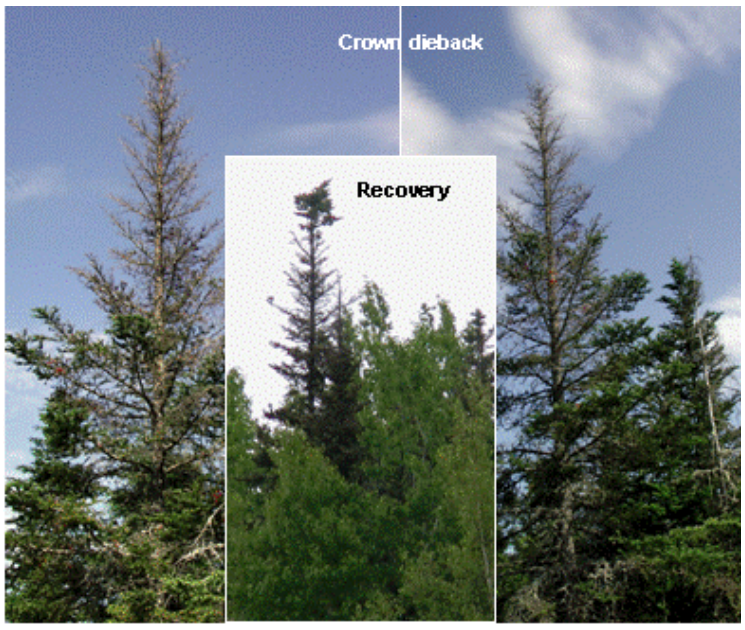
Status of forest pests in New Brunswick in 2004

Compiled by Nelson E. Carter
Department of Natural Resources
Forest Pest Management Section

New Brunswick
Natural Resources

2005

ISBN: 1-55396-193-5



<u>Cover photo</u> :

Balsam fir trees showing crown dieback and recovery from attack by Balsam Woolly Adelgid typically seen in southern New Brunswick.

Photos – D. Lavigne (NBDNR)

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aussi disponible en français

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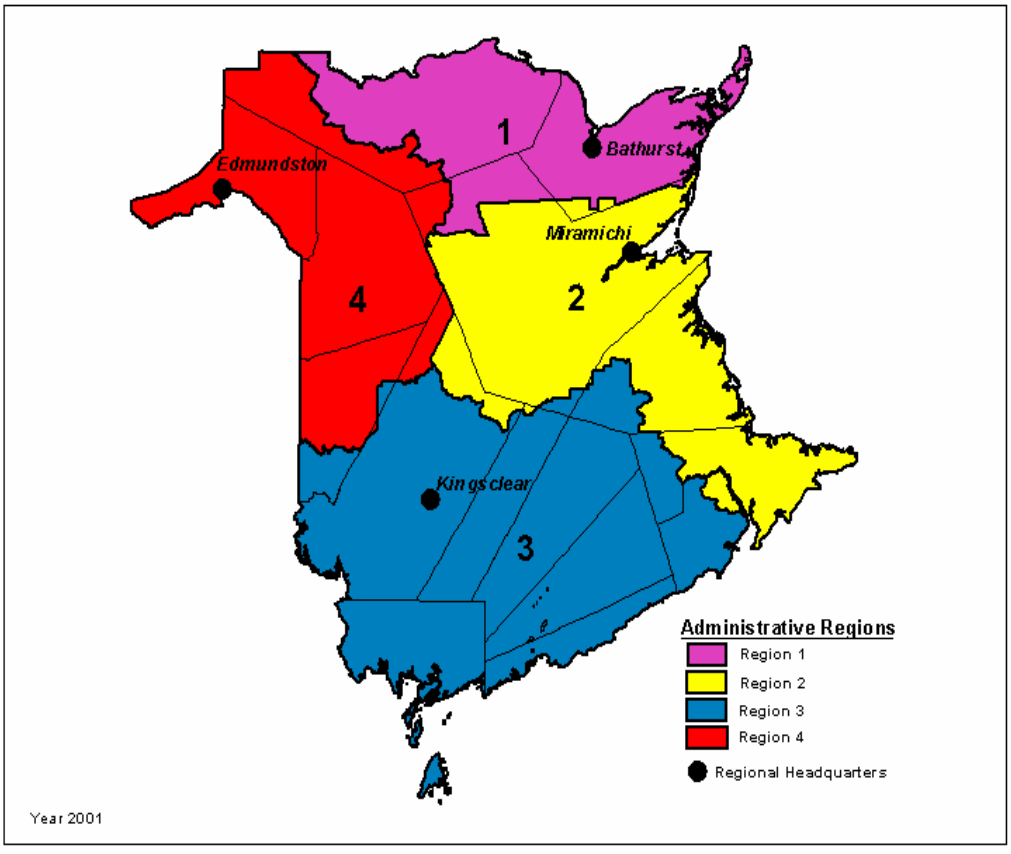

NATURAL RESOURCES ADMINISTRATIVE REGIONS

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ACKNOWLEDGEMENTS

The experience and input of many individuals is required to monitor and assess insect and disease conditions within the Province. Information and data contained in this report were made possible through the conscientious effort of staff within the New Brunswick Department of Natural Resources (DNR) and various other government, industrial and private partners.

Gratitude is extended to staff of the Canadian Forest Service (CFS), especially CFS - Atlantic (Forest Health), and the Canadian Food and Inspection Agency (CFIA) for their continued co-operation and sharing of information related to the status of pests of quarantine significance in New Brunswick.

Finally, appreciation is extended to permanent staff (L. Hartling, D. Lavigne, D. O'Shea, J. Proude, R. Farquhar and D. Winter) and casual staff (R. Hudson, M. Lewis, M. Stewart, R. Kent, E. Moreau and M. Darrah) of the Forest Pest Management Section for their valuable contributions to coordinating, conducting, analyzing and summarizing the information collected for many of the forest pest surveys in 2004

LIST OF ABBREVIATIONS USED IN THIS REPORT

CFIA	Canadian Food Inspection Agency, Agriculture and Agri-food Canada
CFS	Canadian Forestry Service, Natural Resources Canada
DNR	New Brunswick Department of Natural Resources
FPMS	Forest Pest Management Section (DNR)
PDO	Pest Detection Officer (DNR)

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SUMMARY

For Spruce Budworm in 2004, 49% of the pheromone traps were positive, slightly up from 43% in 2003, but average and maximum moth counts were similar. Pheromone trap catches were lowest back in 1997. In the over wintering larval survey, a total of 19 larvae (the most found since 1995) were found from 7 different plots (11 larvae were found on 1 branch). Although six of the positive plots were in the northwest, one was about 10 km north of Fundy National Park. Populations are well below thresholds of impending defoliation, but small and constant annual increases suggest they may be rising. Overall, the data suggest that 1997 might be the nadir of the budworm population cycle in NB, though that remains to be seen.

For Hemlock Looper, a Province-wide 2.5-fold increase in the average number of moths caught was noted in 2004 (with greatest increases in the northwest and north-central), and a follow-up egg survey was done. Although eggs were detected at 19% of the plots, the numbers were low enough that they should not result in detectable defoliation in 2005.

After three consecutive years of aerially-mapped defoliation by Gypsy Moth, none was detected in 2004. This is related to dramatic population declines caused by the past two consecutive extremely cold winters that greatly reduced egg survival, followed by increases in larval diseases in the ensuing summers. Surveys indicate that low-density populations persist in known infested areas in southern NB and at some sites distant from them. No areas of defoliation are anticipated in 2005. Egg masses at distant sites may be a result of the increased risk of movement of life-stages of this pest from infested areas during the years 2001 to 2003 when populations were extremely high; hence finding new positive sites is not surprising. New egg masses were found for the third consecutive year in Miramichi City and Upper Northampton and for the second consecutive year at Sussex and Riverview. In 2004, new and old egg masses were found for the first time in the City of Saint John. Changes to the areas regulated for quarantine purposes by the Canadian Food Inspection Agency under the federal *Plant Protection Act* seem warranted.

Fir trees with distorted, stunted and dead tops as well as "gouty" branches are symptoms of attack by Balsam Woolly Adelgid commonly noticed throughout southern NB. Population assessments at 12 indicator plots in Region 3 in the spring of 2004 revealed no change at 1 plot, decreases at 7 plots, and increases at 4 plots. The latter plots are generally closer to the Bay of Fundy and are subject to a coastal influence of warmer winter temperatures resulting in higher over winter survival of the insect. Conversely, given the extremely cold winters of the last few years especially in inland areas, survival of the insect was probably greatly reduced in these areas possibly resulting in a respite from attack. A Province wide survey in 2004 identified damage to be distributed throughout southern New Brunswick, below a line running approximately south-west to north-east from Nackawic to Miramichi. Changes to this distribution map are expected in subsequent survey years.

In general, Balsam Twig Aphid populations have declined in the past three years and if the past trend happens, they should decline again in 2005. Balsam Gall Midge populations have been low for the past three years and should remain low in 2005, but are expected to soon begin increasing once again if the past trend follows.

Butternut Canker was first confirmed by the Canadian Forest Service to be in NB in 1997 at 5 sites near Woodstock. In 2004, they confirmed several more positive sites. This disease is a concern to the natural biodiversity of NB's forests. It is possible that butternut trees will be named under the Canadian *Species at Risk Act* in 2005.

There were no reported changes for other foreign pests including: Brown Spruce Longhorn Beetle (absent), Pine Shoot Beetle (absent), European Larch Canker (present throughout southern NB), and European Race of Scleroderris Canker of Pines (known only at 3 sites in north-western NB).

Beech mortality associated with Beech Bark Disease has been more noticeable in the past few years, especially in the west-central and north-western parts of the Province. Variable Oak Leaf Caterpillar caused some localized hardwood defoliation in central NB in 2004, and nests of the Fall Webworm were common on roadside hardwood trees throughout the Province.

Populations of Jack Pine Budworm, Whitemarked Tussock Moth, Rusty Tussock Moth, Yellowheaded Spruce Sawfly, Forest Tent Caterpillar, and Satin Moth remained at or below detectable low levels.

With the exception of beech mortality, no other significant areas of damage were noted in the aerial survey except occasional patches of hardwood dieback, possibly caused by miscellaneous insects, diseases and abiotic factors over past years.

Minor pest problems occurred in some of DNR's seed orchards (i.e., spruce cone maggot, yellowheaded spruce sawfly, and white pine weevil).

There were no pest related enquiries from DNR's Kingsclear Tree Nursery.

STATUS OF FOREST PESTS IN NEW BRUNSWICK IN 2004

Introduction

Outbreaks of minor and major forest pests occasionally occur and cause variable amounts of growth loss and tree mortality. Besides affecting the natural forest, outbreaks can adversely affect high-value reforestation and tree improvement programs, from nurseries to seed orchards, to plantations and thinned stands. Thus, long-term forest management plans are constantly under threat of possible compromise from unwanted pest outbreak. In addition to timber losses, major effects can be caused to non-timber values such as terrestrial and aquatic wildlife habitat, recreational sites and aesthetics.

Besides native pests, today's global economy brings increased risk from the accidental introduction of insects and diseases from around the World. Such introductions could not only cause direct impacts on natural forests and the environment, but also indirect economic impacts through regulations placed on domestic, national, or international movement of goods. These trade issues can negatively affect the ability of small and large companies to be competitive in local and global markets. For all these reasons, it is necessary to know about the status of forest pests and the threats they pose.

Monitoring and forecasting the status of forest pests requires the use of different techniques that reflect survey objectives, pest population levels, the pest's biology, and knowledge of relationships between numbers of pests and damage. For some pests these are well established; and for others these are not. Aerial surveys provide the means to map damage in various categories to assess the extent and severity of outbreak over vast areas.

For some insects, surveys can be conducted to establish population levels by sampling appropriate locations for eggs or egg masses, depending on the female's egg laying habits. Surveys of larvae can be conducted during the insect's active feeding period, or during periods when they are inactive, such as in the over wintering stage. Surveys of pupae to estimate insect population levels are less common.

