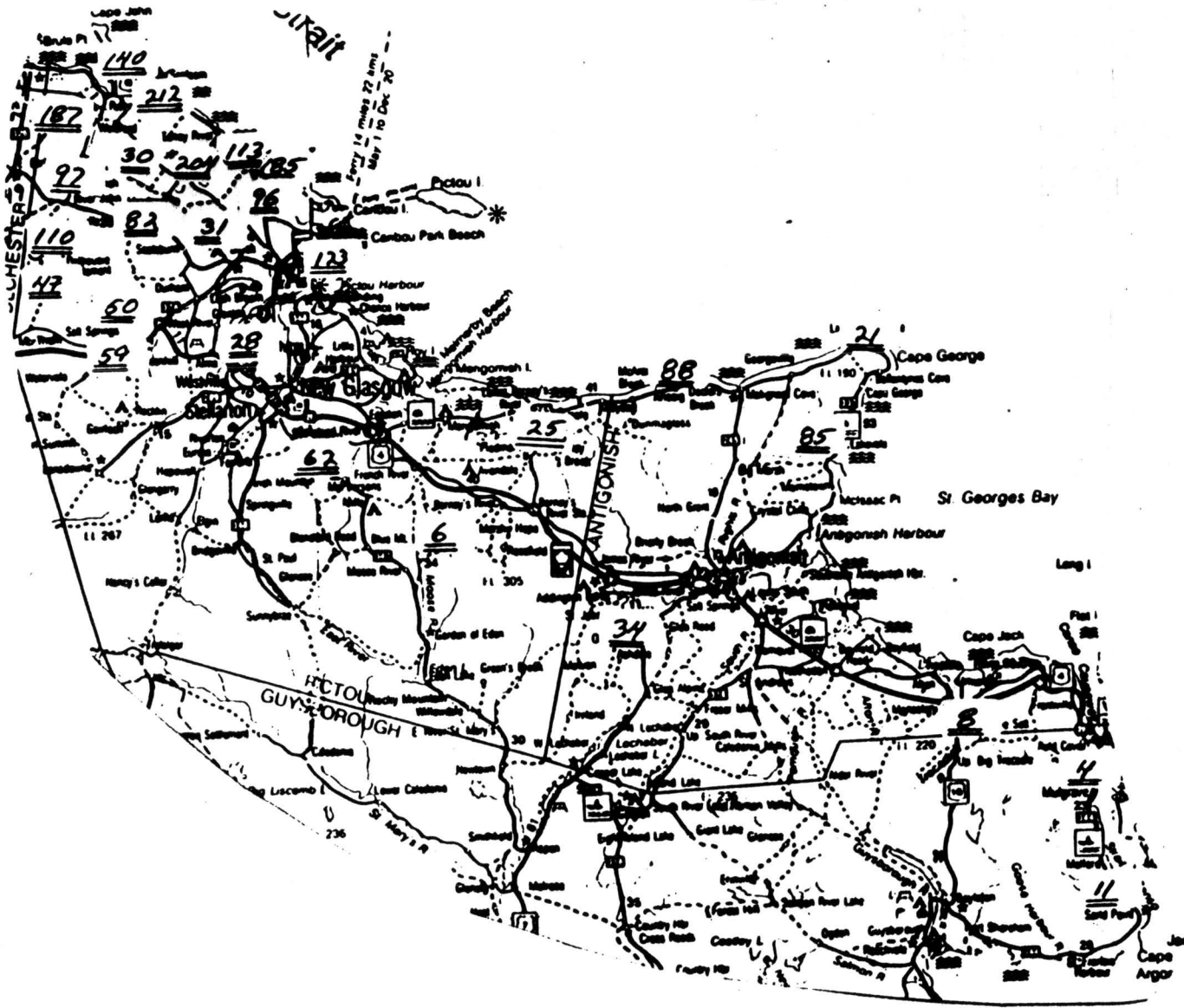
Mean number of second instar spruce budworm larvae per branch from sample locations in Cumberland, parts of Colchester and Kings Counties, Nova Scotia, fall 1984. Sample locations and mean number of larvae No.



Number of second instar spruce budworm larvae per branch from sample locations at the head of St. Margaret's Bay, Halifax County, Nova Scotia, fall 1984. Sample location and mean number of larvae No.



Mean number of second instar spruce budworm larvae per branch from sample locations on Cape Breton Island, Nova Scotia, fall 1984. Sample locations and mean number of larvae No.



Mean number of second instar spruce budworm per branch from sample locations in Pictou, Antigonish and parts of Guysborough Counties, Nova Scotia, fall 1984. Sample locations and mean number of larvae No.

Appendix 2.

Mean number of second instar spruce budworm larvae
per branch. Nova Scotia 1984.

Mean number of second instar spruce budworm larvae per branch.
Nova Scotia 1984.

