

GRANDMAISON - 1992 - 1

FOREST INSECT AND DISEASE
CONDITIONS IN MANITOBA
IN 1991

MIKE GRANDMAISON

FILE REPORT

GRANDMAISON - 1991 - 1

FOREST INSECT AND DISEASE SURVEY
FORESTRY CANADA
MANITOBA DISTRICT OFFICE
200 - 180 MAIN STREET
WINNIPEG, MANITOBA
R3C 1A6

Introduction

The Forest Insect and Disease Survey (FIDS) unit of Forestry Canada, Northwest Region continued to monitor forest pest problems in the province of Manitoba during 1991, with Mike Grandmaison (FIDS technician) operating from the Manitoba District Office in Winnipeg. Herb Cerezke (FIDS Head) and Jan Volney (Project Leader) from Northern Forestry Centre in Edmonton, provided functional assistance.

Pest detection involves a coordinated effort, including ground truthing and aerial surveys. These aerial surveys take place during critical periods when defoliation by a particular pest is most apparent. In 1991, a total of 4.9 hours of chartered aircraft time was provided by ForCan for aerial pest surveys (Figure 1). I wish to acknowledge Manitoba Forest Protection for conducting the aerial surveys.

In summary, the spruce budworm and forest tent caterpillar populations increased considerably during 1991. The jack pine budworm remained at endemic levels.

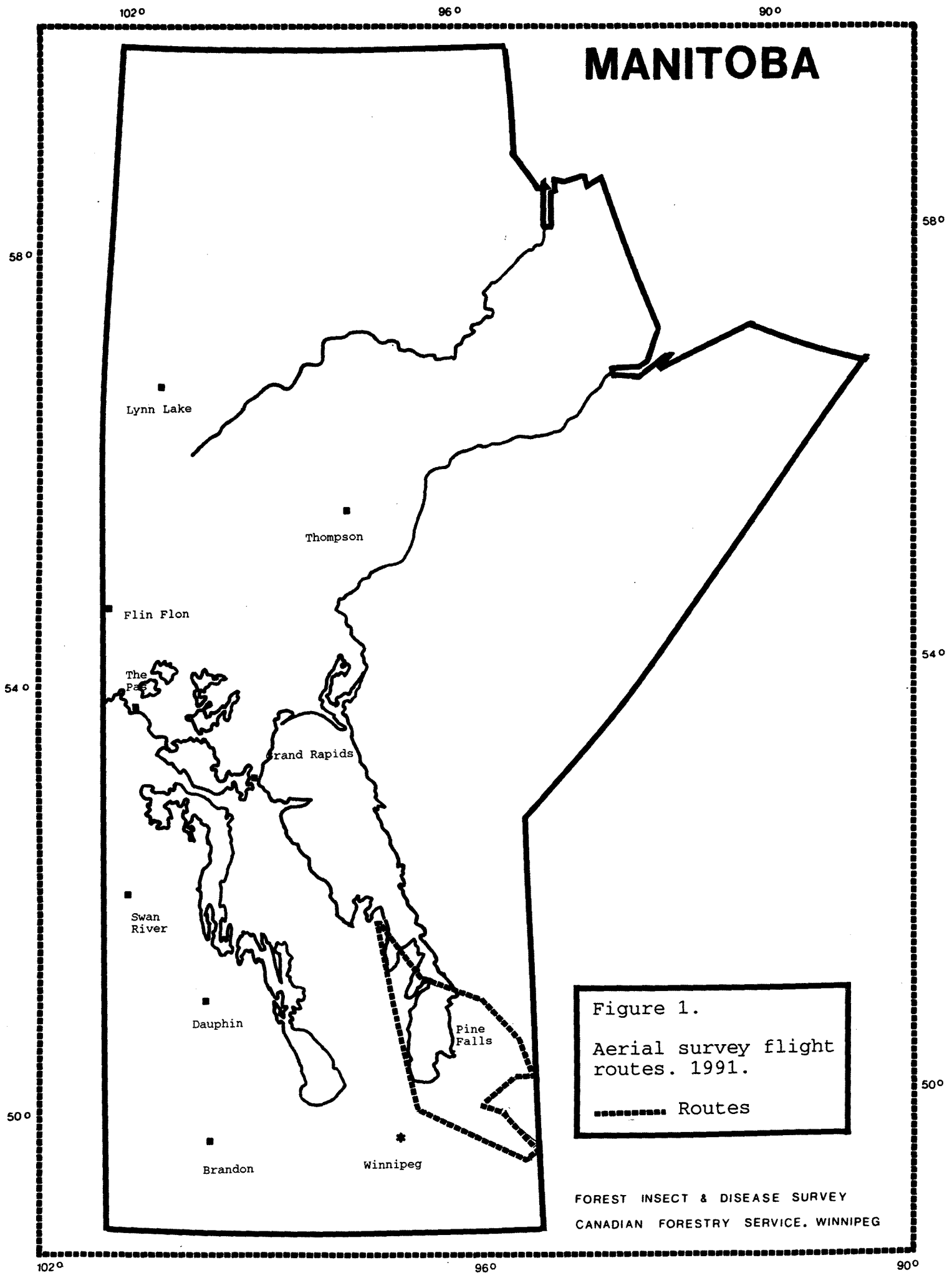


Figure 1.
 Aerial survey flight routes. 1991.
 ----- Routes

FOREST INSECT & DISEASE SURVEY
 CANADIAN FORESTRY SERVICE, WINNIPEG

Spruce Budworm

In 1991, some 30,499 ha of white spruce - balsam fir forests were defoliated by the spruce budworm, *Choristoneura fumiferana* (Clem.). This represents a 61 % increase in the area defoliated the previous year (Table 1).