Special odours or scents, called pheromones, are given off by female insects to attract males of the same species for mating. In recent years, the identification and artificial synthesis of sex pheromones for a number of forest insects has led to the use of pheromone-baited traps as a technique to monitor these pests. This is especially true when populations are very low and not detectable by traditional survey sampling intensity for other life stages. Because these artificial lures are often very potent, they sometimes offer the opportunity to detect subtle increases that might not be as easily detected by the other means. In other instances, they might still be under development and results have to be interpreted with caution. Depending on thresholds or yearly trends, these surveys could result in the implementation of other methods to forecast levels of damage expected the ensuing year.

One of the cornerstones of DNR's pest monitoring program is the use of pheromone traps for the early detection of changes in population levels of many softwood and hardwood forest pests, before they increase to potential outbreak status. It is important, however, to be aware that the number of insects captured in a trap is greatly influenced by the type of lure used, its concentration, the trap design and the insect species itself. Therefore, a moth count considered to be biologically significant for one species may be insignificant for another by several orders of magnitude. Consequently, the absolute number of insects in a trap is not as important as the trends between years and over time.

INSECT PESTS OF SOFTWOODS

Spruce Budworm
Choristoneura fumiferana (Clem.)

Spruce budworm is a notorious pest of balsam fir and various species of spruce. From the 1950s to the 1990s, it was a perennial pest of the softwood forests of New Brunswick and many other jurisdictions in eastern North America. The last detectable area defoliated by spruce budworm in New Brunswick (4 000 ha) occurred in 1995 (Figure 1). No operational controls have been applied since 1993 on Crown land and in 1995 by J.D. Irving, Limited on their freehold lands. No defoliation was forecast for 2004 and none was detected.

Although few larvae and low moth counts have persisted since the mid-1990's, analysis of the pheromone trap survey data indicates that populations have started to show a small but fairly constant increase. This might imply that 1997 could have been the nadir of spruce budworm populations in the Province, but the picture will become clearer over the next few years.

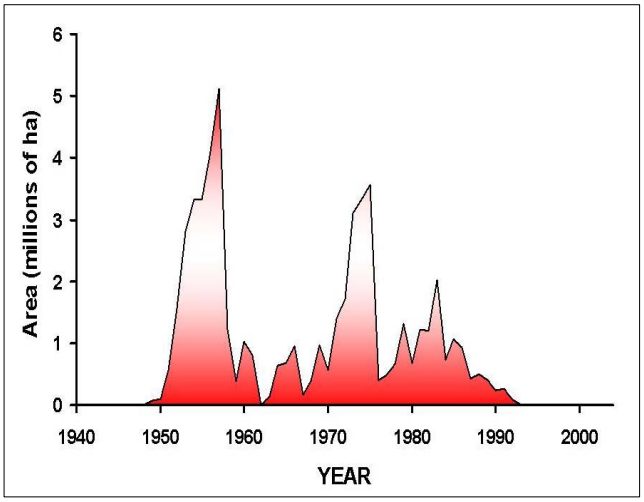

Figure 1. Moderate and severe defoliation caused by spruce budworm in New Brunswick from 1949 to 2004.

Pheromone Survey: In 2004, FPMS distributed Multipher pheromone traps at locations evenly distributed throughout the Province (Figure 2). Reviewing past data indicates that pheromone trap catches were lowest in 1997, followed by four consecutive years with increases in the proportion of traps that caught moths, and corresponding slight increases in mean number of moths/trap (Table 1). This trend did not continue in 2002; though mean trap catch was still above 1997 levels. In both 2003 and 2004, the percent of positive traps increased from 2002, but was not as many as in 2001.

In addition to the Provincial pheromone trap survey done by FPMS, JD Irving, Limited conducts a similar survey on their freehold limits in their Districts of Black Brook, Deersdale, and Sussex. Their trap results (from 78 plots) were similar to the provincial survey done by FPMS.

L2 Survey: An overwintering L2 survey was also conducted by FPMS throughout the Province (Figure 3). In 1998, DNR began using a combination of sampling intensities consisting of a 'traditional' set of 50 plots, where 3 trees/plot are sampled; and another 25 more intensive plots, where 30 trees/plot are sampled. Additional plots are added as deemed necessary in any particular year, and this may also be followed by supplementary sampling to refine the population forecast.

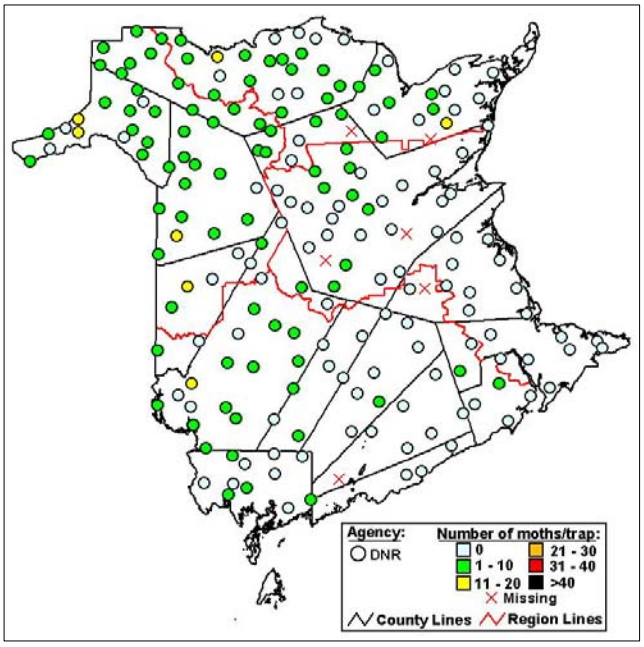

Figure 2. Distribution of spruce budworm pheromone traps and results of the 2004 survey.

Table 1. Summary of spruce budworm pheromone trap surveys conducted by FPMS from 1995 to 2004.

Year	Number of traps	% of traps positive	Number of moths/trap (range)			Maximum trap catch	Mean trap catch
			Nil	1-10	>10		
1995	296	58%	42%	50%	8%	47	3.27
1996	99	47%	53%	41%	6%	54	3.24
1997	148	27%	73%	27%	0%	6	0.49
1998	148	33%	67%	33%	0%	10	0.95
1999	155	41%	59%	41%	<1%	12	1.05
2000	154	45%	55%	42%	3%	25	1.67
2001	197	58%	42%	50%	8%	32	2.90
2002	198	35%	65%	33%	2%	12	1.02
2003	198	43%	57%	39%	4%	18	1.89
2004	196	49%	52%	45%	4%	17	1.86

In 2003, a total of 8 larvae were found in the FPMS operational survey (Table 2). These all came from plots where 30 trees were sampled (1 plot had 5 larvae on a single branch; 3 other plots each had 1 larva.

In 2004, a total of 19 L2 larvae were detected at 7 plots (i.e., two 3-tree plots, and five 30-tree plots). Six plots each yielded only a single larva, but one 30-tree plot yielded 13 larvae of which 11 came from a single branch (Table 2). Another 30 trees were sampled at this same plot but no more larvae were detected. In total, 24 plots more than the baseline 75 plots were sampled (for an overall total of 1269 branches) The seven positive plots were located as follows: 2 on the panhandle, 1 near Miller Lake , 1 south of Dalhousie, 1 east of Grand Falls, 1 south of Perth-Andover, and 1 north of Fundy National Park.

In addition to the FPMS L2 surveys JD Irving, Limited conducts similar surveys on their freehold limits and submits samples for FPMS to process. In 2004, they submitted 49 samples from the Black Brook District, and 10 plots from Deersdale. One plot had a single larva detected.

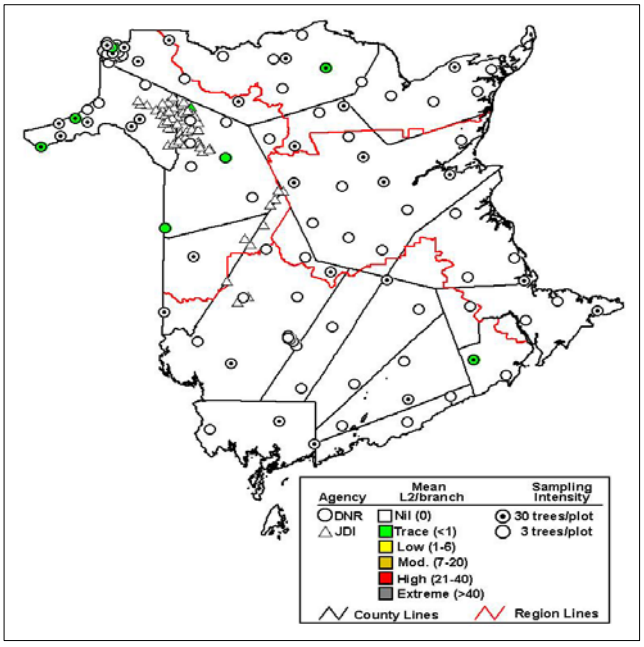

Figure 3. Distribution of spruce budworm L2 samples and results of the initial 2004 fall survey.

Table 2. Summary of over wintering spruce budworm larvae detected in L2 surveys (except supplementary plots) conducted by FPMS from 1995 to 2004.

Year	Number of plots	Number of trees/plot	Number of branches	Number (%) of plots with L2	Number of L2
1995	814	3	2442	28 (3.4%)	65
1996	503	3	1509	3 (0.6%)	8
1997	317	3	951	2 (0.6%)	2
1998	75	3 & 30	900	3 (4.0%)	4
1999	75	3 & 30	900	0 (0.0%)	0
2000	75	3 & 30	900	1 (1.3%)	5
2001	78	3 & 30	909	1 (1.3%)	1
2002	75	3 & 30	900	1 (1.3%)	1
2003	79	3 & 30	1020	4 (5.1%)	8
2004	99	3 & 30	1269	7 (7.1%)	19

Jack Pine Budworm
Choristoneura pinus pinus Free

This insect is a potentially significant pest of jack pine as evident by periodic severe outbreaks in Ontario and Manitoba. Defoliation by jack pine budworm in New Brunswick has not been reported since 1983, though monitoring is conducted annually because of the importance of natural jack pine stands and plantations for the Provincial wood supply. No defoliation was forecast for 2004 and none was detected

In 2004, pheromone trapping indicated that populations of jack pine budworm remain at endemic levels in the Province. No defoliation was forecast for 2005, and no control was necessary.

Pheromone Survey: Since 1997, FPMS has placed out Delta traps at selected areas representing plantations and natural stands throughout the Province (Figure 4). In 2004, to improve the quality of samples and make species identification more precise FPMS began to use Multi-pher 1 traps (which contain a killing strip) instead of using Delta traps (having sticky Tanglefoot to catch the insects).

No moths were caught in the first year, but since then traps have annually caught moths, albeit in low numbers, with the maximum being 41 moths in a single trap in 1999 (Table 3). In that year, a follow-up L2 survey was done, but no larvae were detected. Moth catches remained low in 2004.

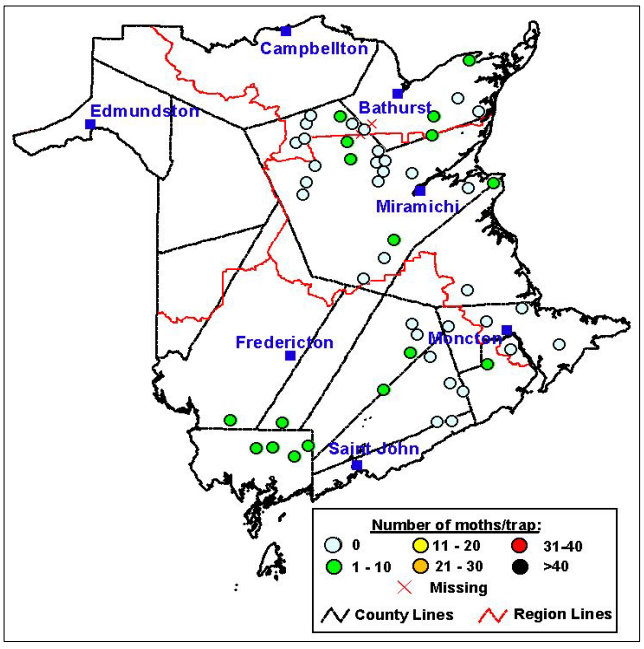

Figure 4. Distribution of jack pine budworm pheromone traps and results of the 2004 survey.

