

Preliminary Summary of Forest Pest Conditions in New Brunswick in 2008 and Outlook for 2009

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SUMMARY

Spruce Budworm: In 2006, the percent of positive traps decreased to 60% followed by a decrease to 48% in 2007, with a further decline to 39% in 2008. These three consecutive years of decreases following a fluctuating but more or less upward trend since 1995 add to the complexity of forecasting long-term trends for spruce budworm when populations are at endemic levels. In 2008, a total of 28 larvae were obtained from three separate 30-tree plots. Overall, any population trends suggested by the pheromone trap data and L2 data at this time continue to present a challenge for making predictions into the future due to the difficulties associated with detecting subtle changes within low density spruce budworm populations. Nevertheless, the data do not suggest any threat for 2009.

Jack Pine Budworm: Overall, the survey results in 2008 indicate that jack pine budworm populations are still at endemic levels throughout the zones monitored; hence, larval densities in 2009 are expected to stay at very low to undetectable levels and no defoliation is anticipated.

Hemlock Looper: In 2008, the overall Provincial mean trap catch decreased to 63 moths/trap (somewhat comparable to the low levels in 1999, and 2003). There appears to be very little likelihood of defoliation in 2009. Nonetheless, yearly increases and trend analyses are worth doing to ensure prompt detection of an outbreak and decision-making because this insect can kill trees in a single year.

Whitemarked Tussock Moth: Whitemarked tussock moth populations were expected to remain at endemic levels in 2008. Indeed, populations appeared to decline this year as only 1 trap caught a single moth. There appears to be no threat of defoliation by this pest in 2009.

Rusty Tussock Moth: In 2007, it was reported that trap catches of rusty tussock moth were lower than in any other year of monitoring for this insect no matter what measure was used to evaluate the data be it mean trap catch, maximum moth catch or percent of positive traps. In 2008, however, all these values fell to even lower levels. In reviewing past data, it now appears that the observed fluctuations in trap catch between years are normal fluctuations in a stable, endemic population. Pheromone trap catches indicate that rusty tussock moth populations will remain at endemic levels throughout southern New Brunswick in 2009.

Balsam Twig Aphid: In 2007, the number of plots with detectable balsam twig aphid decreased to 47% compared to 70% in 2006 presenting a case where it was uncertain whether populations might further decline in 2008 or rebound. As it happened, populations appeared to rebound somewhat with 66% of the plots being positive. Once again it is not clear from the year-to-year trends whether populations will increase or decrease in 2009. We expect that populations will persist at levels similar to recent years.

Balsam Gall Midge: In 2006, 23% of the plots had galls present (after three consecutive years of less than 5%). In 2007, fir plots with balsam gall midge populations increased for the second straight year to 41%, and we speculated that populations could still increase somewhat over the next few years. Because the percent of positive plots rose to 66% in 2008, we again speculate that they may slightly increase or possibly remain at or about these levels for the next few years.

Balsam Woolly Adelgid: Data collected over the past six years continue to indicate what an insidious pest this insect is. Populations fluctuate depending on winter and possibly other unexplored/unexplained factors. Symptoms of damage are prone to show increases and recovery. Although galling and distorted tops are common on balsam fir in southern New Brunswick, we have yet to encounter any area suffering from stem attack – a condition that is more associated with tree mortality.

Brown Spruce Longhorn Beetle: This non-native insect was confirmed present in Nova Scotia in the spring of 2000. Eradication actions, under the leadership of the Canadian Food Inspection Agency (CFIA) under the federal *Plant Protection Act*, were initiated in 2000. Reports from Nova Scotia confirmed a significant increase in the area over which the beetle was found in 2006. As a result, the CFIA switched to a 'slow-the-spread' policy and instituted a greatly expanded Containment Area to regulate the movement of specified high-risk materials. In 2007, the NB forest industry self-imposed a voluntarily one-year moratorium on regulated spruce materials coming from the Containment Area within NS. The CFIA also greatly increased its survey efforts within the Atlantic Provinces and Québec in 2007, but no BSLB were found outside Nova Scotia. Nonetheless, substantial increases were detected in that Province, raising expectations for further expansion of the Containment Area in 2008. This did not happen,

however, due to strong representation by the forest industry led by the Maritime Lumber Bureau. The New Brunswick forest industry extended its voluntary moratorium into 2008. Plans for 2009 have yet to be developed.

Pine Shoot Beetle: Since 1992, this non-native insect has gradually been found from Ontario eastward into Québec and in the Lake States, ultimately reaching Maine in 2000. So far, monitoring surveys done by the CFIA and CFS have not detected its presence in New Brunswick. Quarantine regulations are in place under the federal *Plant Protection Act* administered by the CFIA.

Pine Leaf Adelgid: The life cycle of the pine leaf adelgid extends over two years and involves five different forms and two hosts. In New Brunswick, an outbreak started in 1942 and within 10 years all stands of red spruce and eastern white pine in most of the Province were infested. Populations then declined unexpectedly, and have rarely been reported since. In 2005, the pine leaf adelgid caused widespread attack on white pine generally north and south of the Miramichi River in central as well as eastern New Brunswick. Damage on white pine was generally much less evident in 2006. In 2007, widespread damage was again apparent within the same areas, as well as other parts of the Province. In 2008, new galls on red/black spruce and the presence of winged adults and immature life-stages of adelgid on white pine were confirmed. Although feeding by the pine leaf adelgid on the current shoots of white pine was evident in 2008, the symptoms of damage will not be apparent until next spring, unless over winter mortality and natural bio-controls reduce the adelgid populations.

Hemlock Woolly Adelgid: The hemlock woolly adelgid, native to Japan, was first reported in western U.S. (Oregon) in 1924, and in eastern U.S. in the mid-1950s near Richmond, VA. In the U.S., it feeds only on hemlock tree species (*Tsuga* spp.). In Maine, after several years of detection on nursery stock, its presence in the natural forest was first detected in 2003 in the southern part of the State. In 2005, FPMS conducted a detection survey in New Brunswick for this non-native pest for the first time in forested areas (30 hemlock stands) but no signs of the insect or damage were found. The survey was not repeated in 2006. In 2007, 52 hemlock stands were assessed, but again no life stages or symptoms of damage were detected. No survey was conducted by FPMS in 2008.

European Larch Canker: This non-native disease was first found by the CFS in NB in 1980. It is capable of killing mature and immature larch trees. It is present mostly throughout the southern half of the Province and quarantine regulations are in place administered by the CFIA under the federal *Plant Protection Act*. No specific survey for this disease has been done since 2000.