Table 1. Areas of white spruce and balsam fir forests in Manitoba defoliated by the spruce budworm from 1982 to 1991.

Year	Area defoliated (ha)
1982	31,380
1983	40,500
1984	142,700
1985	77,500
1986	34,318
1987	15,540
1988	33,670
1989	58,016
1990	18,985
1991	30,499

The infestation increased markedly in every forest section of the province where it had been detected last year with the exception of the Interlake Forest Section where 7,188 ha were mapped (Table 2). The infestation persisted in the Lake Winnipeg East Forest Section with 21,627 ha of forest defoliated as well as in the Pineland Forest Section where 1,684 ha of forests were defoliated (Fig. 2; Table 2). Defoliation in Management Unit (MU) 20 represents an extension of the present outbreak. Table 2 summarizes the area defoliated by Forest Management Unit and Forest Section and detailed infestation data are compiled in Appendix 1. Areas of mortality continue to grow in the Lake Winnipeg East Forest Section as the infestation continues.

For the seventh consecutive year, pheromone-baited traps (non-saturating Multi-Pher) were deployed in 13 locations to test this technique as a survey monitoring tool. At each site, three traps were baited with a .03 % pheromone bait, spaced 40 m. apart and positioned in a triangle. Two mid-crown branches from each of two trees adjacent each trap were assessed for defoliation levels and egg mass estimates, and to correlate with numbers of moths caught. Results are shown in Tables 3 and 4. Male moth counts were generally lower or similar in 1991 to those in 1990. Moth counts remain high in the Wanipigow (197), Spruce Woods Provincial Forest (290) and Whiteshell Provincial Park (455) study sites. Table 5 summarizes pheromone data from 1985 to 1991. Egg mass counts indicate that similar defoliation levels will occur within these

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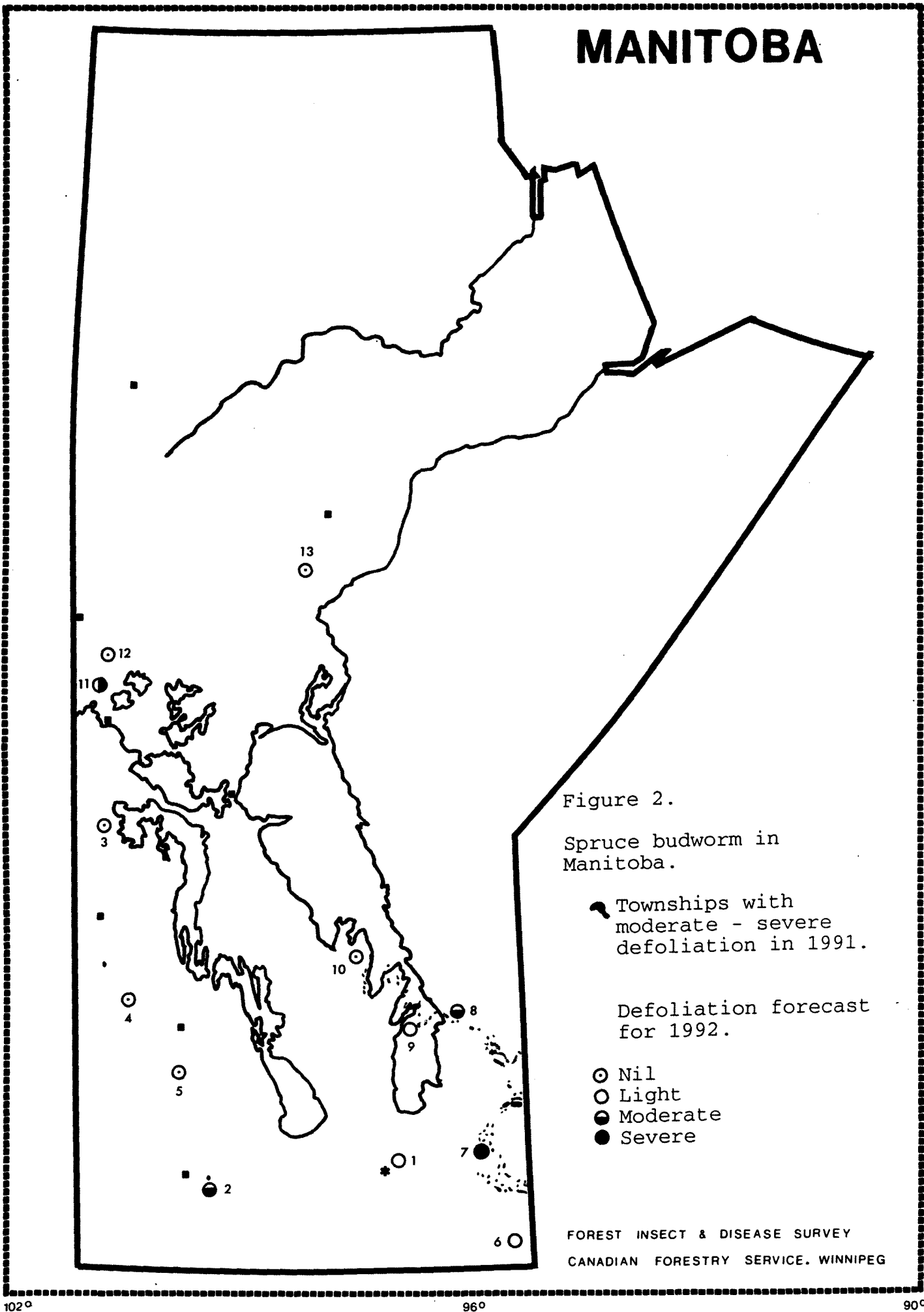


Figure 2.