Table 3. Summary of jack pine budworm pheromone trap surveys conducted by FPMS from 1997 to 2004.

Year	Number of traps	% of traps positive	Number of moths/trap (range)					Trap catch (range)	Mean trap catch
			0	1-10	11-20	21-40	>40		
1997	46	0%	46	0	0	0	0	0	0.00
1998	52	42%	30	22	0	0	0	0 – 8	1.42
1999	51	55%	23	23	4	0	1	0 – 41	3.25
2000	51	27%	37	13	1	0	0	0 – 17	1.45
2001	51	57%	22	24	1	4	0	0 – 30	1.51
2002	51	41%	30	18	2	1	0	0 – 22	1.92
2003	50	26%	37	12	1	0	0	0 – 14	1.12
2004	50	34%	33	17	0	0	0	0 – 10	1.46

Hemlock Looper
Lambdina fiscellaria fiscellaria Gn.

This insect is a menacing pest of hemlock and balsam fir. It can kill trees within a single year due to its wasteful feeding habits. Besides consuming entire needles, it also partially eats many needles causing them to die. Severe outbreaks are common in Newfoundland and Québec. The only reported outbreak of hemlock looper in New Brunswick occurred from 1989-1993. Areas affected were in the northwestern, north-central and southwestern parts of the Province. In the north, the CFS estimated about 650 000 m^3 of merchantable balsam fir were killed during this period, though salvage harvesting by Fraser Inc. and Repap New Brunswick Inc. reduced the volumes actually lost. Controls were applied in 1990, 1991 and 1993.

Since 1997, populations have been monitored using a network of pheromone traps throughout the Province. Supplementary egg surveys are conducted when needed. Populations had increased in 2000, hinting an impending outbreak (Table 4), but decreased in 2001, though defoliation was mapped over 760 ha that year. In 2002 and 2003, no defoliation was recorded and trap catches resembled those of 1997-1999.

In 2004, however, a 2.5-fold Province-wide increase over last year's mean trap catch occurred, somewhat resembling the increase seen in 2000. Highest trap catches occurred in the extreme northwest close to the Québec border and in the north-central parts of the Province. Subsequently, a follow-up egg survey was done to see if populations were high enough to anticipate noticeable defoliation in 2005. No defoliation was forecast for 2005 and no control was needed.

Pheromone Survey: A pheromone trapping survey (1 Multipher trap/site, baited with 10-μg strength lures) was conducted at locations throughout the Province by FPMS (Figure 5) and by J.D. Irving, Limited on their freehold limits in their Districts of Black Brook, Deersdale, and Sussex.

The overall Provincial mean trap catch (157 moths/trap) was approximately 2.5 times last year and was greater than the previous three years (Table 4). Moreover, population increases occurred throughout most of the Province (e.g., increases occurred at 87% of the plots sampled both years) much the same as occurred in 2000. Whether this signals an impending outbreak or populations will subside as in 2001 remains to be seen, but a follow-up egg survey was done (see following).

Trap catches from J.D. Irving, Limited (74 plots) were similar to those from the Provincial survey.

Table 4. Summary of hemlock looper pheromone trap surveys conducted by FPMS from 1997 to 2004.

Year	Number of traps	Mean trap catch*	Moths/trap (range)*
1997	103	92	0 – 448
1998	95	71	0 – 524
1999	98	69	3 – 411
2000	99	230	3 – 863
2001	199	89	0 – 837
2002	101	77	0 – 444
2003	98	64	0 – 342
2004	101	157	6 – 1127

** Numbers are based on pheromone lure strength of 10-µg. For 1997 to 2000, the numbers of moths/trap (using 200-µg lure) were converted to estimates of moth catches using 10-µg strength lure using the equation: Y = 0.565X + 1.469 developed from a 3-year study (1998 – 2000)*

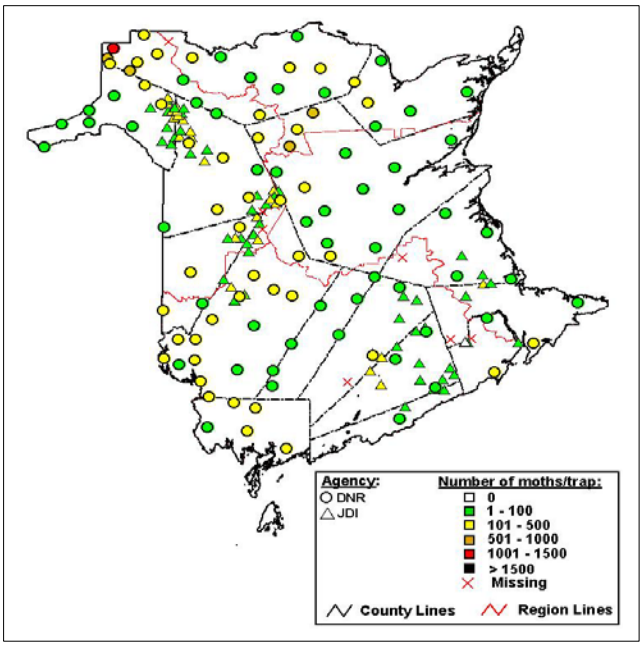

Figure 5. Distribution of hemlock looper pheromone traps and results of the 2004 survey.

Egg Survey: A total of 161 plots were sampled by FPMS for hemlock looper eggs (Figure 6). Each plot consisted of one 100-cm lower-crown branch taken from each of 3 balsam fir trees. Although eggs were detected at 19% of the plots (Table 5), our past experience suggests that these numbers are not sufficiently high enough to forecast areas of defoliation for 2005. Only 3 eggs appeared parasitized but this is might be an underestimate due to laboratory rearing procedures.

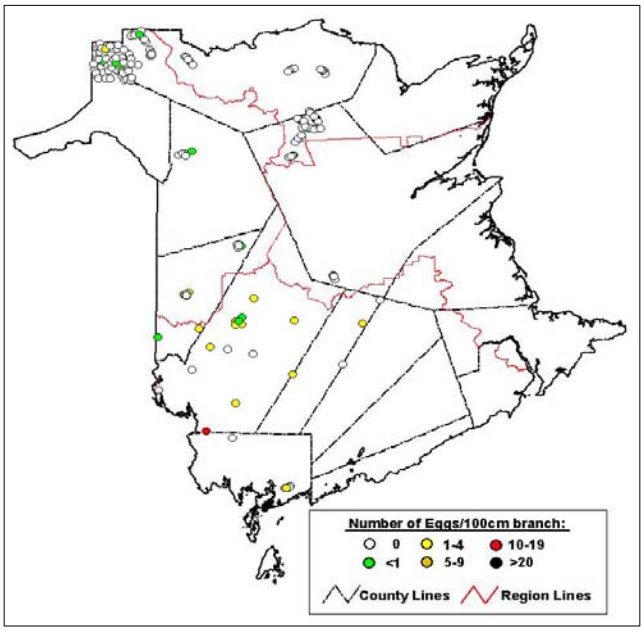

Figure 6. Distribution of plots sampled for hemlock looper eggs and results of the 2004 survey.

Table 5. Summary results of the hemlock looper egg survey conducted by FPMS in 2004.

	Mean number of healthy* eggs/branch						
	0	<1	1 - 4	5 - 9	10 - 19	20+	Totals
Number of plots	131	10	17	2	1	0	161
Percent of plots	81	6	11	1	1	0	100

* i.e., no sign eggs had been parasitized when they were extracted in the lab process.

Whitemarked Tussock Moth
Orgyia leucostigma (J.E. Smith)

This insect can feed on a number of different hardwood and softwood tree species. Damage is less severe on hardwood trees because these hosts normally loose their leaves annually, and can produce a second set of leaves within the same year after defoliation by a pest. Most significant damage occurs on balsam fir, and under extreme populations trees can be killed in a single season. The last outbreak of this pest occurred in the 1970s in both New Brunswick and Nova Scotia. In 1975, the area defoliated in New Brunswick was 25 000 ha, and in 1976 it was 202 400 ha. Thus, the population explosion of this insect in Nova Scotia in 1997 coupled with their forecast for 1998 caused great interest in New Brunswick.

Since 1998, however, annual monitoring has not revealed any significant populations in this Province. No defoliation has yet been detected and none is expected in 2005.

Pheromone Survey: FPMS initiated a pheromone trapping survey in 1998 to monitor populations of whitemarked tussock moth. In 2004, Multipher traps were placed out in the southeast (mostly) and some southwestern locations in the Province (Figure 7). These locations reflect the distribution of defoliation in New Brunswick in historic Maritimes outbreaks. Very few moths have ever been caught, or any evidence of defoliation detected. Only a single adult whitemarked tussock moth was caught in 2002 (Table 6). There is some concern about the sensitivity of the operational lure available for monitoring this insect.

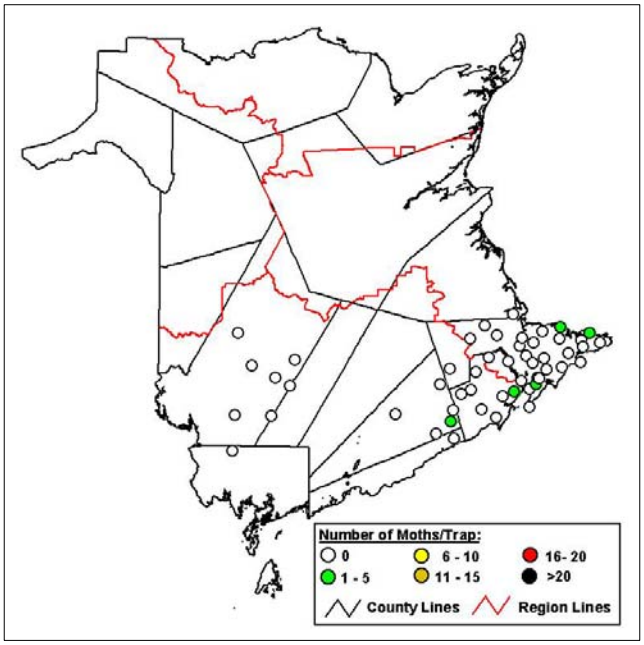

Figure 7. Distribution of whitemarked tussock moth pheromone traps and results of the 2004 survey.

In 2003, however, there was an increase in the percent of traps that caught moths and a corresponding increase in mean trap catch (Table 6). An egg mass search was done at five positive sites, but no egg masses or other life stages were detected. There was no significant change in 2004. Populations remain at endemic low levels and no defoliation is anticipated in 2005

Table 6. Summary of whitemarked tussock moths caught in pheromone trap surveys conducted by FPMS from 1998 to 2004.

Year	Number of traps	Number (%) of positive traps	Number of moths/trap (range)	Mean trap catch
1998	59	5 (8%)	0 – 4	0.17
1999	57	2 (4%)	0 – 2	0.05
2000	54	2 (4%)	0 – 1	0.04
2001	49	0 (0%)	0	0.00
2002	49	1 (2%)	0 – 1	0.02
2003	49	6 (12%)	0 – 4	0.20
2004	51	5 (10%)	0 – 1	0.10

Rusty Tussock Moth
Orgyia antiqua L.

This insect, of European origin, is now transcontinental in distribution. It is highly polyphagous and can attack most conifers and hardwoods. Outbreaks are usually small and of short duration, and are not common in New Brunswick, but they have been reported several times in Newfoundland.

Each year since 1998, pheromone traps used for detecting whitemarked tussock moth have also caught moths of this closely related species (Table 7, Figure 8).

Although there was a significant increase in percent of positive traps in 2002, the percentage declined in 2003 and again in 2004 (Table 7). So far, no defoliation has been detected, thereby suggesting that the numbers of moths being caught are below the threshold of impending detectable feeding due to this insect, and hence below an indication of when an egg survey might be needed.

Table 7. Summary of rusty tussock moths caught in pheromone trap surveys conducted by FPMS from 1998 to 2004.