Scleroderris Canker of pines: The North American race of this disease seldom causes mortality to trees over 2-m tall, though branches up to this height are affected. The European race, however, is capable of killing much taller trees. It was once thought to occur at about a dozen sites in New Brunswick, but newer testing methods used by the CFS in 1998 confirmed only one site was actually positive for the European race (found on Scots pine in north-western New Brunswick). In 1999, two nearby sites were confirmed positive (one Scots pine and the other red pine). No new positive sites have been reported since then. Quarantine regulations are in place under the federal *Plant Protection Act* administered by the CFIA. In 2008, a reconnaissance visit was made to two of the three known infected sites. The Scots pine plantation visited showed signs of tree mortality and trees with dead and dying tops were easily seen. The red pine plantation, however, had no obvious sign of red needles or other obvious symptoms of infection – in fact, it was remarkably healthy looking.

Sirococcus Shoot Blight on red pine: Sirococcus shoot blight was first found in the Maritimes in the early 1970s, but has been known in North America since the early part of the last century. Severe damage is not common in New Brunswick. Nevertheless, from time to time isolated stands of red pine have been identified with damage particularly in south-western New Brunswick. In 2008, two stands – one in north-western New Brunswick and one in south-western New Brunswick had mortality and damage caused by Sirococcus. Both sites are expected to be harvested.

Gypsy Moth: Annual pheromone trapping and egg mass surveys indicate that low-density populations persist in known infested areas in southern New Brunswick and at some sites distant from them. In the spring of 2008, egg masses were collected at four sites to estimate over-winter survival. When all egg masses were pooled, the overall percent of eggs that hatched was 65%. This compares to 82% in 2007 and 92% in 2006. No areas of defoliation were forecast for 2008 and none were detected. Results from the 2008 pheromone trapping survey and egg mass survey reveal some apparent population increases despite the cold winter. No areas of defoliation are forecast for 2009, but given the right circumstances it's possible that some noticeable feeding damage could occur at some isolated, localized sites. Finally, although several new sites with new egg masses were found within currently regulated areas, no sites outside the currently regulated areas in the Province were found to have new egg masses in 2008. Overall, survey results continue to indicate that large areas of northern New Brunswick still remain free of this pest.

Forest Tent Caterpillar: The last two outbreaks of this insect each lasted about 6 years with a 12-year period between the start of each. If the same trend were to repeat, a build-up of populations would have occurred about 2003. Therefore, in 2002, in anticipation of another outbreak, pheromone traps were set out in a network of locations evenly distributed throughout the Province to establish baseline data for comparison in following years. From 2002 to 2005, there appeared to be a decreasing population trend as reflected in the trap catch data giving no evidence of an impending outbreak. In 2006, trap catches increased thus leading to speculation that this might signal the start of a population rise. In 2007, however, trap catches drastically declined. In 2008, a further decrease was experienced in terms of the percent of traps that were positive; nonetheless, the overall provincial mean trap catch rose very slightly as did the maximum trap catch. These increases appear to be mainly associated with a number of traps in the north-central part of the Province. It will be interesting to see if trap catches increase there again in 2009 and if so, by how much. Nonetheless, populations remain at low levels and no defoliation is forecast for the coming year.

Large Aspen Tortrix: Outbreaks of this pest occur periodically throughout the range of its preferred host, trembling aspen. Outbreaks are usually characterized by very sudden surges in populations followed by sharp decreases after only two or three years. In 2007, ground surveys and aerial reconnaissance detected small but widespread patches of trembling aspen defoliation in the northern half of the Province. In 2008, ground surveys again detected defoliation from this pest in these areas as well as an area north of Tracy Depot.

Fall Webworm: This insect is a common defoliator of hardwood trees in late summer. The webs it makes resemble silken “nests” and these were commonly seen along the roadside around the Province in 2004. Similar conditions had been reported in the early 1990s. In 2005, there were numerous incidental reports though seemingly less than the year before. In 2006, the insect was again reported and observations made at sporadic locations throughout most regions of the Province but seemed much more prevalent in the lower Saint John River Valley. There were no significant reports of this pest in 2007 or 2008, though it was observed.

Fall Cankerworm: This insect periodically reaches outbreak levels throughout its range in North America. In 2005, feeding damage was reported to about 15 ha along the southwest Miramichi River (near Blissfield) but no larvae were found at the time it was subsequently investigated. In 2006, a visit was made to [this area](#) and numerous larvae of fall cankerworm were found. There were no significant reports of this pest in this area in 2007. In 2008, small patches of defoliation were observed in the Grand Lake Meadows Area between McGowans Corner and Jemseg.

Butternut Canker: This disease was first confirmed present in New Brunswick by the CFS in 1997 at five sites but no regulatory action was taken by the CFIA. In 2004, the CFS confirmed six new positive sites. In 2005, butternut trees were put on the Endangered List under the Canadian *Species at Risk Act*. No evidence of newly infected areas was reported in 2005 or 2006. In 2007, the CFS reported 5 new positive sites once again, this time somewhat farther south in the general vicinity of Fredericton. In 2008, the CFS reported two more new positive locations – one in York County and one in Sunbury County.

General Detection: Results from the annual aerial survey conducted within the Province found no evidence of widespread damage from any major forest pests other than a small area of hardwood defoliation suspected to be caused by large aspen tortrix as well as continued evidence of beech bark disease in the north-central and north-western portions of the Province. Similar to 2007, patches of moderate to severe defoliation on trembling aspen caused by the aspen leaf roller were observed again in the Saint John River Valley. In north-central New Brunswick an extreme weather event on June 8th and 9th caused hail damage over a widespread area. Red flagging on fir and characteristic scarring on the upper sides of branches were evident on trees in this area.

There were no pest enquiries from DNR's Kingsclear forest tree nursery in 2008.

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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; 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 trap catch 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.

Pests of Softwoods

Spruce Budworm

No defoliation by spruce budworm has been reported since 1995, the last year that controls were applied. Since then, operational monitoring has been done by the Forest Pest Management Section (FPMS) using a combination of spruce budworm pheromone traps to capture male moths and branch samples to collect over wintering second instar larvae (L2). Monitoring locations are more or less evenly distributed throughout the Province, and supplementary sampling is done as needed.

In 2006, the percent of positive traps decreased to 60% followed by a decrease to 48% in 2007, with a further decline to 39% in 2008 (Table 1). The Provincial mean trap catch also decreased over these years (Table 1). These three consecutive years of decreases following a fluctuating but more or less upward trend since 1995 add to the complexity of forecasting long-term trends for spruce budworm when populations are at endemic levels. Nonetheless, the highest trap catches were once again detected in north-western New Brunswick, where since 2000, they have been perennially higher than the rest of the Province.

Table 1. Summary of spruce budworm pheromone trap surveys conducted by FPMS in New Brunswick from 1995 to 2008.