Spruce budworm in Manitoba.

- ▣ Townships with moderate - severe defoliation in 1991.

Defoliation forecast for 1992.

- Nil
- Light
- Moderate
- Severe

study sites next year. Moderate to severe defoliation levels are expected in the Wanipigow and Whiteshell sites and moderate defoliation is expected in the Spruce Woods Provincial Forest site. While light to moderate defoliation may occur in the Rocky Lake site, all other study sites will experience either light or no defoliation. It should be pointed out that these predicted levels of defoliation apply only to the associated baited study sites. Weather, parasites and diseases may alter these predicted defoliation levels for 1992.

Manitoba Natural Resources (Forest Protection) also conducted surveys of spruce budworm egg mass densities in high priority areas defined for spruce budworm management ¹. Data from these are based upon a large number of sample locations distributed throughout the management lease areas, and therefore provide population estimates that are representative of the entire area. Based on these surveys, the results of Manitoba Natural Resources indicate light to moderate defoliation is expected to occur in Nopiming Provincial Park and Abitibi-Price forest management lease areas (44 and 59 egg masses/10 m² respectively, from 22 and 25 sample locations each). Moderate defoliation is forecasted for both Falcon-West Hawk lakes (75 egg masses/ 10m²) and Dorothy Lake (81 egg masses/ 10 m²) areas in Whiteshell Provincial Park. These counts were derived from 12 and 8 sample locations respectively.

¹ Keith Knowles, Manitoba Natural Resources; personal communication.

Table 2. Areas defoliated by the spruce budworm in Manitoba in 1991, summarized by Management Unit and Forest Section.

Forest Section	Management unit (MU)	Defoliated area (ha)	
		MU total	Section
Pineland	20	648	1,684
	23	1,036	
Lake Winnipeg East	30	7,382	21,627
	31	14,245	
Interlake	40	6,475	7,188
	41	713	
Manitoba (Total)			30,499

Table 3. Summary of spruce budworm data in Manitoba study sites: defoliation levels, egg mass counts in 1991, and defoliation forecasts for 1992.

Plot no.	Plot location	Forest management unit	Percent defoliation 1991	Defoliation level rating 1991	Number of egg masses/ 10m ² foliage 1991	Defoliation predicted for 1992 ^a
1	Birds Hill Provincial Park	01	13	Light	10	Light
2	Spruce Woods Provincial Forest	04	13	Light	76	Moderate
3	Red Deer River	12	<1	Trace	0	Nil
4	Duck Mountain Provincial Park	13	2	Trace	0	Nil
5	Riding Mountain National Park	15	1	Trace	0	Nil
6	Northwest Angle Provincial Forest	20	2	Trace	4	Light
7	Whiteshell Provincial Park	30	30	Moderate	279	Severe
8	Wanipigow	31	30	Moderate	138	Moderate
9	Hecla Provincial Park	40	5	Trace	4	Light
10	Lake St. George	41	2	Trace	0	Nil
11	Rocky Lake	56	8	Low	30	Light - moderate
12	Simonhouse	60	2	Trace	0	Nil
13	Pisew Falls	84	3	Trace	0	Nil

^a Based on egg mass density estimates from 6 trees (12 branches) at each plot location.

Table 4. Spruce budworm moth captures in pheromone-baited traps at 13 study sites in Manitoba during 1991.

Plot no.	Plot location	Forest management unit	UTM ^a Grid No.	Number of male moths			
				Trap 1	Trap 2	Trap 3	Average
1	Birds Hill Provincial Park	01	14 653 5541	104	73	113	98
2	Spruce Woods Provincial Forest	04	14 465 5523	259	244	367	290
3	Red Deer River	12	14 362 5861	27	28	20	25
4	Duck Mountain Provincial Park	13	14 380 5704	3	5	6	5
5	Riding Mountain National Park	15	14 429 5618	24	11	5	13
6	Northwest Angle Provincial Forest	20	15 332 5460	39	15	32	29
7	Whiteshell Provincial Park	31	15 303 5556	673	422	269	455
8	Wanipigow	31	15 300 5660	187	265	140	197
9	Hecla Provincial Park	40	14 663 5668	52	29	33	38
10	Lake St. George	41	14 611 5735	14	53	29	32
11	Rocky Lake	56	14 343 6006	31	55	45	44
12	Simonhouse	60	14 346 6034	22	17	14	18
13	Pisew Falls	84	14 538 6116	6	12	1	6

^a UTM Grid No. refers to the Universal Transverse Mercator Grid system of designating locations on maps.

Table 5. Summary of spruce budworm moth captures per pheromone-baited trap in Manitoba study sites from 1985 to 1991.

Plot no.	Plot location	Forest management unit	Average number of moths captured per trap						
			1985	1986	1987	1988	1989	1990	1991
1	Birds Hill Provincial Park	01	2	279	128	40	328	114 _b	98
2	Spruce Woods Provincial Forest	04	60	435	293	122	559	322	290
3	Red Deer River	12	25	16	9 ^a	2	52	57	25
4	Duck Mountain Provincial Park	13	1	13	1	3	8	8	5
5	Riding Mountain National Park	15	2	52	2 ^b	0	14	6	13
6	Northwest Angle Provincial Forest	20	- _c	103	136	213	56	9	29
7	Whiteshell Provincial Park	30	335	3517	1326	612	774	643	455
8	Wanipigow	31	97	1585	456	431	659 ^a	509	197
9	Hecla Provincial Park	40	9	239	65	15	84	37	38
10	Lake St. George	41	1	77	9 ^b	6	9	6	32
11	Rocky Lake	56	5	66	9	2	41	49	41
12	Simonhouse	60	0	8	1 ^b	1	22	30	18
13	Pisew Falls	84	-	8	1	0	16	6	6

^a Data from 1 of 3 traps.