Year	Number of traps	Number (%) of positive traps	Number of moths/trap (range)	Mean trap catch
1998	59	19 (32%)	0 – 9	0.9
1999	57	20 (35%)	0 – 11	1.4
2000	54	14 (26%)	0 – 10	0.8
2001	49	19 (39%)	0 – 20	1.8
2002	49	30 (61%)	0 – 18	1.5
2003	49	21 (43%)	0 – 12	1.3
2004	51	17 (33%)	0 – 10	1.0

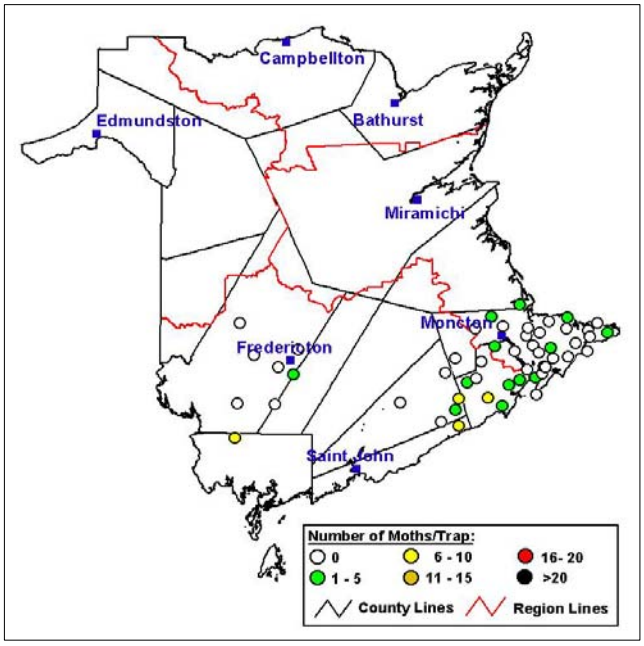

Figure 8. Distribution of pheromone traps that caught rusty tussock moth adults in 2004.

Balsam Twig Aphid
Mindarus abietinus Koch

This insect is not a significant forest pest, though it can be a major problem for the Christmas tree industry. Populations of balsam twig aphid were monitored around the Province by assessing their presence on balsam fir branch samples collected for the spruce budworm L2 survey (Figure 9). Data from previous years indicate a tendency for balsam twig aphid populations to increase and decrease in general synchrony throughout the Province (though local variations do occur).

Results indicate that the percent of plots with detectable presence of this pest was 87% in 2001, declining to 70% in 2002, and down to 61% in 2003. The decline continued to 36% in 2004 (Figure 10), and if the past trend continues, populations should decline

further in 2005. Nonetheless, the data are from a limited number of plots and local conditions vary, hence Christmas tree growers should continue annual vigilance.

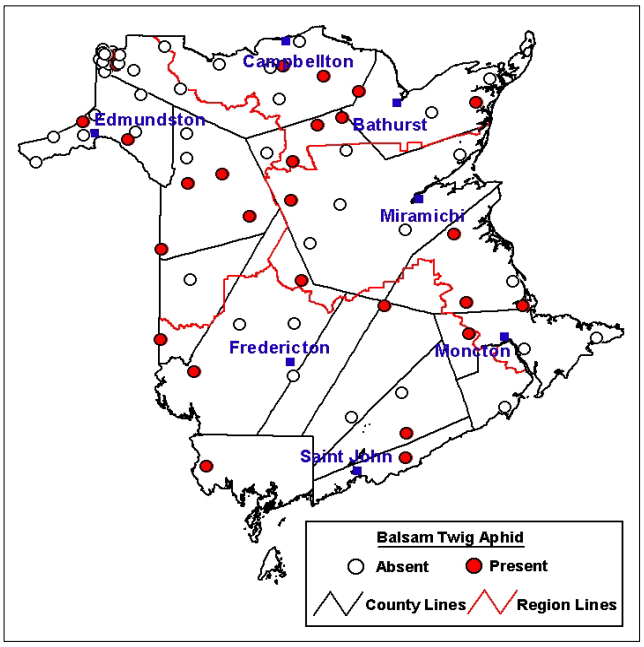

Figure 9. Distribution of locations assessed for balsam twig aphid in 2004.

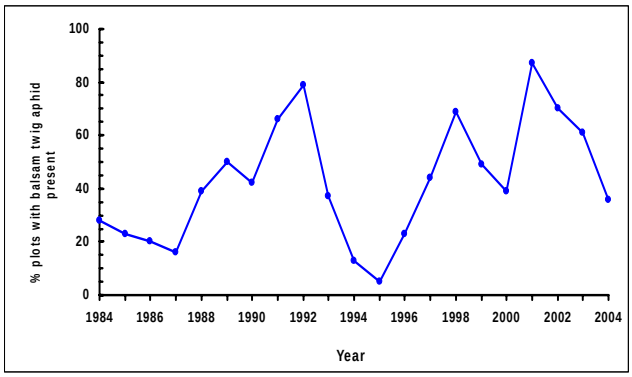

Figure 10. Provincial changes in populations of balsam twig aphid from 1984 to 2004.

Balsam Gall Midge
Paradiplosis tumifex Gagné

This insect is also not considered a significant forest pest, but like the balsam twig aphid it can be a problem for Christmas tree growers. Populations of balsam gall midge were also monitored around the Province by assessing their presence on balsam fir branch samples collected for the spruce budworm L2 survey (Figure 11). As with balsam twig aphid, previous years' data indicate a tendency for balsam gall midge populations to increase and decrease in general synchrony (with some local variations) throughout the Province.

Overall results for the Province indicate that the percent of plots with detectable presence of this pest declined in each succeeding year from 2000 to 2003 going from 65% to only 4% of the plots positive (Figure 12). Similarly in 2004, only 4% of the plots were again positive. Consequently, if the population trend from the last two cycles repeats, numbers should be low for several years. Nonetheless, the data are from a limited number of plots and local conditions vary, hence Christmas tree growers should continue annual vigilance.

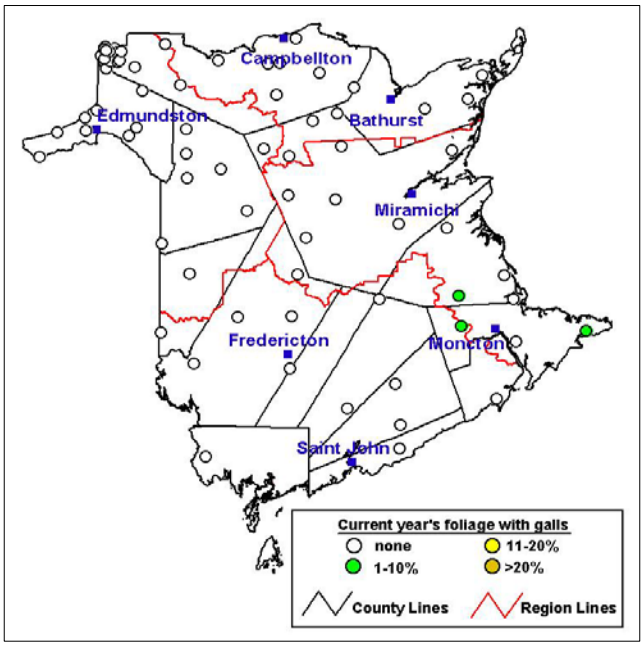

Figure 11. Distribution of locations assessed for balsam gall midge in 2004.

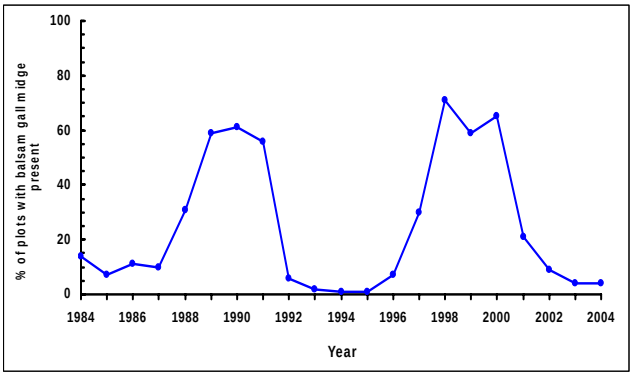

Figure 12. Provincial changes in populations of balsam gall midge from 1984 to 2004.

Balsam Woolly Adelgid
Adelges picea (Ratz.)

This is a European insect first found in the Maritimes in the early 1900's and in Québec in 1964. It only occurs on true firs of the genus *Abies*. The insect has a complex life cycle, and can have two or three generations per year. Over the years, it has become a pest in the Atlantic Provinces, the northeastern and northwestern States, and southern British Columbia. In eastern Canada, damage became severe in many locations during the 1960s and 1970s. In New Brunswick, its damage has been overshadowed by perennial epidemics of spruce budworm.

The insect feeds by inserting its pointed mouth parts into the bark and sucking nutrients from the tree. Severe attack can cause growth loss, dead tops, tree mortality, and the production of dense compressed wood of reduced quality for pulp. Symptoms of attack can be (a) swelling of nodes on branches causing a "gouty" appearance, (b) abnormal, flattened tops or (c) patches of white 'wool-like' substance (that covers their bodies) on tree trunks.

In 2000, heavy attack and some tree mortality was reported in young balsam fir trees of varying ages, from 1-8 m tall at two sites south of Sussex. In 2001, general reports of trees with symptomatic "gouty tops" seemed to be more common throughout southern New Brunswick, though no specific survey was conducted. It has been speculated that a series of generally milder winters might be contributing to population increases, because mortality of dormant stages increases when temperatures reach – 20°C and is complete at – 37°C.

In 2002, FPMS examined 260 stands in southern New Brunswick and 85 (32.7%) were positive. In 75% of these positive stands,

<10% of the trees sampled had any evidence of damage, and this was predominantly light. Only 13% of the positive stands had trees with moderate damage. Observations of damage were also recorded at other locations during other routine pest surveys.

In the spring of 2003, samples of balsam fir branch tips from 13 locations indicated that over wintering populations above the snow line could have been substantially reduced due to the extremely cold temperatures experienced during the winter of 2002-2003, though precise quantitative assessments were not made.

In the spring of 2004, the same plots were again sampled (but one had been cut). Population estimates indicated no change at 1 plot, decreases at 7 plots and increases at 4 plots. The latter plots are generally closer to the Bay of Fundy and are subject to a coastal influence of warmer winter temperatures resulting in higher over winter survival of the insect. Conversely, given the extremely cold winters of the last few years especially in inland areas, survival of the insect was probably greatly reduced in these areas possibly resulting in a respite from attack.

Also in 2004, a Province wide survey at 221 permanent pest monitoring plots identified symptoms of balsam wooly adelgid damage on balsam fir distributed throughout southern New Brunswick, below a line running approximately south-west to north-east from Nackawic to Miramichi (Figure 13). Fine tuning of this distribution map is expected in subsequent survey years.

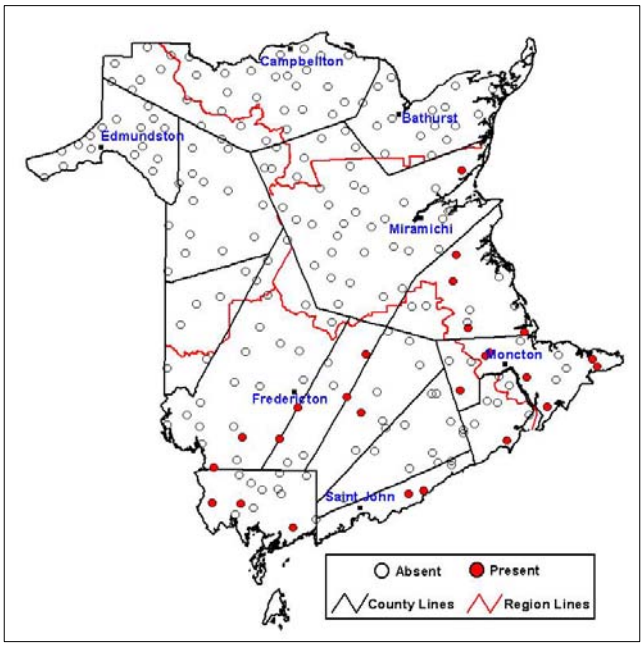

Figure 13. Distribution of locations showing symptoms of damage caused by balsam woolly adelgid.

Yellowheaded Spruce Sawfly
Pikonema alaskensis (Roh.)