Year	Number of traps	% of traps positive	% of traps in each class of moths/trap			Number of moths/trap	
			0	1-10	>10	Range	Mean
1995	296	58%	42%	50%	8%	0 - 47	3.27
1996	99	47%	53%	41%	6%	0 - 54	3.24
1997	148	27%	73%	27%	0%	0 - 6	0.49
1998	148	33%	67%	33%	0%	0 - 10	0.95
1999	155	41%	59%	41%	<1%	0 - 12	1.05
2000	154	45%	55%	42%	3%	0 - 25	1.67
2001	197	58%	42%	50%	8%	0 - 32	2.90
2002	198	35%	65%	33%	2%	0 - 12	1.02
2003	198	43%	57%	39%	4%	0 - 18	1.89
2004	196	49%	52%	45%	4%	0 - 17	1.86
2005	255	81%	19%	73%	8%	0 - 41	3.81
2006	281	60%	40%	54%	6%	0 - 42	2.68
2007	298	48%	52%	45%	4%	0 - 56	2.28
2008	295	39%	61%	37%	3%	0 - 18	1.29

In 1998, DNR modified its L2 monitoring survey (which replaced the egg mass survey in 1985) by using a combination of sampling intensities consisting of a 'traditional' set of plots, where 3 trees/plot are sampled; and 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.

From 1995 to 2008, L2 surveys also show endemic populations within the Province. Only trace levels have been detected at a small number of plots fluctuating from a low of 0% in 1999 to a high of 7.1% in 2004 (Table 2). In 2006, only one plot had detectable larvae (i.e., 2 larvae from a 3-tree plot). That plot was located on the north-western part of the Province referred to as the 'panhandle'. In 2007, only two plots, both in north and north-western New Brunswick, were positive for L2 larvae; 2 larvae were extracted from a 3-tree plot and 4 larvae from a 30-tree plot.

In 2008, a total of 28 larvae were obtained from three separate 30-tree plots. Two plots were located on the panhandle and one in the central region. One of the plots on the panhandle yielded 21 larvae from one branch and the other plot yielded 2 larvae from one branch. The central plot yielded 5 larvae from one branch.

Table 2. Summary of spruce budworm larvae detected in L2 surveys conducted by FPMS in New Brunswick from 1995 to 2008. (Supplementary samples to refine the forecast are not included in this table).

Year	Number of plots	Number of trees/plot	Number of branches	Number of L2 detected	Number (%) of plots with L2 detected	Plot type where L2 found
1995	814	3	2442	65	28 (3.4%)	
1996	503	3	1509	8	3 (0.6%)	
1997	317	3	951	2	2 (0.6%)	
1998	75	3 & 30	900	4	3 (4.0%)	3 x 30-tree plots
1999	75	3 & 30	900	0	0 (0.0%)	
2000	75	3 & 30	900	5	1 (1.3%)	1 x 30-tree plot
2001	78	3 & 30	909	1	1 (1.3%)	1 x 30-tree plot
2002	75	3 & 30	900	1	1 (1.3%)	1 x 3-tree plot
2003	79	3 & 30	1020	8	4 (5.1%)	4 x 30-treeplots
2004	99	3 & 30	1269	19	7 (7.1%)	5 x 30-tree plots; 2 x 3-tree plots
2005	95	3 & 30	1041	5	3 (3.2%)	2 x 30-tree plots; 1 x 3-tree plot
2006	100	3 & 30	1056	2	1 (1.0%)	1 x 3-tree plot
2007	110	3 & 30	1167	6	2 (1.8%)	1 x 30-tree plot; 1 x 3-tree plot
2008	105	3 & 30	1125	28	3 (2.9%)	3 x 30-tree plots

Overall, any population trends suggested by the pheromone trap data and L2 data at this time continue to present a challenge for making predictions into the future due to the difficulties associated with detecting subtle changes within low density spruce budworm populations. Nevertheless, the data do not suggest any threat for 2009.

In addition to the Provincial pheromone trapping and L2 surveys conducted by FPMS, J.D. Irving, Limited conducts similar surveys on parts of their freehold limits and submits samples to FPMS for processing. Their results were similar to the Provincial surveys.

Jack Pine Budworm

Defoliation by jack pine budworm in NB 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. A network of pheromone traps was initiated in 1997 at locations selected to represent these stands. In 2008, a review of the survey resulted in the addition of a number of plots and increasing the area surveyed to include some areas felt to be under represented.

No moths were caught in the first year, but since then moths have been caught annually, albeit in low numbers, with the maximum being 41 moths in one trap in 1999 (Table 3). In that year, a follow-up L2 survey was done, but no larvae were detected. In 2004, we switched from Delta traps (sticky on 3 sides) to the Multi-Pher1® traps with Vaportape II® killing strip to improve the quality of samples collected and facilitate more accurate moth identification.

In 2006, we conducted a comparative test using traps baited with a rubber septa pheromone lure (100 µg load) produced by the New Brunswick Research & Productivity Council (RPC), and traps baited with a PVC flex lure (300 µg load) commercially available from Phero Tech Inc. (PTI) in British Columbia. Based on that test (results previously reported), and similar studies done in higher populations in Manitoba and Saskatchewan which yielded no significant differences between the two lure sources, we switched to the PTI lure in 2007.

Since the inception of the trapping program in New Brunswick, jack pine budworm populations have remained at endemic levels, with only low moth counts found in pheromone traps. In this context, 2007 seemed an opportune time to switch lures to the commercially available PVC flex lure (300 µg load). Any spikes in trap catches in future years can then be attributed to population change rather than the switch to the new lure.

Table 3. Summary of jack pine budworm pheromone trap surveys conducted by FPMS in New Brunswick from 1997 to 2008.

Year	Number of traps	% of traps positive	Percent of traps in each class of moths/trap					Moths/trap	
			0	1-10	11-20	21-40	>40	Range	Mean
1997	46	0%	100%	0%	0%	0%	0%	0	0.00
1998	52	42%	58%	42%	0%	0%	0%	0 – 8	1.42
1999	51	55%	45%	45%	8%	0%	2%	0 – 41	3.25
2000	51	27%	73%	25%	2%	0%	0%	0 – 17	1.45
2001	51	57%	43%	47%	2%	8%	0%	0 – 30	1.51
2002	51	41%	59%	35%	4%	2%	0%	0 – 22	1.92
2003	50	26%	74%	24%	2%	0%	0%	0 – 14	1.12
2004	50	34%	66%	34%	0%	0%	0%	0 – 10	1.46
2005	49	39%	61%	39%	0%	0%	0%	0 – 10	0.82
2006	47	43%	57%	43%	0%	0%	0%	0 – 9	1.02
2007	49	53%	47%	49%	4%	0%	0%	0 – 13	1.59
2008	59	58%	42%	51%	5%	2%	0%	0 – 21	3.00

Since 1998, 26% to 58% of the traps have been positive and average moth counts have fluctuated within the range of 0.82 to 3.25 moths/trap (Table 3). It is interesting to note that the percent of traps positive has increased annually for the last five years since 2003, and the average number of moths/trap has increased annually for the last three years since 2005. These are most likely normal endemic fluctuations, though it will be interesting to see if populations do indeed increase within the next few years.