UTM Grid No.	Map Sheet No.	Nearest Town or Village	L-2/branch	Population Level
<u>Kings Co.</u>				
39(3) 501(3)	13	Blomidon Park	2	L
<u>Halifax Co.</u>				
42(6) 495(7)	20	Muskrat Lake	8	M
42(2) 495(2)	20	Pogwa Lake	11	M
42(8) 496(1)	20	Little Indian Lake	4	L
43(3) 485(0)	20	Junction of Routes 213 and 103	2	L
<u>Colchester Co.</u>				
41(3) 503(5)	19	Lynn Mtn.	67	E
41(9) 502(6)	19	Five Island Park	26	H
42(6) 503(2)	19	Ebbtown	8	M
43(4) 503(7)	19	Economy Lake	10	M
46(7) 506(4)	22	Bay Head	21	H
47(0) 506(1)	22	French River Rd.	144	E
47(6) 505(2)	22	Central New Annan	126	E
47(8) 507(1)	22	Malagaash Pt.	42	E
48(0) 505(9)	22	Waughs River	50	E
48(9) 504(7)	22	Nuttby Mtn.	16	M
48(3) 505(8)	22	Balfron	56	E
48(3) 505(3)	22	The Falls	31	H

UTM Grid No.	Map Sheet No.	Nearest Town or Village	L-2/branch	Population Level
<u>Colchester Co. - Continued</u>				
48(4) 504(9)	22	Spidell Hill	46	E
48(4) 504(9)	22	Spidell Hill	36	H
48(5) 506(1)	22	Middleton	184	E
48(8) 505(2)	22	North Earltown	49	E
<u>Cumberland Co.</u>				
35(3) 502(8)	13	Eatonville	4	L
36(5) 503(3)	13	Advocate Block	10	M
37(2) 504(6)	12	Sand River Block	3	L
37(6) 503(3)	13	Advocate Block ck. pt.	6	L
37(9) 504(2)	12	Flat Brook Block	10	M
38(3) 503(6)	13	Welton Lake	8	M
38(5) 504(1)	12	Chignecto Block S.	16	M
38(7) 504(8)	12	Chignecto Block N.	2	L
39(2) 506(6)	12	Minudie Block	3	L
39(3) 505(7)	12	Round Lake	7	M
39(4) 502(6)	13	Parrsboro	38	H
39(7) 505(0)	12	Thunder Hill ck. pt.	108	E
39(8) 504(7)	12	Thunder Hill Block	24	H
40(1) 505(0)	18	Barren Brook Block	46	E
40(5) 505(4)	18	Hampton Block	46	E

UTM Grid No.	Map Sheet No.	Nearest Town or Village	L-2/branch	Population Level
<u>Cumberland Co. - Continued</u>				
40(6) 503(5)	19	Moose River	17	M
40(7) 504(6)	18	Lawrence Block	16	M
41(3) 505(3)	18	Springhill	83	E
42(0) 506(7)	18	Leicester Ridge	119	E
42(4) 508(5)	18	Amherst Head	44	E
42(7) 504(8)	18	Collingwood Cn.	58	E
42(9) 505(7)	18	River Philip	92	E
43(3) 508(2)	18	West Linden	146	E
43(5) 507(3)	18	Rosendale	34	H
43(7) 506(5)	18	West Hansford	39	H
43(8) 505(0)	18	Millvale	9	M
44(3) 506(3)	18	East Hansford	100	E
44(4) 507(3)	18	Upper Pugwash	108	E
44(5) 506(7)	18	Conns Mills	32	H
44(7) 505(4)	18	Greenville Stn.	10	M
45(0) 507(9)	22	McLeans Pt.	212	E
45(0) 506(6)	22	Hartford	11	M
45(5) 507(2)	22	Wallace River	61	E
46(1) 507(8)	22	Fox Harbour	90	E
46(2) 505(8)	22	Mattatall Lake	10	M
46(5) 506(9)	22	Wallace Ridge	92	E

UTM Grid No.	Map Sheet No.	Nearest Town or Village	L-2/branch	Population Level
<u>Pictou Co.</u>				
52(0) 505(0)	26	Granton	28	H
52(5) 506(2)	26	Loganpoint	123	E
53(0) 504(3)	26	McLellans Mtn.	62	E
53(6) 505(3)	26	Chance Harbour	29	H
54(6) 505(4)	26	Brownsville	32	H
54(6) 504(3)	26	Woodfield	6	L
55(4) 505(5)	29	Lower Barneys River	25	H
49(1) 506(1)	22	Mountain Rd.	187	E
49(5) 505(4)	22	West Branch	97	E
49(6) 506(8)	22	River John	140	E
49(7) 505(8)	22	Dalhousie Settlement	47	E
49(9) 506(7)	22	Seafoam	212	E
50(1) 506(2)	26	Rogers	30	H
50(3) 505(1)	26	Fitzpatrick Mtn.	110	E
50(4) 505(8)	26	Meadowville	82	E
50(7) 506(4)	26	Poplar Hill	204	E
50(8) 504(2)	26	Saltspring	59	E
51(0) 504(9)	26	Four Mile Brook	50	E
51(1) 506(6)	26	Caribou River	113	E
51(3) 505(7)	26	Hardwood	31	H
51(6) 506(6)	26	Waterside	85	E

