

Summary of Aerial Overview Surveys in the Southern Interior Forest Region - 2003



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2003 Overview of Forest Health in the Southern Interior Forest Region



INTRODUCTION

During the winter of 2002/2003, a reorganization of the Ministry of Forests administrative boundaries resulted in the formation of the Southern Interior Region by amalgamating the former Cariboo, Kamloops, and Nelson Regions, plus the Robson Valley District (originally in the Prince George Region). In addition, several adjoining Districts were amalgamated and re-named (Figure 1). In 2003, as in the past, separate survey crews were responsible for each of the old administrative areas. Surveys were completed using the standardised Aerial Overview Survey methodology, and mortality and/or damage resulting from bark beetles, defoliators, diseases, and any other detectable forest health factors was recorded. The complete set of sketch mapping and data management standards can be viewed on the Ministry of Forests website, <http://www.for.gov.bc.ca/hfp/FORSITE/overview/overview.htm>.

Bark beetle and defoliator damage levels used in the aerial overview surveys are:

Bark beetle intensity class	Current mortality	Defoliation intensity class	Attributes
Light	1-10%	Light	some branch tip and upper crown defoliation, barely visible from the air
Moderate	11-29%	Moderate	thin foliage, top third of many trees severely defoliated, some completely stripped
Severe	30%+	Severe	bare branch tips and completely defoliated tops, most trees sustaining >50% total defoliation

Poor air quality due to numerous large wildfires and inversion conditions caused mapping difficulties in several areas during the 2003 aerial overview surveys. Visibility was particularly poor in areas around Nelson, the southeast portion of the Rocky Mountain District, the Robson Valley, and in most areas of the former Kamloops Region. Poor visibility sometimes impaired the ability of surveyors to detect smaller and/or low intensity bark beetle infestations, and areas of light defoliation. All areas of the Region were covered by the surveys, except for a small area in the southeast portion of the Rocky Mountain District, and a small 'buffer' area around the large McLure Fire in the Kamloops District.

The most damaging pests in the Southern Interior Region in 2003, based on area affected, were mountain pine beetle (2,527,247 ha), western spruce budworm (506,033 ha), and western balsam bark beetle (208,381 ha). Summaries of all significant forest health factors detected during the 2003 overview surveys are in tables 1 and 2.

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Figure 1. New administrative boundaries and District names of the Southern Interior Forest Region.