Overall, the survey results in 2008 indicate that jack pine budworm populations are still at endemic levels throughout the zones monitored; hence, larval densities in 2009 are expected to stay at very low to undetectable levels throughout New Brunswick and no defoliation is anticipated.

Hemlock Looper

This insect can kill trees in a single year. The only reported outbreak of hemlock looper in New Brunswick occurred from 1989 to 1993. Areas affected were in the north-western, north-central and south-western parts of the Province. In the north, the Canadian Forest Service (CFS) estimated about 650 000 m³ 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 supplemented by egg surveys as needed. Pheromone trap catches had increased 3.3-fold Province wide in 2000 (hinting an impending outbreak), 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 (Table 4).

In 2004, a 2.5-fold Province-wide increase in trap over 2003 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. Consequently, a follow-up egg survey was done in selected areas to see if populations were high enough to anticipate defoliation in 2005. Based on previous experience with the number of eggs encountered, no defoliation was anticipated for 2005, and none was detected from aerial surveys or ground observations. Likewise, no defoliation was reported in 2006.

Mean and maximum trap catch progressively decreased from 2004 to 2006 suggesting the increase in 2004 was part of normal population fluctuations. Moth counts slightly increased in 2007, but remained at endemic levels.

In 2008, the overall Provincial mean trap catch decreased to 63 moths/trap – somewhat comparable to the low levels in 1999, and 2003 (Table 4). There appears to be very little likelihood of defoliation in 2009. Nonetheless, yearly

increases and trend analyses are worth doing to ensure prompt detection of an outbreak and decision-making because this insect can kill trees in a single year.

Table 4. Summary of hemlock looper pheromone trap surveys conducted by FPMS in New Brunswick from 1997 to 2008.

Year	Number of traps	% of traps positive	Number of moths/trap	
			Mean *	Range *
1997	103	99	92	0 – 448
1998	95	99	71	0 – 524
1999	98	100	69	3 – 411
2000	99	100	230	3 – 863
2001	199	>99	89	0 – 837
2002	101	99	77	0 – 444
2003	98	100	64	1 – 342
2004	101	100	157	6 – 1127
2005	198	>99	115	0 – 723
2006	93	99	105	0 – 649
2007	105	99	121	0 – 719
2008	102	99	63	0 – 545

* 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: $Y = 0.565 X + 1.469$ developed from a 3-year study, 1998 – 2000.

In addition to the Provincial pheromone trap survey conducted by FPMS, J.D. Irving, Limited conducts a similar survey on parts of their freehold limits and submits samples to FPMS for processing. Their results were similar to the provincial survey.

Whitemarked Tussock Moth

The last outbreak of this pest in New Brunswick occurred in the 1970s. 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 with pheromone traps (Table 5) and occasional egg mass searches had not revealed any significant populations in this Province. Nonetheless, a low-level increasing trend in populations seemed somewhat evident since 2001 when no moths were detected followed by increases up to 2006 when the highest percent (39%) of traps were positive with the highest mean (0.92 moths/trap) and maximum trap catch (12 moths) (Table 5). Indeed, the frequency of encountering incidental levels of larvae in the field significantly increased in 2006.

Table 5. Summary of adult whitemarked tussock moths caught in pheromone trap surveys conducted by FPMS in New Brunswick from 1998 to 2008.

Year	Number of traps	Number (%) of traps positive	Number of moths/trap	
			Range	Mean
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	0.22
2004	51	5 (10%)	0 – 1	0.10
2005	49	12 (24%)	0 – 4	0.51
2006	75	29 (39%)	0 – 12	0.92
2007	102	11 (11%)	0 – 2	0.15
2008	101	1 (1%)	0 – 1	0.01

In view of these changes, an egg-mass/life stage survey was conducted in southern New Brunswick at 245 locations. New cocoons were found at 26% of the sites, yet new egg masses were only detected at 2% of the sites. Examination of the cocoons/pupae found that on average 25% of the insects successfully emerged from their pupal cases; 39% were parasitized; 22% failed to successfully complete development; 7% were diseased; and 6% were predated upon. Whether these low-level changes in pheromone trap catches and findings of cocoons were indications of an impending outbreak, or normal endemic fluctuations, were then unclear. As it turned out, in 2007 moth catches in pheromone traps declined from the previous two years. Only 11% of the traps were positive, with 1-2 moths/trap. Positive traps were found in south-eastern New Brunswick, in a geographic band east of Saint John, running along the Bay of Fundy to the Nova Scotia border and Northumberland Strait.

Whitemarked tussock moth populations were expected to remain at endemic levels in 2008. Indeed, populations appeared to decline this year as only 1 trap caught a single moth. There appears to be no threat of defoliation by this pest in 2009.

Rusty Tussock Moth

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 6).

In 2005, the mean trap catch was the highest yet, and the data hinted an increasing trend, though overall results were not significantly beyond levels seen in the past. And, no defoliation has been detected so far, thereby suggesting that the numbers of moths being caught are below the threshold of impending detectable larval feeding, and hence below an indication of when an egg mass survey might be needed. Thus no defoliation was forecast for 2006 and none was detected.

Table 6. Summary of rusty tussock moth pheromone trap surveys conducted by FPMS in New Brunswick from 1998 to 2008.

Year	Number of traps	Number (%) of traps positive	Number of moths/trap	
			Range	Mean
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
2005	49	26 (53%)	0 – 20	2.4
2006	75	30 (40%)	0 – 32	2.1
2007	102	17 (17%)	0 – 7	0.4
2008	101	4 (4%)	0 – 3	0.1

In 2007, it was reported that trap catches of rusty tussock moth were lower than in any other year of monitoring for this insect no matter what measure was used to evaluate the data be it mean trap catch, maximum moth catch or percent of positive traps. In 2008, however, all these values fell to even lower levels (Table 6). In reviewing past data, it now appears that the observed fluctuations in trap catch between years (e.g., high of 2.4 moths/trap in 2005 to a low of 0.1 moths/trap in 2008) are normal fluctuations in a stable, endemic population. Pheromone trap catches indicate that rusty tussock moth populations will remain at endemic levels throughout southern New Brunswick in 2009.

Balsam Twig Aphid

This insect is not a significant forest pest, though it can be a major problem for the Christmas tree industry. Populations are monitored in a general way throughout the Province by assessing their presence on balsam fir branch samples collected for the spruce budworm L2 survey. 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).