UTM Grid No.	Map Sheet No.	Nearest Town or Village	L-2/branch	Population Level
<u>Pictou Co. - Continued</u>				
51(6) 506(2)	26	Three Brooks	96	E
<u>Antigonish Co.</u>				
56(4) 506(7)	29	Arisaig Park	88	E
57(2) 504(0)	29	Ohio	34	H
57(4) 505(8)	29	North Grant	29	H
58(2) 508(1)	29	Cape George Point	21	H
58(2) 506(8)	29	West Lakevale	85	E
60(9) 505(0)	34	Monastery	8	M
<u>Guysborough Co.</u>				
62(3) 505(0)	34	Mulgrave	4	L
63(2) 504(2)	34	Melford	11	M
<u>Cape Breton Island</u>				
63(4) 512(8)	33	South West Margaree	19	M
65(0) 509(1)	38	Hume Block	2	L
65(1) 511(1)	38	Gairlock Block	1	L
65(1) 511(2)	38	Gairlock Block	1	L
65(5) 513(4)	38	Margaree Valley	9	M
65(5) 512(3)	38	Gairlock Block	2	L
66(4) 513(8)	38	Margaree Valley Rd.	3	L

UTM Grid No.	Map Sheet No.	Nearest Town or Village	L-2/branch	Population Level
<u>Cape Breton Island - Continued</u>				
66(5) 511(2)	38	Crowdis Mtn. N.	2	L
66(7) 513(8)	38	Fire Camp	2	L
66(8) 512(0)	38	Crowdis Mtn. S.	1	L
66(8) 514(8)	38	Highland Rd. Block	0	-
67(2) 514(7)	38	Miner's Rd. N.	1	L
67(2) 514(1)	38	Miner's Rd. S.	2	L

Appendix 3.

Mean number of second instar spruce budworm larvae
per 45 cm branch, Nova Scotia 1985.

ANNAPOLIS COUNTY

Grid No.	Nearest Landmark	Mean No.	Population
UTM - 020		of L-2	Category
34(9) 494(2)	Springfield	1	Low
34(1) 495(4)	Waterloo Lake	1	Low
33(9) 497(5)	Nictaux Falls	6	Low
33(5) 496(6)	Weasel Hill	3	Low
33(2) 498(1)	Douglas Road	3	Low
32(3) 495(4)	West Dalhousie	2	Low
32(2) 496(0)	Dalhousie Lake	1	Low
32(5) 497(7)	East Arlington	6	Low
31(6) 497(3)	Hampton	0	Zero
30(7) 496(5)	Millbury Lake	3	Low
30(3) 495(3)	Lake La Rose	1	Low
30(1) 496(2)	Dam Road	4	Low

ANTIGONISH

Grid No.	Nearest Landmark	Mean No.	Population
UTM-020		of L-2	Category
56(8) 505(4)	Browns Mtn.	0	Zero
56(9) 506(0)	Highfield	4	Low
57(6) 507(6)	Morar	20	Moderate
57(7) 507(2)	Cape George	4	Low
57(8) 505(8)	Tower Block	1	Low
58(5) 506(4)	Crystal Cliffs	8	Moderate
59(4) 504(4)	Black Avon	1	Low
58(2) 507(8)	Cape George Pt.	13	Moderate
56(2) 506(2)	Eigg Mountain	31	High
56(4) 506(7)	Arisaig Park	78	Extreme
57(2) 506(9)	Malignant Cove	39	High
57(4) 506(5)	Maryvale	37	High
57(4) 505(7)	North Grant	32	High
58(5) 504(9)	Lower South River	2	Low
60(7) 505(0)	Monastery	0	Zero
61(5) 505(8)	Harve Boucher	3	Low
57(6) 503(6)	Glen Apline	3	Low
57(4) 504(9)	Antigonish	11	Moderate
58(3) 506(8)	Lakevale	15	Moderate

CAPE BRETON COUNTY

Grid No.	Nearest Landmark	Mean No. of L-2	Population Category
UTM-020			
69(1) 508(4)	Big Pond	0	Zero
69(2) 507(8)	North Glen	0	Zero
68(7) 507(5)	Lake Vist	0	Zero
68(4) 508(0)	Irishvale	0	Zero
69(8) 509(4)	Ben Edin	0	Zero
70(6) 513(2)	McCreadyville	0	Zero
73(5) 509(1)	Louisbourg	0	Zero
72(4) 510(6)	Morrison Lake	0	Zero
70(2) 510(9)	McLeanville	0	Zero
70(1) 508(1)	Silver Mine	0	Zero
72(0) 508(4)	McLeods Lake	0	Zero
71(3) 508(8)	Campbelldale	1	Low
71(1) 508(0)	Grand Mira South	0	Zero
70(9) 507(6)	Grand Mira	0	Zero
71(2) 509(5)	Marion Bridge	0	Zero