^b Data from 2 of 3 traps.

^c No data collected at this site prior to 1986.

Jack Pine Budworm

Moderate to severe defoliation by the jack pine budworm, *Choristoneura pinus* Free, was not detected in the province. The last outbreak spanned a period of six years, from 1982 to 1987 (Table 6). Results of an egg mass sampling survey by Manitoba Natural Resources for selected locations in Manitoba are shown in Table 7. At each location, six 60cm branches from six different trees are sampled. Defoliation levels for all sample locations are less than 6 % . Defoliation is not expected in any of the sample locations except for the area near Bedford where light defoliation of jack pine could occur.

Table 6. Areas of jack pine in Manitoba defoliated by the jack pine budworm from 1982 to 1991.

Year	Area defoliated (ha)
1982	46,000
1983	153,000
1984	761,000
1985	2,047,500
1986	132,000
1987	100
1988	0
1989	0
1990	0
1991	0

Table 7. Jack pine budworm egg mass counts in 1991 and defoliation predictions for 1992 for selected Manitoba locations. ^a

Location	Forest management unit	Number of plots	Number of egg masses /plot	Defoliation predicted for 1992
Shilo	04 ^b	2	0	Nil
Porcupine Mountain	14 ^b	2	0	Nil
Badger	20	2	0	Nil
Bedford	20	2	0.5	Light
Hadashville	20 ^b	1	0	Nil
Kerry	20 ^b	1	0	Nil
Lonesand	20 ^b	1	0	Nil
Marchand	20	1	0	Nil
Richer	20 ^b	1	0	Nil
Richer	20	4	0	Nil
Sandilands	20 ^b	3	0	Nil
Vassar	20 ^b	1	0	Nil
Woodridge	20 ^b	1	0	Nil
Belair P.F.	23 ^b	2	0	Nil
Whiteshell P.P.	30 ^b	2	0	Nil
Black River	31	1	0	Nil
Cat Lake	31	1	0	Nil
Euclid Lake	31	1	0	Nil
Nopiming P.P.	31 ^b	2	0	Nil
Shoe Lake	31	1	0	Nil
St. Martin	43 ^b	1	0	Nil
Devil's Lake	45	6	0	Nil
Twin Creeks	46	4	0	Nil
Grand Rapids	51 ^b	2	0	Nil
Westray	52	2	0	Nil
Moose Lake	53 ^b	2	0	Nil
Moose Lake Rd.	55	2	0	Nil
Rocky Lake Rd.	56	1	0	Nil
Wanless	56	1	0	Nil
Root Lake	57	2	0	Nil
Reed Lake	60 ^b	2	0	Nil
Kississing Lake	63 ^b	2	0	Nil
Wabowden	83 ^b	2	0	Nil

^a Manitoba Forest Protection data based on egg mass density estimates (egg masses / plot).

^b Pheromone trap site

Aspen Defoliators

Aspen forests were defoliated to the extent of 70,773 ha in 1991 (Figure 3), representing a 2.3 fold increase in the area defoliated last year. The forest tent caterpillar, *Malacosoma disstria* Hbn., was the principal defoliator and responsible for defoliating 58,082 ha. The balance of the defoliated area (12,691 ha) is attributed to the large aspen tortrix, *Choristoneura conflictana* (Wlk.). Table 8 summarizes the area infested for the 1981 - 1991 period.

Table 8. Areas of aspen forests in Manitoba defoliated by defoliators, mainly the forest tent caterpillar, from 1981 to 1991.

Year	Area defoliated (ha)
1981	100,000
1982	600,000
1983	600,000
1984	76,900
1985	19,500
1986	17,094
1987	4,403
1988	55,685
1989	325,045
1990	30,718
1991	70,773

Defoliation in all forest sections of the province generally increased in 1991 (Table 9). The forest tent caterpillar was responsible for defoliation in the following forest sections: Interlake (53,419 ha), Lake Winnipeg East (4,598 ha) and Pineland (65 ha). The large aspen tortrix on the other hand was the primary defoliator in the Mountain (5,180 ha), Nelson River (3,108 ha) and Highrock (4,403 ha) forest sections. This pest caused little defoliation in the Duck Mountain area and decreased drastically in the Riding Mountain area. The Nelson River and Highrock Forest Sections represent new locations for the tortrix.

A forest tent caterpillar egg band survey to predict population levels for 1992 was conducted in cooperation with Forest Protection, Manitoba Natural Resources. At each location, one site consisting of three trees were sampled except for Big Whiteshell Lk., Minnedosa, Spruce Woods, Turtle Mountain and Hecla where two sites were sampled in each. Results indicate that moderate to severe defoliation of aspen may occur in only a few areas in the Interlake Forest Section in 1992 (Table 10, Figure 3). Light defoliation may however occur in a number of locations in eastern and west-central Manitoba.