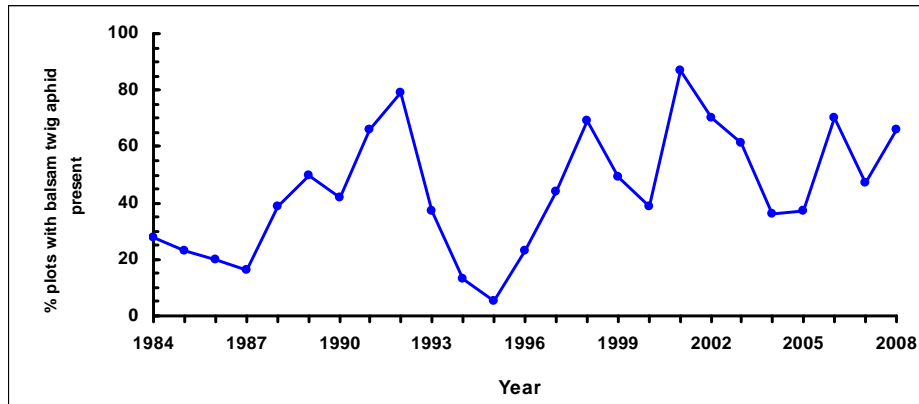


Figure 1. Provincial changes in populations of balsam twig aphid from 1984 to 2008.

In 2007, the number of plots with detectable balsam twig aphid decreased to 47% compared to 70% in 2006 presenting a case where it was uncertain whether populations might further decline in 2008 or rebound. As it happened, populations appeared to rebound somewhat with 66% of the plots being positive. Once again it is not clear from the year-to-year trends whether populations will increase or decrease in 2009. We expect, however, that populations will persist at levels similar to recent years. Because these data are collected at a limited number of locations widely distributed throughout the Province, Christmas tree growers need to monitor conditions on their own property.

Balsam Gall Midge

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 are also monitored around the Province by assessing their presence on balsam fir branch samples collected for the spruce budworm L2 survey. As with balsam twig aphid, previous years' data indicated a tendency for balsam gall midge populations to increase and decrease in general synchrony (with some local variations) throughout the Province. Likewise, the data since 1984 suggest a more regular cyclical trend in populations. In this case, because balsam gall midge populations had been low for a few years (2002-2005), we speculated that increases might soon occur if the past trend repeated.

In 2006, an increase was indeed detected as 23% of the plots had galls present (up from three consecutive years of less than 5%). In 2007, fir plots with balsam gall midge populations increased for the second straight year to 41%, and we speculated that if historic patterns repeat themselves, populations could still increase somewhat over the next few years. Because the percent of positive plots rose to 66% in 2008, we again speculate that they may slightly increase or possibly remain at or about these levels for the next few years. Again, Christmas tree growers need to monitor conditions on their own property because these data come from a limited number of samples widely distributed throughout the Province.

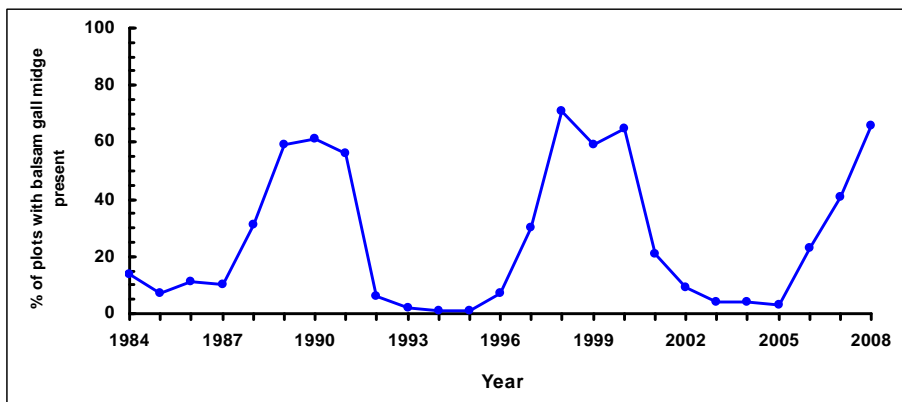


Figure 2. Provincial changes in populations of balsam gall midge from 1984 to 2008.

Balsam Woolly Adelgid

This insect, of European origin, was first found in the Maritimes in the early 1900s and in Québec in 1964. It only attacks true firs of the genus *Abies*. Symptoms of attack, especially gouty tops, are noticeable in southern New Brunswick where local tree mortality, severe in some cases, has been reported in recent years. It has been speculated that populations had increased in the 1990s due to a number of milder winters. Mortality of the adelgid's over-winter dormant stage increases when temperatures reach -20°C and is complete at -37°C . Concerns by forest industry prompted distribution surveys, over-winter survival surveys and small-scale studies on growth impact in the past few years.

Surveys conducted since 2002 have revealed symptoms of attack throughout southern New Brunswick below an irregular line drawn in a general north-easterly direction from about Nackawic in the west to the City of Miramichi in the east. This southern part of the Province below this general line is associated with milder winter temperatures more conducive to over winter survival of the insect and corresponds very well to Plant Hardiness Zones 4b, 5a and 5b for New Brunswick (see <http://sis.agr.gc.ca/cansis/nsdb/climate/hardiness/intro.html>). Curiously, this line is similar to, but a little farther south than reported in the literature (*i.e.*, Fig. 32 in Prebble, M.L. (editor). 1975. Aerial control of forest insects in Canada. Env. Can. Ottawa).

In the spring of 2003, a system to monitor annual population changes of balsam woolly adelgid was initiated at 12 locations in the southern region of the Province. In the spring of 2008, branch samples were collected at these sites and processed in the lab to determine the number of adults present to compare with counts from the previous spring. The winter of 2007-08 was characterized by 19 days with temperatures below -20°C , including 5 days below -25°C (data from Fredericton Airport). Given the cold temperatures, lower populations (as measured using this survey method) were expected. In fact, 4 locations did have lower populations; however, there were 8 locations where populations increased, albeit slight in some cases. We wonder if the insulating effect of heavy snow cover on the tree branches might possibly have contributed to the high survival.

At 10 of these locations, tree damage assessments were made and compared with ratings done in 2003. No change was reported for 68% of the trees, 20% had an increase in damage, and 12% had a decrease in damage (*i.e.*, showed signs of recovery). Overall, 86% of the trees still have damage levels of light or nil. It should be kept in mind, however, that these data come from a small sample size of 5 trees per site and only 10 sites.

Data collected over the past six years continue to indicate what an insidious pest this insect is. Populations fluctuate depending on winter and possibly other unexplored/unexplained factors. Symptoms of damage are prone to show increases and recovery. Although galling and distorted tops are common on balsam fir in southern New Brunswick,

we have yet to encounter any area suffering from stem attack – a condition that is more associated with tree mortality. Finally, branch sampling and damage assessments were done at 69 balsam fir thinnings and 12 permanent sample plots to gather data for UNB/CFS who are working towards a hazard rating system for balsam woolly adelgid.