COLCHESTER COUNTY

Grid No.	Nearest Landmark	Mean No. of L-2	Population Category
UTM-020			
41(8) 503(7)	Gundalow Plains	1	Low
47(8) 504(2)	Nuttby Road	2	Low
47(7) 506(0)	Tatamagouche	108	Extreme
48(9) 502(4)	Greenfield	0	Zero
47(9) 502(1)	Truro	0	Zero
47(5) 499(7)	Stewiacke	0	Zero
43(3) 503(1)	Pleasant Hills	8	Moderate
43(4) 503(7)	Economy Lake	5	Low
44(6) 503(2)	Lornevale	1	Low
45(0) 503(5)	Londonderry	4	Low
41(8) 502(7)	Five Island River	8	Moderate
41(3) 503(5)	Lynn Mountain	38	High
42(4) 503(6)	Five Island Park	0	Zero
42(8) 503(3)	Newton Lake	9	Moderate
43(1) 502(4)	Economy Point	3	Low
47(2) 502(9)	Belmont	0	Zero
46(8) 503(5)	Debert	0	Zero
44(8) 503(4)	Lornevale	2	Low
48(4) 504(8)	Spid ell Hill	13	Moderate
48(5) 505(4)	Balmoral Mill	0	Zero
46(1) 506(9)	Wallace Station	43	Extreme
46(4) 506(4)	Wallace Grant	58	Extreme
47(8) 507(1)	Malagash	67	Extreme
46(8) 506(2)	West Tatamagouche	119	Extreme
46(9) 505(2)	Warwick Mountain	45	Extreme
47(6) 505(2)	The Falls	43	Extreme
49(2) 505(2)	North Earltown	15	Moderate
48(0) 504(5)	Nutty Mtn. (Fire TWR)	3	Low
41(3) 504(4)	East Mapleton	1	Low
41(9) 509(9)	Economy Mtn.	2	Low

CUMBERLAND EAST

Grid No.	Nearest Landmark	Mean No. of L-2	Population Category
UTM-020			
41(8) 505(8)	Springhill (P-1)	15	Moderate
40(4) 505(2)	Hampton (P-1)	122	Extreme
39(5) 505(1)	Chignecto (C-20)	41	Extreme
39(2) 505(0)	Chignecto (C-1)	15	Moderate
39(1) 504(6)	Sparks Brook Road	3	Low
42(4) 508(7)	Beecham	46	Extreme
41(3) 508(2)	Irving Blck.	94	Extreme
40(1) 508(4)	Fort Lawrence	70	Extreme
41(6) 505(8)	Springhill	44	Extreme
42(8) 506(8)	Leicester	29	High
41(9) 506(7)	Leicester	30	High
42(2) 507(4)	Mansfield	73	Extreme
44(7) 504(1)	Sutherland Lake	0	Zero
43(1) 506(0)	Oxford Junction	12	Moderate
41(9) 509(1)	Tidnish Bridge	26	High
41(4) 507(8)	Trueman	9	Moderate
41(8) 505(5)	Springhill	1	Low
40(8) 504(9)	East South Hampton	0	Zero
40(8) 505(0)	South Hampton	2	Low
40(7) 504(7)	South Hampton	3	Low
40(7) 504(6)	Lawrence	10	Moderate
40(6) 504(7)	Lawrence	13	Moderate
41(0) 505(5)	Athol Road	118	Extreme
42(2) 505(2)	Windham Hill	30	High
45(1) 505(8)	West Wentworth	46	Extreme
40(2) 504(8)	South Hampton	16	Moderate
40(3) 505(3)	Hampton	12	Moderate
40(4) 505(8)	Athol	8	Moderate
40(5) 505(3)	Hampton	3	Low
40(9) 506(1)	Little Forks	22	High

CUMBERLAND EAST - Continued

Grid No.	Nearest Landmark	Mean No. of L-2	Population Category
UTM-020			
41(0) 506(3)	West Leicester	13	Moderate
43(7) 507(7)	Port Howe	14	Moderate
43(0) 508(4)	Moose Lake	8	Moderate
42(3) 508(4)	Amherst Head	27	High
42(7) 506(2)	Oxford	7	Moderate
44(3) 505(1)	Westchester Station	0	Zero
45(4) 507(8)	Gulf Shore	43	Extreme
46(2) 505(8)	Mattatall Lake	3	Low
42(7) 507(2)	Mansfield	53	Extreme
41(4) 506(3)	West Leicester	5	Low
44(0) 506(9)	Roslin	101	Extreme
43(6) 506(3)	Hansford	75	Extreme
45(0) 506(7)	Hartford	77	Extreme