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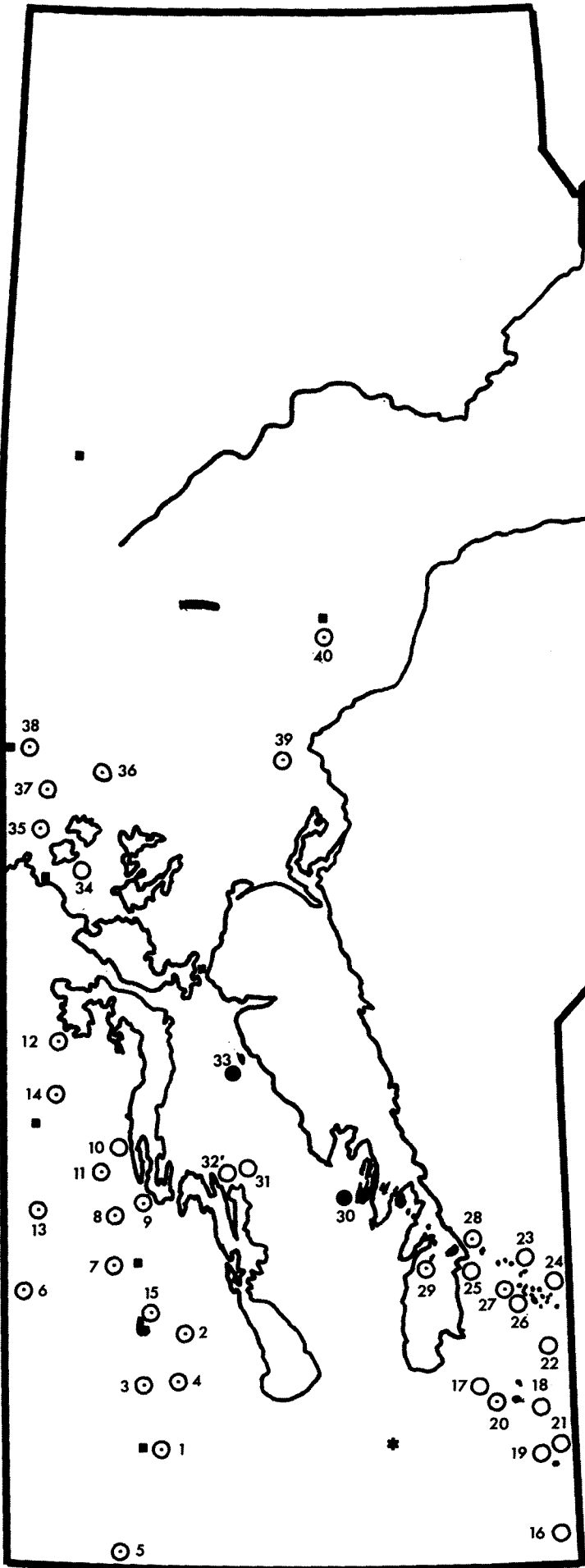






Figure 3.

Aspen defoliators, mainly the forest tent caterpillar, in Manitoba.

 Townships with moderate - severe defoliation in 1991.

Defoliation forecast for 1992.

-  Nil
-  Light
-  Severe

102°

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Table 9. Areas of aspen forests defoliated by defoliators, mainly the forest tent caterpillar, in Manitoba in 1991, summarized by Management unit and Forest section.

Forest section	Management unit (MU)	Defoliated area (ha)	
		MU	Section total
Mountain	15	5,180	5,180
Pineland	23	65	65
Lake Winnipeg East	30	1,166	4,598
	31	3,432	
Interlake	40	17,742	53,419
	41	33,605	
	46	2,072	
Highrock	66	4,403	4,403
Nelson River	83	518	3,108
	89	2,590	
Manitoba (Total)			70,773

Table 10. Forest tent caterpillar egg band survey results in Manitoba in 1991 and defoliation forecast for Manitoba study sites in 1992.

Location	Forest management unit	Aver. plot d.b.h. (cm)	Mean no. of egg bands/plot	Defoliation forecast for 1992	Source of information
1 Spruce Woods	04	8.2	0	Nil	M.N.R.
2 Kelwood	05	9.2	0	Nil	M.N.R.
3 Minnedosa	05	11.2	0	Nil	M.N.R.
4 Neepawa	05	10.7	0	Nil	M.N.R.
5 Turtle Mountain P.P.	06	8.6	0	Nil	M.N.R.
6 Asessippi P.P.	10	8.9	0	Nil	ForCan
7 Ashville	10	10.4	0	Nil	M.N.R.
8 Ethelbert	10	9.1	0	Nil	M.N.R.
9 Winnipegosis	10	7.6	0	Nil	M.N.R.
10 Camperville	11	9.2	0.3	Light	M.N.R.
11 Pine River	11	7.8	0	Nil	M.N.R.
12 Pelican Rapids Rd.	12	9.9	0	Nil	ForCan
13 Duck Mountain P.P.	13	6.0	0	Nil	ForCan
14 Birch River	14	6.5	0	Nil	ForCan
15 Riding Mountain N.P.	15	7.0	0	Nil	ForCan
16 Moose Lake	20	9.0	2.7	Light	M.N.R.
17 Lac Du Bonnet	23	8.8	0.3	Light	M.N.R.
18 Big Whiteshell Lk.	30	9.3	2.5	Light	M.N.R.
19 Falcon Lake	30	9.2	0.7	Light	M.N.R.
20 Pinawa	30	10.3	0	Nil	M.N.R.
21 West Hawk Lake	30	10.0	1.0	Light	M.N.R.
22 Bird Lake	31	9.0	3.0	Light	M.N.R.
23 Bisset	31	8.0	1.0	Light	M.N.R.
24 Long Lake	31	8.6	3.0	Light	M.N.R.
25 Manigotogan	31	10.1	1.0	Light	M.N.R.
26 Quesnel Lake	31	9.1	1.3	Light	M.N.R.
27 Quesnel Lake Rd.	31	9.3	0	Light	M.N.R.
28 Wanipigow	31	10.3	0	Nil	M.N.R.
29 Hecla Island P.P.	40	9.0	0	Nil	M.N.R.
30 Lake St. George	41	8.3	10.3	Severe	M.N.R.
31 Gypsumville	43	7.3	0.3	Light	ForCan
32 Lake St. Martin	43	7.7	3.3	Light	M.N.R.
33 Centre Three River	45	7.4	15.0	Severe	ForCan
34 Moose Lake	55	10.4	0.3	Light	ForCan
35 Rocky Lake	56	7.1	0	Nil	ForCan
36 Reed Lake	60	12.5	0	Nil	ForCan
37 Simonhouse	60	8.0	0	Nil	ForCan
38 Flin Flon	62	7.8	0	Nil	ForCan
39 Jenpeg road	83	7.6	0	Nil	ForCan
40 Thompson	87	4.4	0	Nil	ForCan