Brown Spruce Longhorn Beetle

This non-native insect was confirmed present in Nova Scotia in the spring of 2000 and it was subsequently revealed that it had been present at least since 1990, but had mistakenly been mis-identified as a similar native species. It appears capable of killing red, white, black and Norway spruce and poses a threat to spruce forests and associated forest industry. Eradication actions, under the leadership of the Canadian Food Inspection Agency (CFIA) under the federal *Plant Protection Act*, were initiated in 2000. There is speculation that population increases and expansion could be associated with extensive wind-thrown trees from Hurricane Juan in 2003.

So far, surveys have not detected its presence in New Brunswick. However, reports from Nova Scotia confirmed a significant increase in the area over which the beetle was found in 2006, thus jeopardizing continued eradication actions. As a result, the CFIA switched to a 'slow-the-spread' policy and instituted a greatly expanded Containment Area to regulate the movement of specified high-risk materials. That increased the concerns in New Brunswick because softwood from that Province is sometimes delivered to mills in New Brunswick. The CFIA have maintained dialogue with government and industry representatives of both provinces, and CFS researchers, regarding the expanded management zone and conditions of treatment that would facilitate the continued movement of host spruce material.

In 2007, the NB forest industry self-imposed a voluntarily one-year moratorium on regulated materials coming from the Containment Area within Nova Scotia. The CFIA also greatly increased its survey efforts within the Atlantic Provinces and Québec in 2007, but no brown spruce longhorn beetles were found outside Nova Scotia.

Nonetheless, substantial increases were detected in that Province, raising expectations for further expansion of the Containment Area in 2008. This did not happen, however, due to strong representation by the forest industry led by the Maritime Lumber Bureau. The New Brunswick forest industry extended its voluntary moratorium into 2008. Plans for 2009 have yet to be developed though meetings are anticipated between the CFIA and its industrial partners this winter to examine the implications of surveys and research conducted this past summer.

Pine Shoot Beetle

Since 1992, this non-native insect has gradually been found from Ontario eastward into Québec and in the Lake States, ultimately reaching Maine in 2000. In Ontario, it has been found in association with mortality in Scots, red, white and jack pines, though it is uncertain whether Scots pine must be present to enable populations to become high enough to damage the other pine species. Quarantine regulations are in place under the federal *Plant Protection Act* administered by the CFIA. So far, monitoring surveys done by the CFIA and CFS have not detected its presence in New Brunswick.

Pine Leaf Adelgid

According to the literature, the life cycle of the pine leaf adelgid extends over two years and involves five different forms and two hosts. Its primary hosts are red and black spruce and its secondary hosts are generally eastern white pine and occasionally red, Scots and Austrian pine. It occurs in all Canadian provinces as well as Maine, New Hampshire, Vermont and New York. Damage on spruce consists of the formation of cone-shaped galls which do not affect the health of the trees. On pine, damage may cause mortality of shoots and even tree death. Records indicate

that this insect has on occasion been a major pest in New Brunswick, Nova Scotia and Maine. In New Brunswick, an outbreak started in 1942 and within 10 years all stands of red spruce and eastern white pine in most of the Province were infested. In 1948, populations declined unexpectedly and have rarely been reported since.

In 2005, the pine leaf adelgid caused widespread attack on white pine generally north and south of the Miramichi River in central as well as eastern New Brunswick. Damage on white pine was generally much less evident in 2006.

In 2007, however, widespread damage was again apparent within the same areas, as well as other parts of the Province. Given the concerns expressed by DNR Regional and industry staff, a survey was conducted in 2007 to examine the severity of damage, specifically in areas where intensive pine management is conducted. Damage was rated on a total of 1996 over-story and 1835 under-story trees in 66 representative stands. Approximately 75 to 90% of the trees had damage in the nil to trace categories (1-5% of the 2006 foliage affected), 7-10% had light damage (6-30% of 2006 foliage affected), and trees with moderate (31-70%) and severe (>70%) damage represented only 15% of the trees assessed in the under-story and 2.5% in the over-story, respectively. These results suggest that the more mature trees are less severely attacked (as reported in the literature). It remains to be seen whether populations will persist and increase, and whether the future health and growth of trees will be severely impacted.

Also in 2007, observations were made to determine the life-stage and the specific host the adelgid was feeding on within its complex two-year life-cycle. In the same stands assessed for severity of damage, no evidence of winged adults on white pine or new galls on red/black spruce were found. This suggested the insect had migrated from the white pine back to the red/black spruce in 2007. Whether populations would persist or increase in 2008 was unknown. If they persisted, it was speculated that the adelgid's life-stages would move back to white pine in 2008 with no damage apparent until 2009.

In 2008, new galls on red/black spruce and the presence of winged adults and immature life-stages of adelgid on white pine were confirmed. This also indicated that populations were still present and active in the area. Although feeding by the pine leaf adelgid on the current shoots of white pine was evident in 2008, the symptoms of damage will not be apparent until next spring. Shorter shoots and some discoloration of foliage (yellowish-green) were observed, but no widespread reddening of foliage indicating dead shoots was seen. This is in keeping with the trend of white pine being damaged in alternating years. Consequently, we expect to see damage on white pine in 2009, unless over winter mortality and natural bio-controls reduce the adelgid populations.

Hemlock Woolly Adelgid

The hemlock woolly adelgid, native to Japan, was first reported in western U.S. (Oregon) in 1924, and in eastern U.S. in the mid-1950s near Richmond, VA. In the U.S., it feeds only on hemlock tree species (*Tsuga* spp.). The two tree species native to western U.S., western hemlock and mountain hemlock, are not noticeably affected. In contrast, the two tree species native to eastern U.S., eastern hemlock and Carolina hemlock, can be severely defoliated and killed, often within five years of infestation. All ages and sizes of eastern hemlock trees are susceptible to damage. As of 1999, the USDA Forest Service had documented the insect in eleven eastern states from North Carolina to Massachusetts.

In Maine, after several years of detection on nursery stock (starting in 1999) its presence in the natural forest was first detected in 2003. The Maine Forest Service implements aggressive efforts to contain or slow the spread of this pest in the State. Infested sites occur in York County in the southern part of the State.

In 2005, FPMS conducted a detection survey in New Brunswick for this non-native pest for the first time in forested areas (30 hemlock stands) but no signs of the insect or damage were found. The survey was not repeated in 2006. In 2007, 52 hemlock stands were assessed, but again no life stages or symptoms of damage were detected. No survey was conducted by FPMS in 2008.

European Larch Canker

This non-native disease was first found by the CFS in New Brunswick in 1980. It is capable of killing mature and immature larch trees. It is present mostly throughout the southern half of the Province and quarantine regulations are in place administered by the CFIA under the federal *Plant Protection Act*. In 1977, the CFS found a positive site outside, but close to the known regulated area, but the CFIA have made no changes to the regulated zone. Surveys by the CFS from 1998 to 2000 did not detect any new positive sites, and no specific survey has been done since.