CUMBERLAND WEST

Grid No.	Nearest Landmark	Mean No. of L-2	Population Category
UTM-020			
39(2) 506(8)	Minudie	0	Zero
38(4) 504(2)	Tipping Meadow	2	Low
40(6) 503(4)	Moose River	1	Low
39(6) 503(6)	Lakelands	9	Moderate
36(5) 502(7)	Beech Hill	2	Low
36(5) 503(5)	East Apple River	0	Zero
37(4) 503(7)	Shulie Lake	0	Zero
37(7) 503(5)	Shulie	0	Zero
38(1) 503(4)	Fox River	6	Low
38(3) 503(1)	Diligent River	19	Moderate
39(3) 501(1)	Kirkhill	32	High
36(2) 502(0)	East Advoate	1	Low
35(5) 502(6)	New Yarmouth	0	Zero
36(1) 503(1)	New Salem	0	Zero
35(4) 503(4)	Apple River	1	Low
36(2) 503(8)	East Apple River	3	Low
36(8) 503(8)	East Branch Apple R.	0	Zero
39(5) 506(4)	Lower River Hebert	8	Moderate
38(5) 505(8)	Flat Brook	2	Low
38(3) 505(6)	Two River Pt.	4	Low
37(8) 505(1)	Shulie	36	High
37(4) 504(8)	Raven Head	5	Low
38(3) 503(8)	Chignecto	4	Low
39(2) 505(8)	River Hebert	60	Extreme
38(4) 504(4)	Chignecto Game Sanc.	2	Low
39(4) 505(0)	Chignecto Gate	4	Low
39(1) 504(1)	Halfway River	77	Extreme
39(6) 503(7)	Lakelands	32	High
40(0) 503(1)	New Prospect	10	Moderate
36(8) 504(2)	Sand River	6	Low
37(5) 504(1)	Shulie River	10	Moderate
38(5) 505(2)	Chignecto North	4	Low
38(4) 504(7)	Chignecto Game Sanc.	49	Extreme

DIGBY COUNTY

Grid No.	Nearest Landmark	Mean No.	Population
UTM-020		of L-2	Category
29(0) 493(4)	Morganville	19	Moderate
28(5) 492(8)	Bigtom Wallace Lake	1	Low
26(3) 490(3)	Lac A Patrice	0	Zero
26(4) 489(6)	Wentworth Lake	0	Zero
27(8) 484(4)	Little Bay	3	Low
27(0) 485(5)	Argyle Head	1	Low
25(8) 487(8)	Lake Jesse	0	Zero
26(3) 487(1)	Raynard's Lake	2	Low
27(6) 486(7)	East Quinan	1	Low
28(1) 490(0)	Toad Lake	0	Zero
28(6) 491(2)	Birch Island	2	Low
27(8) 491(3)	Long Tusket Lake	0	Zero
27(6) 490(7)	Barn Lake	1	Low
27(4) 489(8)	Barrio Lake	0	Zero
25(3) 490(3)	Lower Concession	1	Low
27(5) 491(0)	Langford Bog	3	Low
27(4) 492(0)	Branch Meadows	0	Zero
28(8) 493(9)	Bear River	1	Low

GUYSBOROUGH COUNTY

Grid No.	Nearest Landmark	Mean No. of L-2	Population Category
UTM-020			
57(7) 499(6)	Goldenville	0	Zero
56(8) 501(4)	Smithfield	1	Low
54(8) 501(4)	Caledonia	3	Low
60(7) 502(2)	Ogden	0	Zero
62(2) 503(3)	McPherson Lake	0	Zero
63(0) 504(4)	Byers Cove	1	Low
62(5) 505(1)	Mulgrave	0	Zero
61(3) 504(0)	Lincolnville	1	Low

HALIFAX EAST

Grid No.	Nearest Landmark	Mean No. of L-2	Population Category
UTM-020			
53(3) 500(0)	Liscombe	0	Zero
53(8) 499(5)	Anto Dam	0	Zero
53(6) 497(6)	Sheet Harbour	0	Zero
51(1) 496(2)	Ship Harbour	0	Zero
51(9) 497(4)	Mooseland	0	Zero
45(9) 497(3)	Halifax Airport	0	Zero
45(4) 495(8)	Waverley	0	Zero
43(3) 495(0)	St. Margaret's Bay	0	Zero
42(5) 495(7)	St. Margaret's Bay	0	Zero
41(6) 496(7)	Shady Lake	0	Zero
41(2) 495(1)	Skinner Brook	0	Zero