Plantation Surveys

Thirteen plantations were surveyed in the Agassiz, Belair and Grand Beach areas of the Pineland Forest Section (MU 20 and 23). These plantations were selected from a priority list drafted by Forest Protection (M.N.R.) and account for a fraction of the plantation surveys carried out by provincial summer crews. Plantation data for the 1991 season are summarized in Table 11. A file report summarizing the first five years of plantation surveys will follow.

Pest Assessment on Permanent Sample Plots

A total of 15 plots were visited and assessed during the 1991 field season, bringing the total number of plots visited to 138 since the initiation of this project. This cooperative study with Manitoba Natural Resources was initiated to monitor insect and disease problems on a long term basis. This information could provide more accurate volume loss estimates as a result of impact by various pests. Plots visited in 1991 were located in Turtle Mountain Provincial Park (MU 06), Sandilands (MU 20), Bisset (MU 31) and Wabowden (MU 83) areas. A progress report will follow.

Gypsy Moth

The survey for the gypsy moth, *Lymantria dispar* (Linnaeus), was intensified in 1991 as a result of a number of male moth captures in Northwestern Ontario in 1990, including Manitoba's first record at Falcon Lake, in Whiteshell Provincial Park. A total of 327 traps were set out by Agriculture Canada, Plant Protection Division in Manitoba and Northwestern Ontario. Single male moth captures were reported in five locations in Manitoba in 1991: Caddy Lake (Whiteshell P.P.), Norkway Park (near Portage La Prairie), Austin, Sidney and Spruce Woods Provincial Park. In Northwestern Ontario, single male moth captures were reported from Quetico and Blue Lake Provincial Parks as well as in the Pacwash Forest. The gypsy moth was also reported in Saskatchewan (Moose Jaw) for the first time, again another single male moth capture. The gypsy moth is potentially a serious defoliator if it becomes established in our region. It feeds on a variety of hardwoods and conifers, but prefers oak, poplar and birch. In Canada, it is well established in Ontario, Quebec and the Maritimes.

Table 11. Summary of Manitoba plantation data. 1991.

Plantation no.	MU	Year planted	Species planted	Area (ha)	No. of plots	No. of trees sampled	No. of trees/plot
67-11	20	1967	jP wS rP	117.4	19	614	32.3
84-4	20	1984	jP rP	14.4	6	95	15.8
84-6	20	1984	rP jP	6.1	2	24	12.0
71-1	23	1971	rP sP	6.6	4	29	7.3
75-3	23	1976	rP sP	15.7	7	62	8.9
76-4	23	1976	rP	6.6	3	10	3.3
81-4	23	1981	jP rP	15.4	15	182	12.1
83-5	23	1983	jP rP	5.2	2	20	10.0
84-5	23	1984	jP rP	25.3	6	56	9.3
85-2	23	1985	rP	3.4	2	18	9.0
85-11	23	1985	bS	30.9	9	152	16.9
85-13	23	1985	jP	38.0	14	283	20.2
85-30	23	1985	wS	22.3	5	70	14.0

Pest Conditions in Riding Mountain National Park

Dutch elm disease, *Ceratocystis ulmi* (Buism.), remains the most important pest in the park. The disease is well established in the east-northeast section of the park. Monitoring of the disease in the park did not take place this year.

Although the large aspen tortrix, *Choristoneura conflictana* (Wlk.), continued to cause moderate to severe defoliation of trembling aspen (5,180 ha), defoliation was discontinuous. Once again defoliation was most evident in the southern part of the park. Populations of the large aspen tortrix are expected to decline even further during 1992.

The spruce budworm did not cause any moderate to severe defoliation again this year and the result of an egg mass survey indicates no moderate to severe defoliation is expected in the coming year either. Only 13 male spruce budworm moths were captured in pheromone-baited traps.

Results from an egg band survey conducted near Lake Audy indicate that the forest tent caterpillar is not expected to cause any moderate to severe defoliation in 1992.

Acid Rain National Early Warning System

The four ARNEWS plots, situated in Whiteshell Provincial Park, Duck Mountain Provincial Park, Jenpeg and Leaf Rapids, were monitored on two separate occasions: mid June and late July-early August. Annual plot tree assessments (ARNEWS Form 4, 7, 8, 9, & 10) were performed and included tree and branch conditions, current defoliation, bare top length, storm damage, seed production, acid rain symptoms, annual growth, foliar and woody tissue damaged caused by insects and diseases. An interim report outlining the national situation is in progress. The Leaf Rapids plot, established in the fall of 1990, was completed earlier in the spring.