Scleroderris Canker of pine

The North American race of this disease seldom causes mortality to trees over 2-m tall, though branches up to this height are affected. The European race, however, is capable of killing much taller trees. It was once thought to occur at about a dozen sites in New Brunswick, but newer testing methods used by the CFS in 1998 confirmed only one site was actually positive for the European race (found on Scots pine in north-western New Brunswick). In 1999, two nearby sites (within a few kilometres) were confirmed positive (one Scots pine and the other red pine). No new positive sites have been reported since then. Quarantine regulations are in place under the federal *Plant Protection Act* administered by the CFIA.

In 2008, a reconnaissance visit was made to two of the three known infected sites. The Scots pine plantation visited showed signs of tree mortality and trees with dead and dying tops were easily seen. The red pine plantation, however, had no obvious sign of red needles or other obvious symptoms of infection – in fact, it was remarkably healthy looking.

Shoot Blight of red pine

Sirococcus shoot blight was first found in the Maritimes in the early 1970s, but has been known in North America since the early part of the last century. Its hosts may include red pine, black spruce, white spruce; rarely jack pine, red spruce, Colorado spruce, or Norway spruce.

Although this fungal disease attacks many conifers, it is most damaging to red pine. It kills only the current year's shoots about 4-6 weeks after infection. Repeated attack can cause stunted growth and ultimately result in tree death. Seedlings, especially container-grown stock, die quickly; older trees may die after several successive years of severe infection.

This disease is known to be widely distributed in the Maritime Provinces, but severe damage is not common in New Brunswick. Nevertheless, from time to time isolated stands of red pine have been identified with damage from Sirococcus shoot blight particularly in south-western New Brunswick.

In 2008, two stands – one in north-western New Brunswick (14-km east of Veneer) and one in south-western New Brunswick (15-km south of the Town of Nackawic near Lily Lake) had mortality and damage caused by Sirococcus. Both sites are expected to be harvested.

Pests of Hardwoods

Gypsy Moth

Historically, gypsy moth was reported present in south-western New Brunswick in the mid-1930s but eradicated by 1940. It was 'rediscovered' in the same general area in 1981, and since then it has gradually expanded its range in the Province. Quarantine regulations have been put in place under the federal *Plant Protection Act* administered by the CFIA. Defoliation (~ 4 ha of second-growth poplar) was first mapped from the air in 1987. Increasing populations were detected in south-central regions between 1998 and 2000. This led to three consecutive years of defoliation (from 2001 to 2003) followed by population collapse due to extremely cold winter temperatures in 2002-2003 and 2003-2004, and build-up of larval diseases (i.e., nuclearpolyhedrosis virus and the fungus *Entomophaga maimaiga*), along with other natural bio-controls. Some private landowners had some of their property aerially sprayed with *Btk* in 2002 and 2003.

Annual pheromone trapping and egg mass surveys indicate that low-density populations persist in known infested areas in southern New Brunswick and at some sites distant from them (e.g., as far northeast as Miramichi City). During the years with high populations and defoliation there was an increased risk of spread of this pest, hence finding new positive sites was anticipated.

In 2005, the CFIA increased the regulated areas from the smaller parish level to the larger county level and included eight counties, plus Miramichi City. The regulated counties include: Charlotte, Carleton, York, Sunbury, Kings, Queens, Saint John, and Albert. These new regulated areas incorporated all the positive sites found outside the regulated area from 1993 to 2004. In the fall of 2005, evidence of new populations was found for the first time in Moncton and Memramcook in Westmorland County, and Bouctouche in Kent County, extending the known distribution of gypsy moth farther eastward in the Province. In 2006, new egg masses were again found in Memramcook and Bouctouche, and found for the first time in Petitcodiac and in Sackville (reported by the CFIA). This led to the addition of Westmorland County and the Town of Bouctouche to CFIA's list of regulated areas.

In the spring of 2008, egg masses were collected at four sites (from heights believed to be above the snow line) to estimate over-winter survival. A total of 50 egg masses were collected (i.e., 10 at each of 3 sites and 20 at the other site). Not unexpectedly, there was variability in survivorship between sites. Seven (14%) egg masses failed to have any eggs hatch at all; conversely, various numbers of eggs hatched from the remaining 43 (86%). Egg hatch at each site was 28%, 51%, 95%, and 99%, respectively. When all egg masses were pooled, the overall percent of eggs that hatched was 65%. This compares to 82% in 2007 and 92% in 2006 (Table 7). According to daily minimum temperature data, recorded at Fredericton Airport, the winter of 2007-08 was colder than the winter of 2006-07, and that one was colder than the winter of 2005-06 (Table 7).

Table 7. Mean hatch of gypsy moth eggs from egg masses collected in the spring of the three past winters as noted.

Winter	Number of days below -20°C *	Number of days below -25°C *	Overall mean % egg hatch
2005-06	0	0	92%
2006-07	17	2	82%
2007-08	19	5	65%

* Temperatures recorded at Fredericton Airport.

No areas of defoliation were forecast for 2008 and none were detected in Provincial ground or aerial surveys. In the City of Fredericton, however, some minor tree defoliation was reported by the City Forester. The most ironic sighting, however, was very severe defoliation on most of the crown of a single ornamental blue spruce tree (about 5-m tall) in a homeowner's front yard.

Results from the 2008 pheromone trapping survey and egg mass survey reveal some apparent population increases despite the cold winter. Since 1998, an early detection pheromone trap survey has been conducted at approximately 105 sites throughout the Province where gypsy moth egg masses or life stages other than male moths have not been found. Interestingly, the mean trap catch rose from 34 moths/trap to 55 moths/trap which is the highest yet reported by this survey. Most of the high catches, however, came from traps located in the general proximity of the areas known to be infested. Trapping conducted to monitor low density populations within known infested areas in southern New Brunswick also showed an increase in the average number of moths caught per trap.

Within the egg mass survey, about 75 sites have been visited each year since 1995 to give an indication of annual population change in known infested areas. Overall, new egg masses were detected at 85% of these sites compared to 46% last year and 71% the preceding year. In addition, the overall egg mass density increased from an average of 12 new egg masses/person-hour searching in 2007 up to 30 new egg masses/person-hour searching in 2008. These increases seemed to have happened despite the low minimum temperatures that occurred in the winter of 2007-08.

No areas of defoliation are forecast for 2009, but given the right circumstances of high over winter survival and lack of significant natural bio-controls next summer, it's possible that some noticeable feeding damage could occur at some isolated, localized sites.

Finally, although several new sites with new egg masses were found within currently regulated areas, no sites outside the currently regulated areas in the Province were found to have new egg masses in 2008. Overall, survey results continue to indicate that large areas of northern New Brunswick still remain free of this pest.