In the early to mid-1990s, the yellowheaded spruce sawfly caused concern due to its increased presence in numerous spruce plantations (including some tree mortality) in south-eastern and north-central parts of the Province. In 2003, a total of 73 locations with a history of damage were re-assessed for damage or presence of the insect. Current-year damage was only detected at 8 locations at very low levels, and only 24% of the plantations showed any evidence of previous damage. An additional infested plantation was detected in the northwest in Region 4 during the aerial survey. No specific survey was done for this insect in 2004.

Brown Spruce Longhorn Beetle
Tetropium fuscum (Fabr.)

This foreign insect was confirmed present in Nova Scotia in the spring of 2000. Subsequent investigations by federal authorities revealed that it had actually been detected in 1990, but unfortunately had been mistaken for a similar native species (i.e. the eastern larch borer). In its native range in Europe and Asia, this insect mainly attacks weakened Norway spruce, other spruce species, fir, pine and larch.

In Nova Scotia, it has attacked red spruce, as well as white, black and Norway spruce. If it spreads, it could pose significant direct threats to North American softwood forests and indirect threats to the forest industry (e.g. quarantine restrictions). To prevent this,

the Canadian Food Inspection Agency (CFIA) initiated an eradication program in Nova Scotia (under the federal *Plant Protection Act*). A future outbreak of spruce budworm (or other pest) could enhance the potential for tree mortality if defoliated and weakened host trees subsequently become infested with this new pest. Similar concerns are being expressed due to the aftermath of Hurricane Juan that occurred in Nova Scotia on September 29th, 2003. So far, surveys have not detected its presence in New Brunswick.

Pine Shoot Beetle
Tomicus piniperda (L.)

This insect is recognized as one of the most destructive bark beetles of pines in its native Eurasia. It can attack both healthy and stressed trees, and kill trees within two years. Since 1992, this non-native insect has gradually been found from Ontario eastward into Québec and in the Lake States, ultimately reaching Oxford and Franklin Counties in western Maine in 2000 and 2001, respectfully. This insect has not yet been detected in New Brunswick.

It was first thought that this insect would only be a pest of Scots pine Christmas trees or unhealthy plantations. In 1998, however, considerable damage, including tree mortality, was found on Scots, red, white and jack pine in several counties in southwestern Ontario. It is not yet known whether Scots pine must be present to enable populations to become high enough to damage healthy trees of other pine species. Further research is necessary, though anecdotal reports seem promising at this time. Regulations are in place in Canada (administered by CFIA) and the United States restricting the movement of pine material from infested to non-infested areas.

In 2000, the CFIA and the CFS conducted a detection survey at six sites in northern New Brunswick, but no pine shoot beetles were found. In 2001 and 2002, traps were set at 10 sites, but these were again negative. No traps were placed out in New Brunswick in 2003. Traps were again placed out in 2004, but no beetles were found.

DISEASES OF SOFTWOODS

European Larch Canker
Lachnellula willkommi (Htg.) Dennis)

This disease was first found by the CFS in New Brunswick in 1980. It is capable of killing mature and immature trees. Ultimately, a quarantine zone was implemented by the CFIA under the federal *Plant Protection Act* (Figure 14).

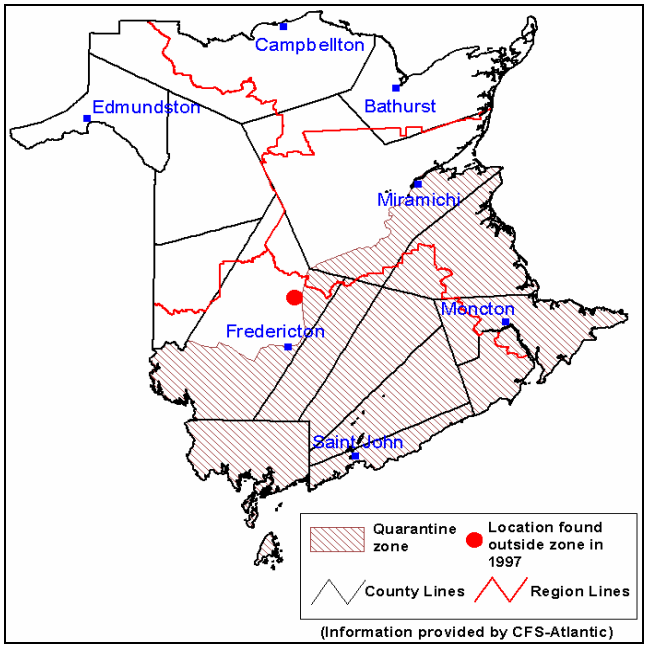

Figure 14. Area of New Brunswick considered infested with European larch canker for quarantine purposes since 1986.

In 1997, the CFS found one new site positive for European larch canker just outside the quarantine zone (but no change was made to the regulated area). In 1998, 1999, and 2000, surveys done by the CFS did not detect any new sites positive for European larch canker outside the regulated area. No specific survey has been done for this disease since then.

Scleroderris Canker of Pines
Gremmeniella abietina (Lagerb.) Morelet

The North American race of this fungus causes cankers and mortality of seedlings of jack pine and red pine, and has been associated with plantation failures in other jurisdictions. It seldom causes mortality to trees over 2-m tall, though branches up to this height are affected. On the other hand, the European race is capable of causing mortality to red pine and Scots pine trees taller than 2 m.

In 1998, the CFS had confirmed only one site was positive for European Scleroderris canker of pine in the Province (in northwestern New Brunswick). That conclusion was based on re-analyses of cultures taken in the 1970s-80s, using an improved method to distinguish between the two races.

In 1999, they again took samples from that site and two other plantations within a few kilometres. The 'original' site was again confirmed positive for the European race. Samples from Scots pine at the second site were also confirmed to be European Race. Likewise, the third site proved positive, but there it was found on red pine (Figure 15). This was the first significant change for this disease within the Province since the improved method has been used.

No specific survey was conducted in 2001. In 2002, samples were obtained by the CFS from the second and third sites (i.e. Scots and red pine, respectively) and both were once again confirmed to be positive for the European race of Scleroderris. No samples were taken in 2003 or 2004.

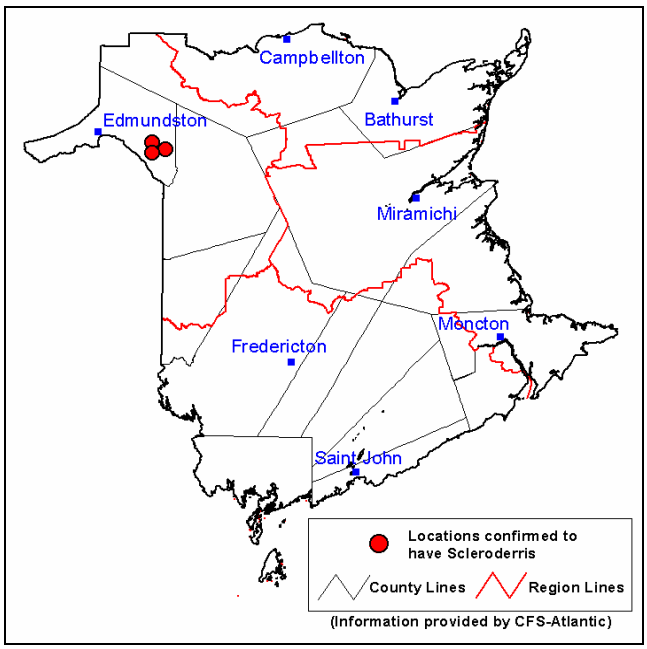

Figure 15. General location of the three sites that tested positive for the European race of Scleroderris canker of pines in New Brunswick (in 1999).

INSECT PESTS OF HARDWOODS

Forest Tent Caterpillar
Malacosoma disstria Hbn.

This insect generally defoliates poplar, but will attack numerous hardwood species during an outbreak. The most recent outbreak lasted about six years (1991 to 1996), as did the preceding outbreak (1979 to 1984) (Figure 15). The former outbreak peaked at about 0.4 million ha and the latter peaked at about 1.4 million ha. If this trend repeats, this insect might not become a problem for several more years.

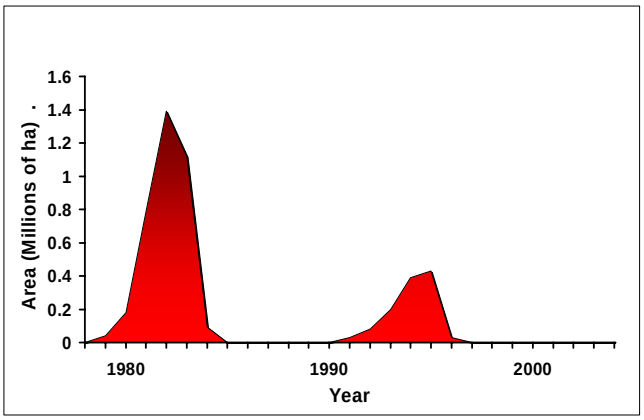

Figure 16. Area defoliated by forest tent caterpillar in the last two outbreaks in New Brunswick.

No defoliation attributed to forest tent caterpillar was noted in 1998, and only 250 ha of defoliation were recorded near Bathurst in 1999. In 2000, a few small, localized areas of hardwood defoliation were detected in the northeastern part of the Province during the aerial survey (total area was only 800 ha). In 2001, no areas of defoliation were mapped from the air, though it was recorded by ground observations in the northeast, but apparently less severe than the year before. No significant defoliation was detected in 2002, 2003 or 2004, and none is expected in 2005.

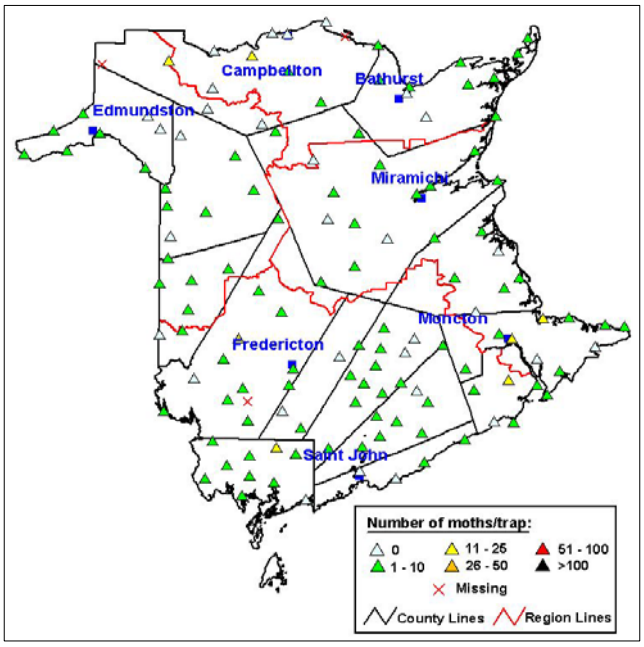

Figure 17. Distribution of forest tent caterpillar pheromone traps and results of the 2004 survey.

Pheromone Survey: In anticipation of the next outbreak of forest tent caterpillar, FPMS initiated a pheromone trapping survey in 2002 to establish baseline data for comparison in following year. Traps are well distributed at the same locations throughout the Province (Figure 17). Trap catches indicate about the same percent were positive in 2004 as in 2003 and slightly lower than in 2002 (Table 8). Maximum and mean trap catches seem to suggest a decreasing trend, but at these levels there is probably no meaningful biological difference. So far, the data do not indicate any imminent threat of defoliation.

Table 8. Summary of forest tent caterpillar moths caught in pheromone trap surveys conducted by FPMS 2002 to 2004.

Year	Number of traps	% of traps positive	Number (%) of moths /trap (range)						Maximum catch	Mean catch
			0	1-10	11-25	26-50	51-100	>100		
2002	128	88	16 (12.5)	78 (60.9)	30 (23.4)	3 (2.3)	1 (0.8)	0 (0.0)	51	7.8
2003	125	77	29 (23.2)	77 (61.6)	16 (12.8)	3 (2.4)	0 (0.0)	0 (0.0)	41	5.2
2004	130	76	31 (23.8)	92 (70.8)	7 (5.4)	0 (0.0)	0 (0.0)	0 (0.0)	23	2.7

Satin Moth
Leucoma salicis (L.)