SPECIAL COLLECTIONS

At the request of David Langor (NoFC), two sites were monitored closely during the summer of 1991 for aspen pests. The sites were located near Homebrook and West Hawk Lake and were monitored on three separate occasions during June, July and August. A number of collections were made at these sites and the samples were sent to NoFC for rearing and identification. Refer to Table 12 (Other Noteworthy and Important Pests in Manitoba, 1991) for a partial listing.

Ken Mallett (NoFC) also requested special collections from Manitoba. Conks of *Phellinus tremulae* (Bond.) Bond. & Boriss. were collected from 6 locations in Manitoba: Lake St. George, Riding Mountain National Park, Duck Mountain National Park, Gypsumville, Simonhouse and Nelson House. Samples were sent to NoFC for culturing and identification.

Other Important and Noteworthy Pests

A number of minor pests listed in Table 12 were encountered during the course of the field season. Although most of these did not cause extensive damage, they have the potential to cause injury in localized areas.

Other Pest Surveys In Manitoba

Additional surveys or research activities relating to forest insect and disease conditions in Manitoba during 1990 were carried out by agencies other than FIDS and are listed in Table 13.

Table 12. Other important and noteworthy pest conditions in Manitoba, 1991.

Pest or condition	Host	Location	Remarks
Animal damage	jP	PSP 81 LN504 (Wabowden)	Light browse damage
	jP	Plantation 85-13 Plantation 84-4 (Agassiz)	Occasional light to moderate browsing
	jP	Plantation 75-3 Plantation 81-4 (Belair)	Light browse damage
	jP	Plantation 84-6 (Agassiz)	Varying degrees of browse
	jP	Plantation 85-30 (Grand Beach)	Light to moderate browse
	rP	Plantation 84-5 (Agassiz)	Varying degrees of browse damage, including clipped leaders
	rP	PSP120LN159 (Piney)	Light browse damage
	wS	PSP 45 LN 201 (Turtle Mountain)	Light browse damage
	wS	Plantation 1-67 (Agassiz)	Light browse damage
	bs	Plantation 85-11 (Agassiz)	Light browse damage

Table 12. (continued)

Armillaria root rot Armillaria ostoyae (Romag.) Herink	jP	PSP 354 LN 64 (Piney)	Occasional mortality
		PSP 208 LN 68	
		PSP 46 LN622 (Bisset)	
	bS, tA,	PSP 128 LN624 (Bisset)	Mortality common
	bS, tA, jP	PSP 223 LN713 (Bisset)	Occasional mortality
	jP	Plantation 85-13 (Agassiz)	Moderate incidence
	jP	Plantation 1-67 (Agassiz)	Low incidence
	jP	Plantation 76-4 (Grand Beach)	Common
	jP	Plantation 85-30 (Grand Beach)	Low incidence
	jP	Plantation 85-2 (Belair)	Low incidence
American aspen beetle Gonioctena americana (Schaeffer)	tA	Homebrook	Moderate populations
Aspen leaf beetle Chrysomela crotchi Brown	tA	Homebrook	Trace populations
Aspen leafroller Pseudexentera oregonana (Walsingham)	tA	Homebrook	Moderate-severe defoliation

Table 12. (continued)

Aspen serpentine miner Phyllocnistis populiella Chambers	tA	West Hawk Lake	Trace levels
Aspen twoleaf tier Enargia decolor (Walker)	tA	West Hawk Lake	Trace levels
Aspen webworm Tetralopha aplastella (Hulst)	tA	Homebrook	Trace populations
Cytospora canker * Cytospora sp.	rP	Woodridge planta- tion	Associated with a number of dead and dying trees
Dasychira vagans (Barnes & McDunnough)	tA	Homebrook	Light populations
Diplodia canker * Diplodia pinea (Desm.) Kickx	rP	Woodridge planta- tion	Associated with a number of dead and dying trees
Drought	jP, bF rP	Sandilands Whiteshell P.P.	Mortality common Mortality common
Eastern pine shootborer Eucosma gloriola Heinrich	jP	Plantation 84-4 (Agassiz)	Common incidence
	jP	Plantation 85-13 (Agassiz)	Common incidence
	jP	Plantation 81-4 (Belair)	Low incidence
	jP	Plantation 85-30 (Grand Beach)	Common incidence

* Identified by Forestry Canada, Great Lakes Forestry Centre and Laurentian Forestry Centre

Table 12. (continued)

	tA	Sandilands & Whiteshell P.P.	Generally light defoliation with pockets of moderate - severe defoliation
Pine root collar weevil Hylobius radicis Buchanan	sP	Plantation 71-1 (Grand Beach)	Killed numerous trees
	sP	Plantation 75-3 (Grand Beach)	Some mortality
Pitch mass borer Synanthedon pini (Kellicott)	jP	Stead tree improvement plantation	Trace populations
Planting problems	jP	Plantation 85-13 (Agassiz)	J-root and club root problems common
	jP	Plantation 85-30 (Grand Beach)	
Red turpentine beetle Dendroctonus valens LeConte	rP	Sandilands	Moderate populations in less vigorous trees
Semiothisa sp.	tA	West Hawk Lake	Trace levels
Spearmarked black moth Rheumaptera hastata (Linnaeus)	wB	Leaf Rapids ARNEWS plot south about 120 kms	Moderate -severe defoliation
Speckled green fruitworm Orthosia hibisci (Guenee)	tA	Homebrook	Light-moderate
Cimbex americana Leach	tA	West Hawk Lake	Trace levels

Table 12. (continued)