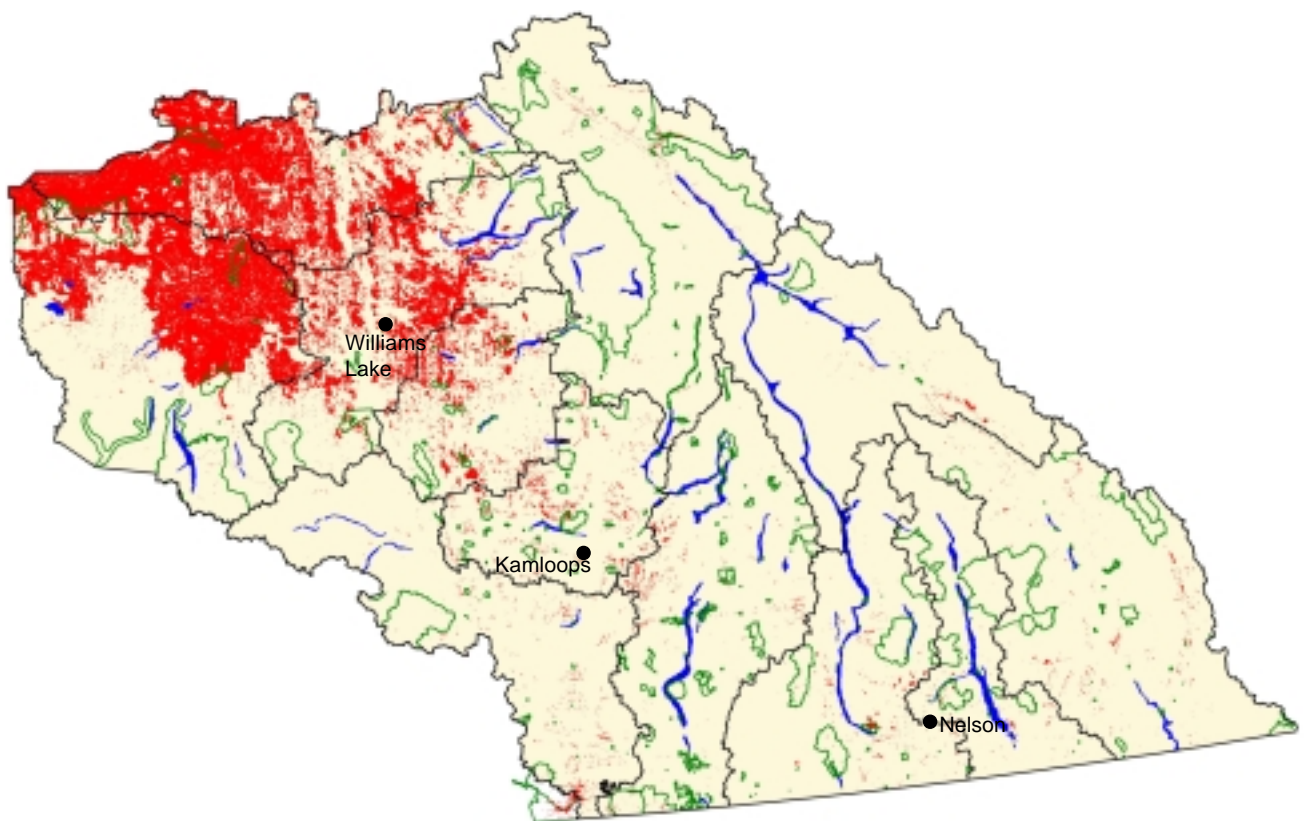


Figure 2. Mountain pine beetle infestations mapped during the 2003 aerial overview surveys.



Table 1. Area summaries for major bark beetles mapped during the 2003 Southern Interior Forest Region aerial overview surveys.

Forest District (new & old) and bark beetle species	Light ¹	Area of Infestation(ha)		
		Moderate ¹	Severe ¹	Total
MOUNTAIN PINE BEETLE				
Kamloops	11,186	10,380	5,926	27,492
Cascades	5,100	3,165	804	9,069
Merritt portion	4,297	2,745	512	7,553
Lillooet portion	803	421	292	1,515
Okanagan Shuswap	5,963	3,325	1,207	10,495
Salmon Arm portion	1,242	1,031	407	2,680
Vernon portion	4,052	2,052	584	6,688
Penticton portion	669	407	216	1,291
Headwaters	3,414	867	840	5,122
Clearwater portion	503	242	205	949
Robson Valley portion	2,912	625	635	4,172
Columbia	84	2,373	1,792	4,250
Rocky Mountain	1,269	2,552	4,671	8,491
Cranbrook portion	1,129	1,394	3,825	6,349
Invermere portion	139	1,158	846	2,143
Arrow Boundary	2,208	4,435	4,948	11,591
Arrow portion	1,828	4,323	4,806	10,958
Boundary portion	380	112	183	675
Kootenay Lake	131	998	1,370	2,499
Quesnel	558,810	290,802	159,314	1,008,926
Chilcotin	845,038	29,991	4,916	879,945
Central Cariboo	417,137	31,071	3,287	451,495
Williams Lake portion	272,472	26,509	2,684	301,665
Horsefly portion	144,665	4,562	603	149,830
100 Mile House	103,606	2,526	215	106,347
Total	1,953,946	382,485	189,290	2,525,722
DOUGLAS-FIR BEETLE				
Kamloops	81	26	9	115
Cascades	239	107	29	376
Merritt portion	130	9	8	147
Lillooet portion	110	98	21	228
Okanagan Shuswap	351	126	14	491
Salmon Arm portion	121	57	8	186
Vernon portion	112	11	0	123
Penticton portion	118	58	6	181
Headwaters	482	313	27	823
Clearwater portion	482	310	27	820
Robson Valley portion	0	3	0	3
Columbia	102	24	0	126
Rocky Mountain	152	395	269	816
Cranbrook portion	140	290	17	447
Invermere portion	12	105	252	369
Arrow Boundary	101	227	128	455
Arrow portion	0	170	35	206
Boundary portion	101	57	92	249
Kootenay Lake	18	0	0	18
Quesnel	0	0	41	41
Chilcotin	168	69	52	289
Central Cariboo	11,788	91	332	12,211
Williams Lake portion	11,675	91	288	12,055
Horsefly portion	113	0	44	157
100 Mile House	6,897	25	261	7,183
Total	20,379	1403	1162	22,944