HALIFAX WEST

Grid No.	Nearest Landmark	Mean No.	Population
UTM-020		of L-2	Category
50(2) 498(6)	Caribou Mines	0	Zero
48(8) 499(1)	Glenmore	1	Low
48(2) 496(7)	Gibraltar	0	Zero
48(0) 495(6)	Conrod Lake	1	Low
47(3) 495(6)	Porters Lake	0	Zero
46(8) 496(2)	East Lake	0	Zero

HANTS COUNTY

Grid No.	Nearest Landmark	Mean No.	Population
UTM-020		of L-2	Category
43(0) 501(3)	Cape Tenny	0	Zero
43(3) 497(2)	Mount Uniacke	0	Zero
43(4) 496(4)	Kehoe Mountain	0	Zero
40(1) 497(7)	Castle Frederick	0	Zero
40(2) 496(8)	Smith's Corner	0	Zero
42(5) 500(0)	Pinnacle Hill	0	Zero
43(8) 500(4)	Wet Meadow	1	Low
44(5) 501(7)	Noel Shore	0	Zero
44(9) 500(6)	Upper Kennetcook	0	Zero
46(7) 500(2)	Admiral Rock	0	Zero
43(9) 498(9)	Rawdon Gold Mines	0	Zero
41(2) 500(6)	Starratt Pt.	0	Zero

INVERNESS COUNTY

Grid No.	Nearest Landmark	Mean No. of L-2	Population Category
UTM-020			
61(5) 509(6)	Port Hood	4	Low
61(8) 508(9)	Little Judique	1	Low
61(8) 507(4)	Long Point	5	Low
62(3) 506(2)	Creignish Rear	0	Zero
64(3) 506(8)	Marshes	0	Zero
63(2) 507(2)	Maple Brook	2	Low
63(2) 508(2)	Upper River Deny's	0	Zero
65(0) 511(3)	Gillander's Mountain	2	Low
65(1) 511(3)	Gillander's Mountain	0	Zero
64(4) 511(1)	Twin Rock Valley	4	Low
63(5) 512(1)	Campbellton Road	5	Low
62(3) 510(9)	MacDonald's Glen	2	Low
62(6) 511(4)	North Cape Highlands	0	Zero
63(2) 511(6)	Kenlock	12	Moderate
63(4) 510(7)	Hays River	0	Zero
65(2) 512(0)	Christie Ponds	0	Zero
65(5) 512(1)	MacRae Brook	0	Zero
65(5) 512(2)	MacRae Brook	0	Zero
64(9) 510(0)	Hume	0	Zero
65(0) 511(0)	Gairlock Mountain	0	Zero
65(2) 511(1)	Gairlock Mountain	2	Low

KINGS COUNTY

Grid No.	Nearest Landmark	Mean No. of L-2	Population Category
UTM-020			
39(2) 501(7)	North Mtn. Blomidon	0	Zero
39(3) 501(3)	Blomidon	0	Zero
38(5) 500(4)	Arlington	0	Zero
37(4) 500(2)	Mountain Front	2	Low
36(6) 500(1)	White's Corner	0	Zero
35(8) 499(4)	Viewmount	1	Low
39(3) 498(9)	Gaspereau	0	Zero
38(0) 497(5)	Lockhart's Hill	0	Zero
37(9) 498(6)	South Alton	3	Low
36(8) 498(1)	Aylesford Lake	0	Zero
36(7) 497(0)	Lake Paul	0	Zero
35(3) 499(5)	Victoria Harbour	2	Low
36(0) 495(1)	East Dalhousie	0	Zero
35(5) 496(6)	Frog Lake	0	Zero
35(0) 497(5)	Torbrook East	1	Low
35(1) 497(9)	Rockville Notch	0	Zero
34(3) 498(9)	Bishop Mountain	3	Low

LUNENBURG COUNTY

Grid No.	Nearest Landmark	Mean No.	Population
UTM-020		of L-2	Category
35(9) 491(0)	Chelsea	1	Low
37(1) 491(2)	Lapland Road	0	Zero
37(5) 490(2)	Italy Cross	2	Low
37(5) 489(8)	Harlow Lake	0	Zero
37(6) 492(1)	Randall Lake	0	Zero
35(8) 492(8)	Hemford	0	Zero
35(9) 493(9)	Meisner's Section	0	Zero
37(5) 494(8)	Harlow lake	0	Zero
39(9) 493(8)	Mariott Meadows	0	Zero
40(3) 493(8)	Squid Cove	0	Zero
39(8) 495(1)	Sherwood	1	Low
38(3) 495(2)	Macks Hill	0	Zero
40(8) 494(2)	Simms Settlement	0	Zero
42(2) 495(2)	Pogwa lake	0	Zero
42(8) 495(1)	Sandy Lake	0	Zero