This insect primarily feeds on leaves of poplar and willow. Since the end of the last outbreak of the forest tent caterpillar, defoliation by satin moth has been detected for several years. In 1998, an aerial survey detected defoliation over approximately 33 800 ha mostly in the same general areas attacked the previous year. In 1999, defoliation was again detected (18 021 ha) – this time distributed over wide areas in northern New Brunswick and subsiding in the southeast. One area (4 833 ha) in the southwest had dead poplar evident, most likely the result of repeated defoliation by satin moth and possible earlier weakening by forest tent caterpillar, coupled with drought for long periods in the previous two summers.

In 2000, small, scattered patches of defoliated poplar were detected at various locations (total area was 8 000 ha) during the aerial defoliation survey, but no large, contiguous areas were noted. Since then, no significant defoliation has been detected.

Greenstriped Mapleworm
Dryocampa rubicunda rubicunda (Fab.)

This is a native insect that attacks all species of maple (red and sugar being preferred) and occasionally other hardwoods. Outbreaks are usually not extensive and last only 2 to 3 years; though in the past some tree mortality has been reported from Ontario to Nova Scotia, including New Brunswick. In New Brunswick, defoliation has been reported for five periods, i.e., 1937, 1956, 1976-79, 1993-94, and 1997. In 2002, defoliation was mapped over 63 ha. Defoliation was again detected in 2003 in the same general location, but over a smaller area and was not mapped during the aerial survey. No defoliation was mapped in 2004.

Variable Oak Leaf Caterpillar
Lochmaeus manteo Dbldy.

This insect is a late-season defoliator of several hardwood species including beech, oak, and sugar maple. According to CFS records, it was first found in the Maritimes in 1952 and is occasionally a minor component in the complex of insects that defoliate hardwood trees. In 1990, they reported that the insect was last recorded in 1976. In 1994, they reported mature and under-story beech were defoliated (i.e., severe defoliation on 7 500 ha, moderate on 2 300 ha, and light on 1 500 ha). Tree mortality was reported in 1995.

In 2004, staff from Bowater Maritimes Inc. observed defoliation by this insect on beech north-west of Boiestown in central New Brunswick. Other observations by them and follow-up surveys by FPMS revealed other stands with variable degrees of defoliation in the same area.

Fall Webworm
Hyphantria cunea (Drury)

This insect, widely distributed in North America, makes webs on trees similar to those made by the eastern tent caterpillar (in June) and ugly nest caterpillar (in July). The larvae may be found from July to October feeding on many hardwood trees including birch, alder, cherry, apple, maple and elm. They cause little damage to the trees but are unsightly, often seen in agricultural areas and along roadsides. In 2004, nests were reported from many parts of the Province. Incidental sightings throughout the Province have been common in the past.

Gypsy Moth
Lymantria dispar (L.)

This insect is capable of feeding on several hundred different species of plants and shrubs ranging from ornamentals to forest trees. Many hardwoods, such as oak, poplar and birch are favoured hosts. Since 1981, gypsy moth has been gradually extending its range within southwestern and south-central New Brunswick. Over this time, the CFIA has gradually designated 30 infested Parishes in the Province as Quarantine areas under the federal *Plant Protection Act* (Figure 18).

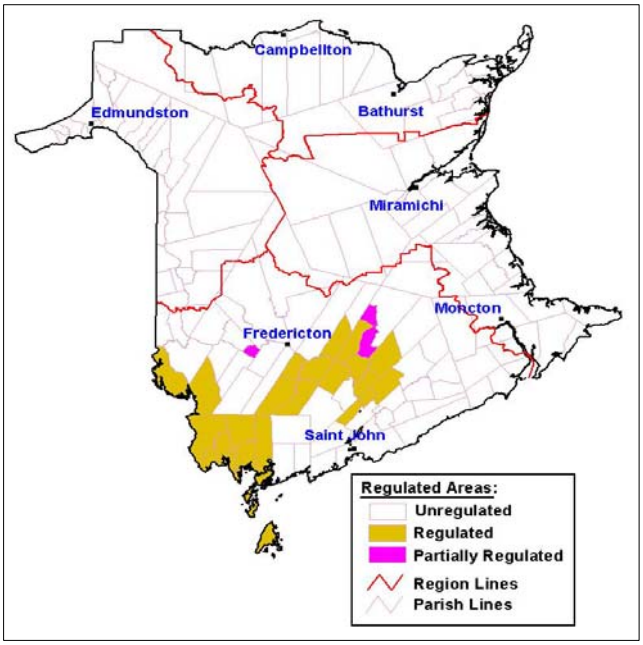

Figure 18. New Brunswick parishes deemed to be infested with gypsy moth for regulatory purposes by the CFIA under the federal *Plant Protection Act*.

Generally increasing populations between 1998 and 2000, subsequently led to defoliation over 1164 ha in 2001, 2061 ha in 2002, and 1504 ha in 2003. Populations have subsided, however, due to extremely cold temperatures over the past two winters and build-up of larval diseases and other natural enemies. No defoliation was aerially detected in 2004.

In 2004, the following gypsy moth surveys were conducted: assessment of over winter egg survival; aerial defoliation; pheromone trapping; and egg mass/life stage searching

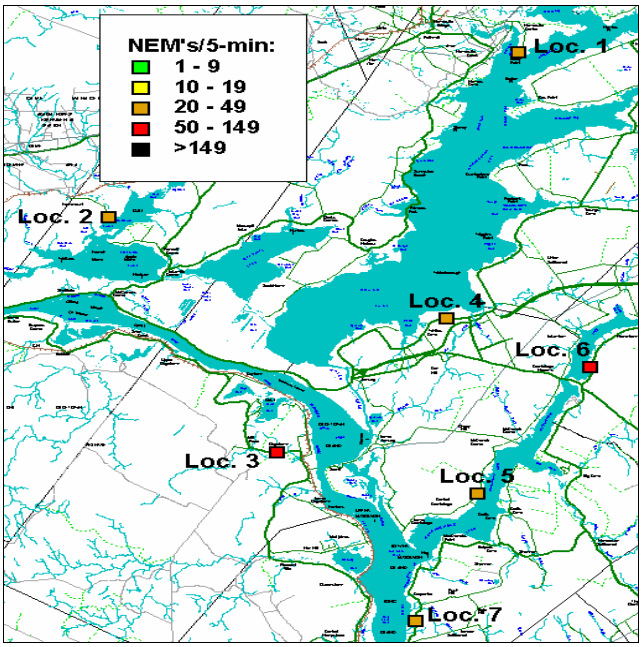

Figure 19. Locations sampled to assess over winter survival of gypsy moth eggs in south-central New Brunswick in the spring of 2005.

Assessment of over winter egg survival: Temperatures below -18°C to -25°C for extended periods can cause varying levels of mortality during the egg stage, with complete mortality occurring at temperatures of -30°C for several days or -35°C for only

several hours. During the winter of 2003-04, colder than normal temperatures occurred in January, and there were more consecutive days with lower minimum temperatures. Also, very little snow cover was recorded (e.g., the snow depth at the Fredericton Airport was < 15 cm) over much of the winter thus providing very little, if any, protection for over wintering egg masses.

Seventy new egg masses were collected from seven locations (in the general vicinity of Maquapit, Grand and Washademoak Lakes) (Figure 19) from April 1st to 6th from heights above 120 cm and below 60 cm (to represent conditions above and below snow level). Egg masses were kept separate and allowed to hatch in a laboratory after which counts of larvae and un-hatched eggs were made. At all but one location, over winter survival of eggs was higher for egg masses below 60 cm, which is consistent with previous studies. Average egg mortality differed between sites (range = 77.1 - 99.7%) with an overall mean of 85.5% which is higher than that recorded in 2002-03 (range = 44 - 79%, overall mean = 61%). Considering these high rates of over winter mortality in two consecutive years, the threat of defoliation and the risk of artificial movement of populations to other parts of the Province was greatly decreased for 2005.

Aerial defoliation survey: Given the reduction in egg mass densities due to high over winter egg mortality, little or no defoliation was expected in 2004, and none was detected by the aerial survey. General ground observations were made in areas previously defoliated and forecast to have populations, but only a few larvae were found at one location and none of the locations examined had noticeable levels of defoliation.

Pheromone Surveys: In total, 479 traps were placed out, *viz*. 110 Multipher II traps by FPMS (Figure 20); 354 Delta traps by CFIA, and 15 Delta traps by CFS/Parks Canada. All but 30 traps were retrieved (Table 8). Additional trapping was done in Moncton, Riverview, Miramichi, Fredericton and Saint John.

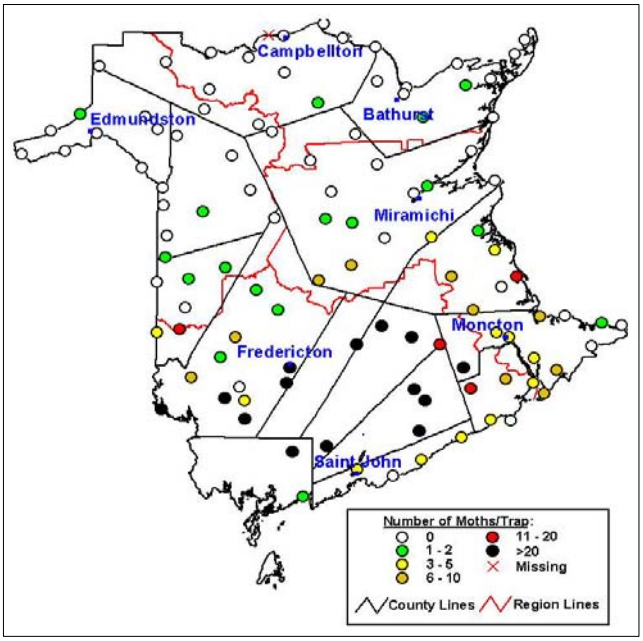

Figure 20. Distribution of gypsy moth pheromone traps placed out by FPMS and results of the 2004 survey.

Table 9. Results of cooperative gypsy moth pheromone trap surveys in New Brunswick in 2004.

Agency (trap type)**	Number of traps		Number of male moths/trap* (range)					Total male moths	Male moths/ trap
	Placed	Missing	0	1-5	6-10	11-20	>20		
CFIA (Delta)	354	25	122 *37.1*	78 *23.7*	63 *19.2*	46 *14.0*	20 *6.1*	1355	4.12
CFS-Atlantic/ Parks Canada (Delta)	15 (Kouchibouquac National Park)	4	6 *54.5*	5 *45.5*	0 *0.0*	0 *0.0*	0 *0.0*	5	0.45
FPMS** (Multipher II)	110	1	52 *47.7*	29 *26.6*	10 *9.2*	4 *3.7*	14 *12.8*	1732	15.88
All agencies combined	479	30	180 *40.1*	112 *24.9*	73 *16.3*	50 *11.1*	34 *7.6*	3092	6.89**

** Percentages in italics.*

*** Note: Different type of trap was used by FPMS.*

General – Early Detection:
Since 1998, FPMS has conducted a Province-wide pheromone trapping survey to provide early detection of gypsy moth populations in areas where life-stages are not known to be present. In 2003, FPMS changed from the traditional sticky-sided Delta traps to Multipher II non-saturating traps. This non-saturating trap, designed specifically for gypsy moth, was used in response to the high populations being found in south-central New Brunswick, and the resultant high trap catches in adjacent areas.

Results in 2004 indicate that overall trap catches and mean trap catches were less than half those observed in 2003 (Table 10). Increases in the number of traps in the lower trap catch ranges were also evident. These reductions likely relate to the lower populations initially forecast for 2004 and subsequent reductions due to high over winter egg mortality and natural control during the summer.

Table 10. Summary of gypsy moth pheromone trap surveys conducted by FPMS from 1998 to 2004.