Table 1 (continued). Area summaries for major bark beetles mapped during the 2003 Southern Interior Forest Region aerial overview surveys.

Forest District (new & old) and bark beetle species	Light ¹	Area of Infestation(ha)		
		Moderate ¹	Severe ¹	Total
SPRUCE BEETLE				
Kamloops	0	9	3	11
Cascades	1,043	125	37	1,206
Merritt portion	93	0	0	93
Lillooet portion	951	125	37	1,113
Okanagan Shuswap	147	650	9	806
Salmon Arm portion	0	57	0	57
Vernon portion	0	16	0	16
Penticton portion	147	576	9	732
Headwaters	651	925	1,967	3,542
Clearwater portion	651	911	1,967	3,529
Robson Valley portion	0	13	0	13
Columbia	44	20	31	95
Rocky Mountain	55	0	36	91
Cranbrook portion	0	0	36	36
Invermere portion	55	0	0	55
Kootenay Lake	0	38	0	38
Quesnel	253	34	9	296
Chilcotin	355	30	34	418
Central Cariboo	2,434	1,211	531	4,176
Williams Lake portion	0	0	0	0
Horsefly portion	2,434	1,211	531	4,176
100 Mile House	8,103	8,133	4,754	20,989
Total	13,085	11,175	7,411	31,668
WESTERN BALSAM BARK BEETLE				
Kamloops	1,833	498	0	2,331
Cascades	3,112	186	0	3,298
Merritt portion	2,887	186	0	3,073
Lillooet portion	225	0	0	225
Okanagan Shuswap	17,597	2,453	0	20,050
Salmon Arm portion	5,058	584	0	5,641
Vernon portion	8,007	1,354	0	9,362
Penticton portion	5,109	515	0	5,624
Headwaters	9,095	1,291	0	10,386
Clearwater portion	5,401	772	0	6,173
Robson Valley portion	3,694	520	0	4,214
Columbia	209	4	29	242
Rocky Mountain	534	990	276	1,800
Cranbrook portion	210	694	112	1,016
Invermere portion	324	296	164	784
Arrow Boundary	1615	621	406	2,642
Old Arrow portion	1,240	529	406	2,175
Old Boundary portion	375	92	0	467
Kootenay Lake	761	2,326	528	3,615
Quesnel	84,319	220	11	84,550
Chilcotin	10,423	21	12	10,456
Central Cariboo	47,010	458	32	47,501
Williams Lake portion	382	66	0	448
Horsefly portion	46,629	393	32	47,053
100 Mile House	18,398	2,380	156	20,934
Total	194,906	11,448	1,450	207,805

¹ severity ratings for bark beetle attack levels: light = 1-10% current attack
moderate = 11-30% current attack
severe = >30% current attack



Table 2. Area summaries for major damaging defoliators mapped during the 2003 Southern Interior Forest Region aerial overview surveys.