PICTOU COUNTY

Grid No.	Nearest Landmark	Mean No.	Population
UTM-020		of L-2	Category
53(0) 504(4)	McLellan's Brook	139	Extreme
51(6) 503(7)	Rocklin	24	High
50(0) 503(8)	Upper Mount Thom	0	Zero
52(5) 503(0)	Eldgin	1	Low
54(2) 502(5)	Sunnybrae	0	Zero
52(9) 503(6)	Irish Mountain	4	Low
49(7) 506(8)	River John	72	Extreme
49(1) 506(1)	Mountain Road	14	Moderate
49(7) 505(4)	West Branch	39	High
50(3) 505(1)	Elmfield	17	Moderate
50(6) 505(0)	Millsville	21	High
49(9) 506(3)	Rogers (C-5)	64	Extreme
50(1) 506(4)	Meadowville	57	Extreme
51(6) 504(7)	Green Hill	62	Extreme
55(3) 505(5)	Baileys Brook	43	Extreme
54(9) 505(0)	Piedmont	60	Extreme
51(7) 505(2)	Loch Broom	107	Extreme
51(2) 505(6)	Scotsburn	15	Moderate
53(8) 504(7)	Sutherland River	6	Low
56(5) 502(7)	East River St. Marys	1	Low
51(8) 504(6)	Greenhill	13	Moderate
50(5) 506(2)	Poplar Hill	99	Extreme
51(2) 506(3)	Sunridge	212	Extreme
53(2) 507(2)	Pictou Island	51	Extreme
53(3) 505(5)	Little Harbour Park	94	Extreme
55(6) 504(5)	Rosfield	0	Zero

Queens County

Grid No.	Nearest Landmark	Mean No. of L-2	Population Category
UTM-020			
35(6) 488(4)	Deep Brook	1	Low
35(7) 487(8)	Milton	0	Zero
34(0) 486(4)	Wilkins	1	Low
35(0) 486(8)	Summerville	3	Low
36(5) 489(3)	Riversdales	0	Zero
35(3) 489(4)	Middlefield	0	Zero
32(7) 488(5)	Sixth lake	0	Zero
34(8) 488(6)	Mersey River	0	Zero
34(3) 489(6)	Black Lake	0	Zero
34(3) 492(6)	Tupper Long Lake	1	Low
31(3) 490(0)	Siskech Lake	0	Zero
32(2) 490(1)	Sand Lake	1	Low
32(9) 492(1)	New Grafton	0	Zero
31(8) 491(2)	Kejimkugik Park	0	Zero
33(5) 490(8)	Douglas Hill	1	Low
33(8) 491(4)	Lakeview	1	Low
34(5) 491(2)	South Brookfield	0	Zero

RICHMOND COUNTY

Grid No.	Nearest Landmark	Mean No.	Population
UTM-020		of L-2	Category
64(7) 505(3)	Louisdale	0	Zero
65(0) 504(6)	Isle Grand Lake	0	Zero
66(2) 506(4)	Oban	0	Zero
68(6) 506(6)	Head of Loch Lamond	0	Zero
69(3) 506(7)	MacLeods Lakes	0	Zero
70(1) 506(7)	North Framboise	0	Zero
69(7) 506(1)	Lower St. Esprit	0	Zero
67(2) 506(0)	Barra Head	0	Zero
67(9) 507(5)	Irish Cove	1	Low
68(3) 507(1)	Lochside	0	Zero

SHELBURNE COUNTY

Grid No.	Nearest Landmark	Mean No.	Population
UTM-020		of L-2	Category
30(4) 487(2)	Phillip Lake	1	Low
30(3) 486(2)	Upper Clyde River	0	Zero
32(0) 486(1)	South Blue Hill	0	Zero
32(6) 485(7)	Egypt Brook	0	Zero
32(8) 487(2)	North Blue Hill	0	Zero
30(8) 485(2)	Welshtown	0	Zero

VICTORIA COUNTY

Grid No.	Nearest Landmark	Mean No. of L-2	Population Category
UTM-020			
69(4) 518(0)	Branch Pond	0	Zero
69(7) 515(8)	Wreck Cove	3	Low
69(4) 514(6)	Little River	8	Moderate
68(6) 513(6)	Tarbotvale	2	Low
66(6) 509(4)	St. Columbia	1	Low
67(1) 511(8)	New Glen	1	Low
65(7) 511(2)	Middle River	0	Zero
65(8) 510(6)	Nyanza	2	Low
67(9) 513(7)	Mount McCurdy	0	Zero
66(7) 513(7)	Maggie Brook	5	Low
66(4) 511(2)	Crowdis Mtn.	1	Low
69(5) 518(9)	Mica Hill	0	Zero
68(2) 519(9)	McEvoys Barren	3	Low
68(9) 514(4)	Indian Brook	3	Low
68(6) 520(9)	Meat Cove	5	Low
69(2) 520(6)	St. Margaret Village	0	Zero
68(4) 510(6)	Point Clear	1	Low
69(7) 517(0)	Ingonish Centre	4	Low
70(1) 518(1)	McKinnons Cove	3	Low
70(0) 517(6)	Ingonish	1	Low
66(7) 515(1)	Coinneach Bk.	0	Zero
66(5) 511(2)	Crowdis Mountain	0	Zero
67(2) 514(1)	Siefert's Lake	2	Low
67(2) 514(7)	Big Marsh	0	Zero
66(7) 513(8)	Old Highland Road	0	Zero
66(8) 511(9)	Muskrat Bk.	2	Low
66(7) 515(8)	Margaree River	0	Zero
67(7) 515(7)	Indian Brook	0	Zero
68(1) 515(8)	Highlands	2	Low
68(9) 515(9)	Gisborne Flowage	3	Low
69(1) 512(4)	Boulevardierie East	0	Zero
66(9) 514(7)	First Forks Brook	2	Low