Year (trap type)	Number of Traps		Number of male moths/trap					Total male moths	Male moths /trap
	Placed	Missing	0	1-5	6-10	11-20	>20		
2004 (Multipher II traps)	110	1	52 *(47.7%)*	29 *(26.6%)*	10 *(9.2%)*	4 *(3.7%)*	14 *(12.8%)*	1732	15.88
2003 (Multipher II traps)	110	4	42 *(39.6%)*	24 *(22.6%)*	5 *(4.7%)*	15 *(14.2%)*	20 *(18.9%)*	3721	34.77
2002 (Delta traps)	110	3	39 *(36.5%)*	17 *(15.9%)*	12 *(11.2%)*	19 *(17.7%)*	20 *(18.7%)*	1034	9.66
2001 (Delta traps)	110	5	55 *(52.4%)*	36 *(34.3%)*	5 *(4.8%)*	7 *(6.7%)*	2 *(1.9%)*	296	2.82
2000 (Delta traps)	103	6	68 *(70.1%)*	20 *(20.6%)*	3 *(3.1%)*	3 *(3.1%)*	3 *(3.1%)*	175	1.80
1999 (Delta traps)	105	3	81 *(79.4%)*	18 *(17.6%)*	2 *(2.0%)*	0 *(0.0%)*	1 *(1.0%)*	74	0.73
1998 (Delta traps)	106	1	87 *(82.9%)*	14 *(13.3%)*	4 *(3.9%)*	0 *(0.0%)*	0 *(0.0%)*	44	0.42

Co-operative Trapping in Cities: Given the high populations in south-central New Brunswick from 2001 to 2003 and the increased risk of movement of life-stages to neighboring urban areas, a co-operative early detection trapping survey was conducted with several cities in southern New Brunswick. Trapping was also continued in the City of Miramichi following the work done there from 1999 to 2003. In Moncton/Riverview and Miramichi City following initial training by FPMS, city crews placed out and collected their traps. Traps from Moncton/Riverview and Miramichi City were processed by FPMS. As in previous years, the City of Fredericton independently did its own trapping. FPMS placed traps out in the City of Saint John and did the assessments.

Moncton / Riverview: City staff placed out Multipher II traps at 48 locations. Of these sites, 20 had also been used for trapping in 2003. There was an increase in mean and maximum trap catch (range = 1 – 291 moths/trap), as well as the number and percent of traps with higher counts. Similar to 2003, an area in Riverview had the highest trap catches. This area was subsequently searched for other life-stages (see also Egg mass/life stage surveys).

Miramichi City: City crews placed out 48 Multipher II traps. Trap catches ranged from 0 to 58 moths/trap. Although the mean number of moths/trap did not change from 2003, maximum trap catches increased. Areas with highest trap catches were the same ones where life-stages other than male moths have been found. Despite the annual removal of egg masses from these areas, trap catches still indicate a resident low-level reproducing population (see also Egg mass/life stage surveys).

Fredericton: City crews placed out 46 Multipher II traps. The City Forester reported a two-fold increase in the mean number of moths/trap in 2004. Of 35 locations where trapping was done in both 2003 and 2004, increases in trap catches were noted at 29 locations (average increase = 157 moths/trap).

Saint John: FPMS crews placed out 20 Multipher traps. Trap catches ranged from 0 to 44 moths/trap. Some minor changes in trap catch were noted from 2003. One location (Riverview Park N.B. Museum) increased from 8 up to 44 moths; another location (Millidge Fire Station #8) increased from 28 up to 37 moths; and a third location (Pipeline Rd.) dropped from 38 moths, the highest

trap catch in 2003, down to 18 moths (see also Egg mass/life stage surveys).

Egg-mass/Life-stage Surveys: FPMS monitors changes in gypsy moth populations within and outside regulated areas by conducting ground searches to look for egg masses or life stages other than male moths. Survey results from these locations help to examine how populations are changing over time. In 2004, searching was conducted at: (a) locations routinely searched in southwestern and south-central New Brunswick, (b) Upper Northampton, (c) Miramichi City, (d) Moncton, (e) around Maquapit Lake, Grand Lake, Washademoak Lake, and (f) some miscellaneous areas reported by the public. Excluding searching done in the Cities a total of 131 locations were searched using a timed-walk method.

(a) Permanent Locations: Searching for egg masses has been conducted at a number of locations since 1995. Results, expressed as the number of new egg masses per person-hour of searching, from these locations help to examine how populations change over time. All locations are within areas currently regulated by the CFIA.

In 2004, two counties (Queens, Kings) had a decrease in the percent of sites with new egg masses (Table 11). Queens County includes the area where the outbreak occurred from 2001 to 2003. One county (Charlotte) increased and two counties (York and Sunbury) remained the same. Despite the good number of locations that still have new egg masses (53 of 74 or 72%), average egg mass densities decreased sharply again in all counties except Charlotte (Table 12). This is the second year that decreases have been noted since the outbreak resulting in an overall reduction in egg densities of 98% from 2002.

Table 11. Percent of sites searched annually since 1995 that had gypsy moth new egg masses in 2004.

Year	Percent of sites with new egg masses by County					
	Charlotte	Queens	Kings	York	Sunbury	Overall
1995	86	97	100	83	100	93
1996	64	79	33	50	50	55
1997	47	30	40	67	50	47
1998	59	52	17	33	50	42
1999	55	79	50	67	75	65
2000	68	94	33	67	88	70
2001	64	97	83	50	100	79
2002	36	100	67	67	88	75
2003	55	81	83	67	88	74
2004	64	75	67	67	88	72

Table 12. Number of gypsy moth new egg masses/person-hour searching at sites visited each year by FPMS from 1995 to 2004.

Year	Average number of new egg masses/person-hour of searching by County					
	Charlotte	Queens	Kings	York	Sunbury	Overall
1995	10.87	54.19	13.67	14.91	81.73	40.10
1996	4.54	11.27	0.67	6.91	79.50	9.70
1997	2.65	3.49	1.29	3.00	6.50	3.50
1998	3.74	2.93	0.25	4.06	1.20	2.90
1999	2.55	12.90	1.17	6.83	4.00	8.60
2000	17.75	59.84	4.49	32.33	20.88	39.00
2001	9.20	465.40	18.00	20.70	34.00	225.50
2002	5.50	608.00	40.83	56.50	117.38	289.44
2003	4.50	17.90	19.70	45.80	23.90	17.00
2004	5.20	4.30	4.30	16.70	11.60	6.40

(b) Upper Northampton: In 2002, new and old egg masses were found at Upper Northampton for the first time. In 2003, new and old egg masses were found for the second consecutive year. In 2004, FPMS made a brief search at a known positive site and confirmed new and old egg masses for a third consecutive year.

(c) Miramichi City: A limited amount of searching by FPMS confirmed new and old egg masses for a third consecutive year.

One old and 11 new egg masses were found in two general areas where egg masses were found in 2002 and 2003. Despite past efforts to find and destroy egg masses, low-level populations persist in the City.

(d) Moncton / Riverview : A limited amount of searching was done by FPMS in 2004. No egg masses were found in Moncton. In Riverview, 3 new egg masses were found at one location, 5 at another, and at a third site 1 new and 1 old egg mass were found. Nothing was found at last year's positive site (Moncton Golf and Country Club). Results from both years suggest a small population of gypsy moth is established in the Riverview area.

(e) Maquapit Lake – Grand Lake – Washademoak Lake: An intensive survey was conducted around these Lakes at a reduced number of sites (n =131). Sampling was decreased in each of the last two years because of declines in the population. For 125 locations common to all three years, the data show a continued reduction in both the mean number of new egg masses (53.0 in 2002; 4.3 in 2003; 0.4 in 2004) and number of locations with 10 or more new egg masses/5-minute walk (63 in 2002; 14 in 2003; 0 in 2004). A spatial comparison of results illustrates the change (Figure 21).

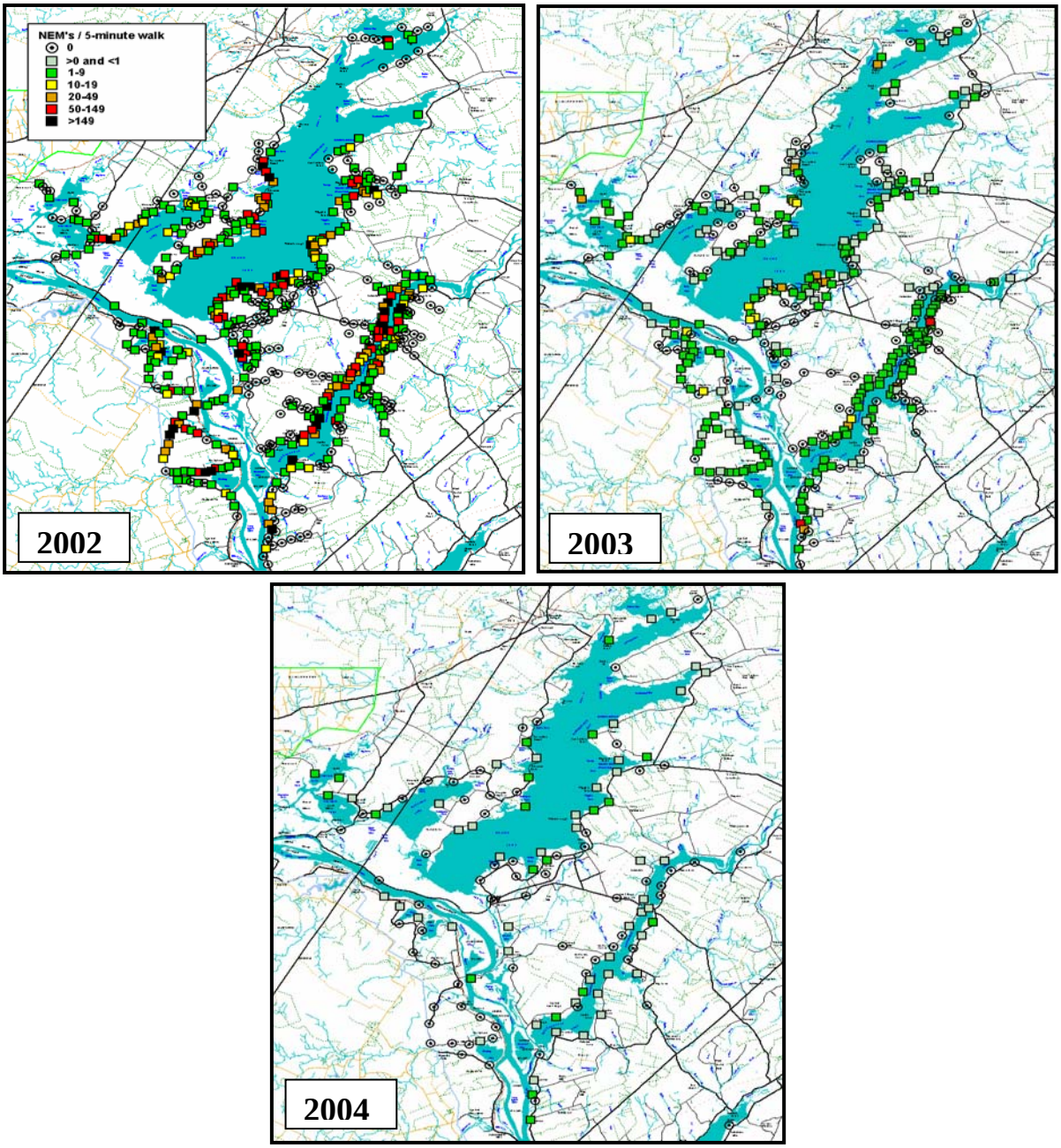

Figure 21. Distribution of sites intensively searched for gypsy moth egg masses/life stages in the general vicinity of Maquapit Lake, Grand Lake and Washademoak Lake in the fall of 2002, 2003 and 2004.

The combination of low egg survival over the winters of 2002-03 and 2003-04 followed by a high incidence of larval diseases (nuclearployhedrosis virus and the fungus *Entomophaga maimaiga*), especially during the summer of 2003, is responsible for this dramatic collapse.

(f) Saint John : A limited amount of searching was done by FPMS, but this was enough to detect 6 new and 6 old egg masses, suggesting a low-level resident gypsy moth population is present. This is the first time detecting egg masses in the City.