Western gall rust Endocronartium harknessii (J.P. Moore) Y. Hiratsuka	jP	PSP442LN 63 (Piney) PSP 46LN622 (Bisset) PSP354LN 64 (Piney) Plantation 85-13 (Agassiz)	Some main stem infections and many lateral infections Some main stem infections of seedlings at ground level
White spotted sawyer beetle Monochamus scutellatus (Say)	jP	Kississing, Sheradon, Abitibi lease areas	Damage to dead and dying trees in areas of the 1989 fires, including logs
Willow sawfly Lyonetia sp.	Salix sp.	Leaf Rapids ARNEWS plot south about 120 kms	Moderate - severe defoliation
Yellow-bellied sapsucker Sphyrapicus varius (Linnaeus)	jP	Stonewall, Plantation 71-1 (Grand Beach), Stead Tree Impro- vement plantation	Low incidence of damage
Yellowheaded spruce sawfly Pikonema alaskensis (Rohwer)	wS	Plantation 85-13 (Agassiz)	Occasional severe defoliation

Table 13. Other pest surveys and research activities in Manitoba during 1991.

Pest	Study	Location	Study leader	Agency
Armillaria root rot Armillaria sp.	Monitoring and impact	FMU 20 23	Knowles	M.N.R.
Dutch elm disease Ceratocystis ulmi (Buism.) C. Moreau	Elm bark beetle contamination monitoring	Southern Manitoba	Pines	M.N.R.
	European elm bark beetle monitoring and pheromone	Southern Manitoba	Pines	M.N.R.
	European elm bark beetle monitoring and pheromone	Winnipeg	Gadawsky	City of Winnipeg
	Native elm bark beetle attractants	Winnipeg	—	S.U. of New York
	Native elm bark beetle control	Winnipeg	—	Private industry
	Native elm bark beetle monitoring and control	Winnipeg	Gadawsky	City of Winnipeg
	Surveillance and control of diseased elm trees	Manitoba	Knowles Matwee Platford Jansen, Pines	M.N.R. M.N.R. M.D.A. City of Winnipeg

Table 13. (continued).

Pest	Study	Location	Study leader	Agency
Dutch elm disease (continued)	Therapeutic elm tree injection trials	Winnipeg	Allen, Pines Swayze	City of Winnipeg
	Therapeutic elm tree pruning trials	Winnipeg	Allen, Pines Gadawsky	City of Winnipeg
Dwarf mistletoe Arceuthobium americanum Mutt. ex Engelm.	Research and impact	FMU 4 23 46 47 51 53 56	French	U. of Minnesota
			Baker	Utah State University
	Sanitation	Manitoba	Knowles	M.N.R.
Fall cankerworm / Alsophila pometaria (Harr.) Spring cankerworm Paleacrita vernata (Peck)	Monitoring and control	Winnipeg	Regional Forestry Staff	M.N.R.
			Gadawsky	City of Winnipeg
Gypsy moth Lymantria dispar (Linnaeus)	Pheromone trapping	Winnipeg	Gadawsky	City of Winnipeg
		Southeast Manitoba	Brandt	Agriculture Canada

Table 13. (continued)

Pest	Study	Location	Study leader	Agency
Western gall rust Endocronartium harknessii (J.P. Moore)	Resistance study in superior jack pine	FMU 01	Hiratsuka Klein Pines	ForCan ForCan M.N.R.
	Thinning study	FMU 13	Knowles Desrochers	M.N.R. M.N.R.

FMU - Forest management unit
 ForCan - Forestry Canada
 M.N.R. - Manitoba Natural Resources
 M.D.A. - Manitoba Department of Agriculture
 S.U. of N.Y. - State University of New York
 U. of M. - University of Manitoba
 U. of Minnesota - University of Minnesota

Appendices

Appendix 1. Spruce budworm outbreak data for Manitoba, 1991.

FOREST SECTION	MU	TWP	RG	NS	MU	TWP	RG	NS
Pineland Forest Section	20	9	14E	1	20	10	12E	.5
	20	10	13E	1				
	23	14	12E	1	23	15	13E	2.5
	23	15	14E	.5				
Lake Winnipeg East Forest Section	30	8	15E	.5	30	8	16E	5
	30	8	17E	3	30	9	14E	3
	30	9	15E	3	30	9	16E	1
	30	9	17E	5	30	10	14E	1
	30	10	15E	3	30	11	14E	.25
	30	11	15E	.5	30	12	14E	1
	30	13	14E	1	30	14	13E	1
	30	14	14E	.25				
	31	16	15E	.5	31	17	15E	9
	31	17	16E	13	31	17	17E	4
	31	18	16E	5	31	18	17E	1
	31	19	15E	1	31	21	14E	1
	31	21	15E	1.5	31	21	16E	2
	31	22	14E	4	31	22	15E	3
	31	22	16E	1	31	22	17E	.5
	31	23	13E	.5	31	23	14E	3
	31	24	13E	.5	31	24	14E	.25
	31	25	10E	.25	31	25	11E	.25
	31	25	12E	.5	31	26	9E	3
31	26	10E	.5					
Interlake Forest Section	40	25	6E	2	40	25	7E	1.5
	40	26	6E	1	40	26	7E	2.5
	40	26	8E	2	40	27	5E	1
	40	27	6E	12	40	27	7E	.5
	40	28	5E	1	40	29	3E	.25
	40	30	4E	.25	40	31	3E	1
	41	28	1E	.25	41	29	1E	1
	41	30	1E	1	41	31	1E	.25
41	32	2E	.25					

FMU = Forest management unit

TWP = Township

RG = Range

NS = Number of sections with moderate to severe defoliation