YARMOUTH COUNTY

Grid No.	Nearest Landmark	Mean No.	Population
UTM-020		of L-2	Category
25(8) 487(8)	Lake Jesse	0	Zero
26(0) 486(2)	Tusket Falls	0	Zero
26(3) 487(1)	Raynard Lake	2	Low
26(3) 488(3)	Lake Edward	0	Zero
27(0) 485(5)	Argyle Head	1	Low
27(2) 488(1)	Kemptville	0	Zero
27(5) 487(3)	Peter's Lake	0	Zero
27(6) 486(7)	East Quinan	1	Low
27(8) 484(4)	Little Bay	3	Low
28(7) 488(8)	Bean Lake	3	Low

Appendix 4.

The frequency and relative frequency of the numbers of occurrences of L-2 class categories by county for Nova Scotia, 1985.

Class Category	Frequency of Occurrence					
	<u>Annapolis</u>		<u>Antigonish</u>		<u>Colchester</u>	
	No.	%	No.	%	No.	%
Zero	1	7.3	2	10.5	7	23.3
Low	11	91.7	7	36.8	10	33.3
Moderate	0	0.0	5	26.3	5	16.7
High	0	0.0	4	21.1	1	3.3
Extreme	<u>0</u>	<u>0.0</u>	<u>1</u>	<u>5.3</u>	<u>7</u>	<u>23.4</u>
	12	100.0	19	100.0	30	100.0
	<u>Cumberland</u>		<u>Cape Breton</u>		<u>Digby</u>	
	No.	%	No.	%	No.	%
Zero	11	14.1	14	93.3	7	38.9
Low	23	29.5	1	6.7	10	55.6
Moderate	18	23.1	0	0.0	1	5.5
High	9	11.5	0	0.0	0	0.0
Extreme	<u>17</u>	<u>21.8</u>	<u>0</u>	<u>0.0</u>	<u>0</u>	<u>0.0</u>
	78	100.0	15	100.0	18	100.0
	<u>Guysborough</u>		<u>Hants</u>		<u>Halifax</u>	
	No.	%	No.	%	No.	%
Zero	4	50.0	11	91.7	15	88.2
Low	4	50.0	1	7.3	2	11.8
Moderate	0	0.0	0	0.0	0	0.0
High	0	0.0	0	0.0	0	0.0
Extreme	<u>0</u>	<u>0.0</u>	<u>0</u>	<u>0.0</u>	<u>0</u>	<u>0.0</u>
	8	100.0	12	100.0	17	100.0
	<u>Inverness</u>		<u>Kings</u>		<u>Lunenburg</u>	
	No.	%	No.	%	No.	%
Zero	11	52.4	11	64.7	12	80.0
Low	9	42.8	6	35.3	3	20.0
Moderate	1	4.8	0	0.0	0	0.0
High	0	0.0	0	0.0	0	0.0
Extreme	<u>0</u>	<u>0.0</u>	<u>0</u>	<u>0.0</u>	<u>0</u>	<u>0.0</u>
	21	100.0	17	100.0	15	100.0

Class Category

Frequency of Occurrence

	<u>Pictou</u>		<u>Queens</u>		<u>Richmond</u>	
	No.	%	No.	%	No.	%
Zero	3	11.5	10	62.5	9	90.0
Low	4	15.4	6	37.5	1	10.0
Moderate	4	15.4	0	0.0	0	0.0
High	3	11.5	0	0.0	0	0.0
Extreme	<u>12</u>	<u>46.2</u>	<u>0</u>	<u>0.0</u>	<u>0</u>	<u>0.0</u>
	26	100.0	16	100.0	10	100.0

	<u>Shelburne</u>		<u>Victoria</u>		<u>Yarmouth</u>	
	No.	%	No.	%	No.	%
Zero	5	83.3	11	34.4	5	50.0
Low	1	16.7	20	62.5	5	50.0
Moderate	0	0.0	1	3.1	0	0.0
High	0	0.0	0	0.0	0	0.0
Extreme	<u>0</u>	<u>0.0</u>	<u>0</u>	<u>0.0</u>	<u>0</u>	<u>0.0</u>
	6	100.0	32	100.0	10	100.0