Outlook for 2005: Although a dramatic decline in populations is welcome, it is disconcerting that gypsy moth continues to be found at locations outside the currently regulated areas such as : Riverview (Coverdale Parish); Town of Sussex (Sussex Parish); Woodstock/Upper Northampton area (Woodstock and Northampton Parishes); City of Miramichi; and now the City of Saint John. It seems apparent that gypsy moth has been spread to other parts of the Province through the long-range movement of various goods and materials. This spread coincides with the recent period when populations were very high in south-central New Brunswick. With populations now present at these locations, it is likely the insect has gained a foothold in these areas, and it is also conceivable populations may yet be found in other new areas.

DISEASES OF HARDWOODS

Butternut Canker

Sirococcus clavigignenti juglandacearum Nair, Kosticha & Kuntz

In the United States, the disease has been destroying butternut stands; thus, it could pose a long-term threat to native butternut stands that contribute to the natural biodiversity of New Brunswick's forests. This fungal pathogen was confirmed present for the first time in this Province in 1997 (K. Harrison, CFS-Atlantic, pers. comm.). One site is located about 12-km north of Woodstock and four sites are located close together about 12-km beyond that near Stickney (Carleton County), in the western part of the Province about 20-km north of Woodstock (Figure 20). These sites are about 25-35 km from Houlton, Me. where the disease has previously been found by Maine authorities.

No new areas of infection were reported by the CFS in 1998, 1999, or 2000; and three sites they sampled in 2001 were negative. No specific surveys were done for this disease in 2002.

In 2003, the CFS collected samples from 4 sites, but none were reported positive. This year, however, they confirmed several new positive sites, some as far as 50-km further north (Figure 22).

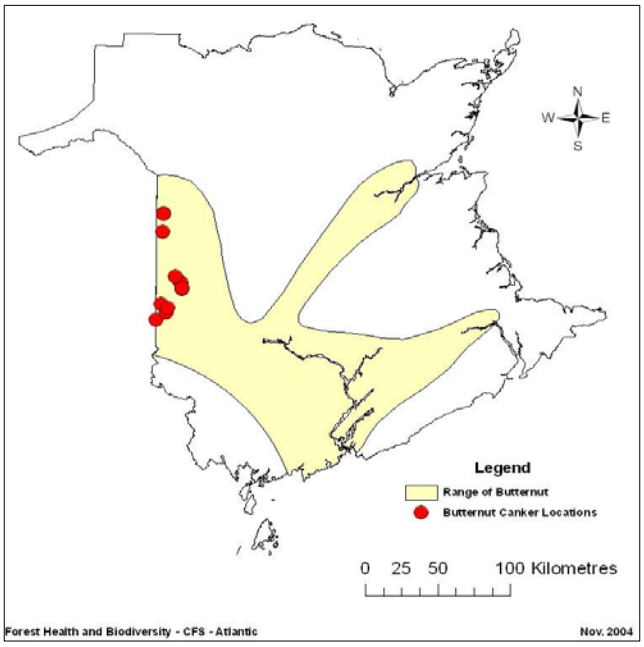

Figure 22. Distribution of butternut canker in New Brunswick in 2004.

The implications of finding this disease in New Brunswick remain unclear, and there have been no quarantine actions taken by the CFIA. It is possible that butternut trees will be named under the Canadian *Species at Risk Act* in 2005.

Beech Bark Disease
Nectria coccinea var. *faginata* Lohm. Wats. & Ayers

This disease is of European origin and is known to occur in New Brunswick, Nova Scotia, Prince Edward Island, Ontario, Québec and the northeastern United States. The disease is a "complex" that also involves scale insects. Affected trees get extensive amounts of cankers and stem deformities making them unsuitable for use other than firewood. Most trees eventually succumb to the disease directly or after attack by secondary insects. Reports of beech mortality in northwestern portions of the Province were received late in the 2002 field season. One sample was confirmed (by CFS) as having the disease.

In 2003, aerial surveys resulted in mapping about 4 500 ha of damage and tree mortality in Regions 1 and 4 (Figure 23). Based on ground observations, other affected stands were reported by staff in Region 4; and others were reported by J.D. Irving, Limited in the Deersdale/Juniper area. No specific survey was done in 2004.

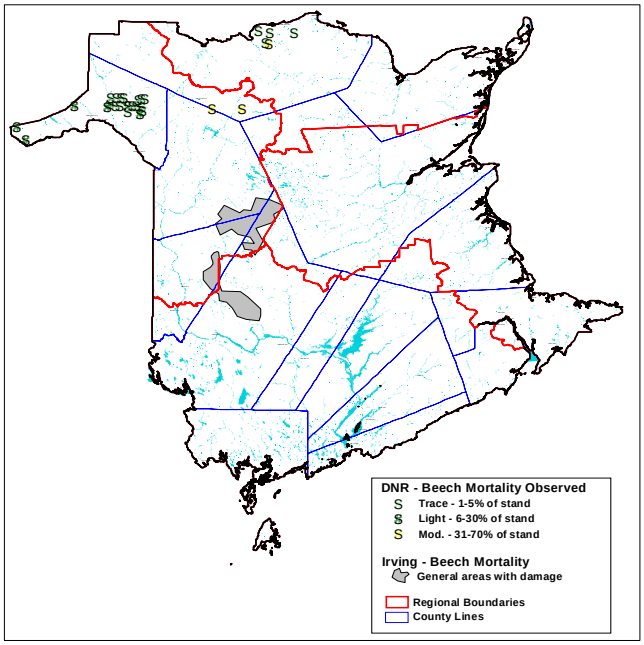

Figure 23. Locations where beech mortality was mapped by aerial survey in 2003.

ASSESSMENTS OF PLANTATIONS AND THINNINGS

Regional staff, designated as Pest Detection Officers (PDOs), conducted assessments in each of DNR's four Administrative Regions. Assessments were done at 240 locations, i.e., 134 plantations, 104 thinnings (Table 13) and 2 areas of natural regeneration. No widespread damage or problems from any major forest pest was noted. Overall, only 36% of the locations had any evidence of a pest(s) or damage, and of these, 73% had only trace or low levels of incidence. White pine weevil was encountered in all four Regions variously attacking Norway, white and black spruce, as well as white and jack pine in some plantations and thinnings. Northern pitch nodule maker occurred on jack pine (in Regions 1, 2, and 3); and Sirococcus shoot blight was found on red pine (in south-western Region 3).

Table 13. Plantations and thinned stands surveyed by Regional Pest Detection Officers in 2004.

Region	Plantations - Primary Species*											Totals
	bF	Sp	bS	wS	nS	rP	jP	wP	SW	HW	MW	
Region 1	0	0	24	1	1	2	6	0	2	0	0	36
Region 2	0	0	9	3	0	0	6	1	0	0	0	19
Region 3	0	0	36	7	6	2	11	0	0	0	0	62
Region 4	0	0	12	0	1	0	0	0	2	0	2	17
Totals	0	0	81	11	8	4	23	1	4	0	2	134

Region	Thinned stands - Primary Species*											Totals
	bF	Sp	bS	wS	nS	rP	jP	wP	SW	HW	MW	
Region 1	8	1	5	0	0	0	2	0	0	3	3	22
Region 2	14	2	7	0	0	0	0	0	10	2	2	37
Region 3	2	1	9	0	0	0	0	0	6	1	5	24
Region 4	5	0	0	0	0	0	0	0	7	3	6	21
Totals	29	4	21	0	0	0	2	0	23	9	16	104

* bF = balsam fir; Sp = spruce; bS = black spruce; wS = white spruce; nS = Norway spruce; rP = red pine; jP = jack pine; wP = white pine; SW = softwood; HW = hardwood; MW = mixed wood.

SEED ORCHARD PEST MONITORING

Routine monitoring of pest conditions was conducted in DNR's first- and second-generation seed orchards. Efforts were minimal, however, in first-generation orchards at Bettsburg and Pokiok due to Tree Improvement's decreased dependency on seed from these areas.

Kingsclear (Balsam Fir, Black Spruce, Jack Pine)

There was no cone crop in the fir stands so only general searching for defoliators was conducted. None were found, except for minimal damage by needle miners (*Coleotechnites sp.*). Balsam twig aphids (*Mindarus abietinus* Koch) were numerous in Field K.

As in 2003, control (Permethrin = Ambush®) was necessary to reduce defoliation by yellowheaded spruce sawfly (*Pikonema alaskensis* Roh.) on young white spruce trees in Field F, and on a small number of individual black spruce trees in Fields I & J. Black spruce in the southern portion of Field J appeared to have most defoliation, but overall damage was less than in the previous couple of years. Scattered trees with lighter damage levels could be found in Fields I & G, where spot treatment were conducted using aerosol permethrin (Raid®). Spruce cone maggot (*Strobilomyia appalachensis* Mich.) and spruce seed moth (*Cydia strobilella* (L.)) caused little damage to black spruce cones. High aphid (*Cinara sp.*) populations on individual black spruce trees in Field I caused new shoots to wilt and die; damage was particularly noticeable on a few trees. In Fields G & J, a small number of tops killed by weevil (*Pissodes strobi* (Peck) were found.

Northern pitch twig moth (*Petrova albicapitana* (Bsk.)) continued to be found in both second-generation jack pine stands. Few were seen in Field M, but were numerous in Field E. In some cases, these galls incorporated a cone cluster resulting in feeding damage to the cones. Spittlebugs (possibly *Aphrophora sp.*) were found feeding on a number of jack pine trees in Field E.

Bettsburg (Black Spruce)

No defoliator activity was seen. A small number of spruce seed moth adults were captured in pheromone traps during the spring. Spruce budworm (*Choristoneura fumiferana* (Clem.)) pheromone traps did not capture any moths

Pokiok (Black Spruce, White Spruce)
No spruce seed moths were captured in pheromone traps placed in the white spruce stand; and spruce budworm levels remained low.

Wheeler Cove (Black Spruce, Jack Pine)
In Field B, trace to light damage by yellowheaded spruce sawfly was found on trees scattered throughout the stand. In Field C, a few weevil infested leaders were removed from trees and very few sawflies were seen.

In late July, jack pine sawfly (prob. *Neodiprion abbotii* (Leach)), was found throughout Field E and in scattered portions of Field D. Each tree in Field E was checked for larval colonies and dozens were removed. Trees mostly contained 1-4 larval colonies each. Numbers were well below levels seen in 2002 when control was necessary. Trees in Field D are much larger and can support more larvae without suffering serious defoliation. Affected trees were found to be more isolated. Northern pitch twig moth was found in low numbers in the jack pine stands.

Queensbury (Balsam Fir, Larch, White Spruce)
Because no seed is presently being harvested from larch, no routine pest monitoring was conducted in the three larch stands in 2004. In the balsam fir stand, feeding by balsam shootboring sawfly (*Pleroneura brunneicornis* Roh.) was evident; with some smaller trees having many shoots affected. Balsam twig aphid was also numerous in this stand. A small number of cones showed heavy internal feeding damage, but the insect had already vacated the cones. Feeding damage by *Zeiraphera spp.* was widespread in the white spruce. Ten Norway spruce trees had their leaders killed due to weevil attack; none were seen in the red spruce stand. A few old cones on Norway spruce showed heavy feeding damage from the previous year, and the large amount of frass in the cones suggested coneworms (*Dioryctria sp.*) may have been responsible. Yellowheaded spruce sawfly was not found in white spruce stands, but light damage was found on half a dozen young red spruce trees. Insecticide treatment (Cygon®) was required in two of three white spruce stands to limit damage by spruce cone maggots

NURSERY PEST SUPPORT

In 2004, there were no pest related enquiries from DNR's Kingsclear Tree Nursery..

GENERAL DETECTION

Aerial reconnaissance surveys were conducted during the summer over various parts of the Province. The objective was to detect insect or disease pests or damage as early as possible, in case more detailed surveys were required because conditions might be of control significance.

Aerial Observations: Overall a total of 55.4 hours of flying time were used during the period July 12th to August 4th. Most of the Province was free of significant defoliation, though occasional patches of hardwood top dieback were observed. In the northwest, patches of hardwood mortality (range 1 - >20% of trees affected) totaling approximately 12 365 ha of were observed. Many of these areas were associated with beech bark disease and tree mortality mapped in 2003. Mortality factors at other areas were not determined but probably were associated with miscellaneous insects, disease or abiotic factors.