Forest Tent Caterpillar

The last two outbreaks of this insect each lasted about 6 years (from 1979-84; and 1991-96) with a 12-year period between the start of each. The first outbreak peaked at about 1.4 million ha and the second peaked at about 0.4 million ha. If the same trend were to repeat, a build-up of populations would have occurred about 2003. Therefore, in 2002, in anticipation of another outbreak, pheromone traps were set out in a network of locations evenly distributed throughout the Province to establish baseline data for comparison in following years. From 2002 to 2005, there appeared to be a decreasing population trend as reflected in the trap catch data giving no evidence of an impending outbreak (Table 8). In 2006, trap catches increased thus leading to speculation that this might signal the start of a population rise. In 2007, however, trap catches drastically declined.

Table 8. Summary of forest tent caterpillar moths caught in pheromone trap surveys conducted by FPMS in New Brunswick from 2002 to 2008.

Year	Number of traps	% of traps positive	Percent of traps in each class of moths/trap						Number of moths/trap	
			0	1-10	11-25	26-50	51-100	>100	Range	Mean
2002	128	88	13%	70%	23%	2.3%	1%	0%	0 - 51	7.8
2003	125	77	23%	62%	13%	2%	0%	0%	0 - 41	5.2
2004	130	76	24%	71%	5%	0%	0%	0%	0 - 23	2.7
2005	137	59	41%	58%	1%	0%	0%	0%	0 - 16	1.7
2006	133	70	30%	67%	3%	0%	0%	0%	0 - 21	2.8
2007	137	47	53%	46%	1%	0%	0%	0%	0 - 17	1.4
2008	135	44	56%	42%	2%	1%	0%	0%	0 - 39	1.7

In 2008, a further decrease was experienced in terms of the percent of traps that were positive; nonetheless, the overall provincial mean trap catch rose very slightly as did the maximum trap catch (Table 8). These increases appear to be mainly associated with a number of traps in the north-central part of the Province. It will be interesting

to see if trap catches increase there again in 2009 and if so, by how much. Nonetheless, populations remain at low levels and no defoliation is forecast for the coming year.

In western Canada, the threshold for damage is >100 moths/trap. If this is applicable to New Brunswick conditions, then populations will have to increase substantially before damage is again detected in this Province.

Large Aspen Tortrix

Outbreaks of this pest occur periodically throughout the range of its preferred host, trembling aspen. Fortunately, this pest has many natural controls. Outbreaks are usually characterized by very sudden surges in populations followed by sharp decreases after only two or three years.

In 2007, ground surveys and aerial reconnaissance detected small but widespread patches of trembling aspen defoliation in the northern half of the Province, from Plaster Rock south-west to Arthurette, north-east of Kedgwick, south of Dalhousie, and from Nash Creek to Bathurst. The defoliator causing the damage was the large aspen tortrix. In 2008, ground surveys again detected defoliation from this pest in these areas as well as an area north of Tracy Depot.

Fall Webworm

This insect is a common defoliator of hardwood trees in late summer. The webs it makes resemble silken “nests” and these were commonly seen along the roadside around the Province in 2004. Similar conditions had been reported in the early 1990s. In 2005, there were numerous incidental reports though seemingly less than the year before. In 2006, the insect was again reported and observations made at sporadic locations throughout most regions of the Province but seemed much more prevalent in the lower Saint John River Valley. No damage was reported for this pest in 2007. Likewise, there were no significant reports of this pest in 2008, though it was observed.

Fall Cankerworm

This insect periodically reaches outbreak levels throughout its range in North America. Host trees include elm, oak, ash, and maples as well as many fruit trees and shrubs. In 2005, feeding damage was reported to about 15 ha along the southwest Miramichi River (near Blissfield) but no larvae were found at the time it was subsequently investigated (mid-July). Damage was evident on elm, hawthorn, alders, pin cherry, butternut and maple, and fall cankerworm was suspected. In 2006, a visit was made in late May to the area where defoliation had been reported in 2005 and numerous larvae of fall cankerworm were found. There were no significant reports of this pest in this area in 2007. In 2008, small patches of defoliation were observed in the Grand Lake Meadows Area between McGowans Corner and Jemseg.

Butternut Canker

In the United States, this non-native disease is causing severe mortality of butternut trees throughout their range. This disease was first confirmed present in New Brunswick by the CFS in 1997 at five sites in the general vicinity of Woodstock, Carleton County, but no regulatory action was taken by the CFIA. Butternut is not a major component of our native forests, nor is it of major economic importance, but the disease could pose a threat to our natural forest biodiversity.

In 2004, the CFS confirmed six new positive sites (i.e., 4 more in Carleton County and 2 in Victoria County). In 2005, butternut trees were put on the Endangered List under the Canadian *Species at Risk Act*. No evidence of newly infected areas was reported in 2005 or 2006. In 2007, however, the CFS reported 5 new positive sites once again, this time somewhat farther south in the general vicinity of Fredericton in York County. These sites represent a significant southerly expansion of the known distribution of butternut canker in New Brunswick. The nearest finds in 1997 and 2004 were located about 60 km northwest, near Woodstock, Carleton County.

In 2008, the CFS (Ken Harrison, pers. comm., CFS-Atlantic) reported two more new positive locations one in York County and one in Sunbury County. Each location is about 35 km due north and southeast (respectively) from the previous finds above Fredericton.

Monitoring of plantations and thinnings

Regional DNR staff, designated as Pest Detection Officers, conduct pest assessments in a sub-set of high-value plantations and thinned stands in each of DNR's four Administrative Regions, as well as general surveillance of forest pests around the Province. Survey results have not yet been compiled, but no major pests or significant areas of damage were reported.

Monitoring DNR's seed orchards and forest nursery

Routine monitoring of pest conditions was conducted in DNR's first- and second-generation seed orchards (mostly located in the Fredericton area). At Kingsclear and Wheeler Cove, egg sampling for spruce cone maggot in the black spruce stands produced very low numbers, so there was no need for control measures. White spruce stands, at Queensbury and Kingsclear, produced few cones making cone maggot egg sampling unnecessary.

In one black spruce stand at Wheeler Cove and one white spruce stand at Kingsclear, yellowheaded spruce sawfly larvae were present but caused very little damage. White pine weevil was responsible for the loss of two dozen leaders on the black spruce at Wheeler Cove and more than four dozen leaders on the Norway spruce at Queensbury. Spruce budworm and jack pine budworm numbers remained low in all spruce and jack pine stands respectively.

There were no pest enquiries from DNR's Kingsclear forest tree nursery in 2008.

General Detection

Results from the annual aerial survey conducted within the Province found no evidence of widespread damage from any major forest pests other than a small area of hardwood defoliation suspected to be caused by large aspen tortrix as well as continued evidence of beech bark disease in the north-central and north-western portions of the Province. Similar to 2007, patches of moderate to severe defoliation on trembling aspen caused by the aspen leaf roller were observed again in the Saint John River Valley.

In north-central New Brunswick (Big Bald Mountain/Christmas Mountain range) an extreme weather event on June 8th and 9th caused hail damage over a widespread area. Red flagging on fir and characteristic scarring on the upper sides of branches were evident on trees in this area.