Forest District (new & old) and defoliator species	Area of Infestation (ha)			
	Light ¹	Moderate ¹	Severe ¹	Total
WESTERN SPRUCE BUDWORM				
Kamloops	6685	440	0	7,125
Cascades	65,302	1,343	0	66,646
<i>Old Merritt portion</i>	<i>53,368</i>	<i>611</i>	<i>0</i>	<i>53,979</i>
<i>Old Lillooet portion</i>	<i>11,934</i>	<i>732</i>	<i>0</i>	<i>12,667</i>
Okanagan Shuswap	2,616	0	0	2,616
<i>Old Vernon portion</i>	<i>573</i>	<i>0</i>	<i>0</i>	<i>573</i>
<i>Old Penticton portion</i>	<i>2,043</i>	<i>0</i>	<i>0</i>	<i>2,043</i>
Quesnel	111	0	0	111
Chilcotin	25	0	0	25
Central Cariboo	199,124	25,468	5,810	230,402
<i>Old Williams Lake portion</i>	<i>199,124</i>	<i>25,468</i>	<i>5,810</i>	<i>230,402</i>
100 Mile	136,302	56,918	5887	199,108
Total	410,165	84,169	11,697	506,033
WESTERN HEMLOCK LOOPER				
Kamloops	336	322	67	725
Okanagan Shuswap	3,570	672	166	4,407
<i>Old Salmon Arm portion</i>	<i>2,534</i>	<i>462</i>	<i>135</i>	<i>3,131</i>
<i>Old Vernon portion</i>	<i>1,036</i>	<i>210</i>	<i>31</i>	<i>1,277</i>
Headwaters	38	19	0	57
<i>Old Clearwater portion</i>	<i>38</i>	<i>19</i>	<i>0</i>	<i>57</i>
Columbia	3,996	13,661	901	18,558
Arrow Boundary	19	0	0	19
<i>Old Arrow portion</i>	<i>19</i>	<i>0</i>	<i>0</i>	<i>19</i>
Chilcotin	49	103	0	152
Central Cariboo	13,088	2,026	298	15,412
<i>Old Horsefly portion</i>	<i>13,088</i>	<i>2,026</i>	<i>298</i>	<i>15,412</i>
100 Mile	31	34	0	66
Total	21,127	16,837	1,432	39,396
TWO-YEAR CYCLE BUDWORM				
Headwaters	1,760	0	0	1,760
<i>Old Clearwater portion</i>	<i>1,760</i>	<i>0</i>	<i>0</i>	<i>1,760</i>
Quesnel	18,923	0	0	18,923
Chilcotin	0	87	0	87
Central Cariboo	15,208	34	0	15,241
<i>Old Horsefly portion</i>	<i>15,208</i>	<i>34</i>	<i>0</i>	<i>15,241</i>
100 Mile	132	0	0	132
Total	36,023	121	0	36,143
BIRCH LEAF MINER				
Kamloops	3,613	239	0	3,852
Okanagan Shuswap	4,215	0	0	4,215
<i>Old Salmon Arm portion</i>	<i>359</i>	<i>0</i>	<i>0</i>	<i>359</i>
<i>Old Vernon portion</i>	<i>3,856</i>	<i>0</i>	<i>0</i>	<i>3,856</i>
Headwaters	898	25	0	923
<i>Old Clearwater portion</i>	<i>898</i>	<i>25</i>	<i>0</i>	<i>923</i>
Columbia	227	0	19	246
Arrow Boundary	630	749	52	1,432
<i>Old Arrow portion</i>	<i>630</i>	<i>749</i>	<i>52</i>	<i>1,432</i>
Kootenay Lake	313	177	142	632
Total	9,896	1,190	213	11,300

REGIONAL OVERVIEW

MOUNTAIN PINE BEETLE, *DENDROCTONUS PONDEROSAE*

Mountain pine beetle infestations in the Southern Interior Forest Region increased 4-fold to over 2,525,500 hectares in 2003, from 612,000 hectares in 2002. This accounts for nearly 60% of the total mountain pine beetle in British Columbia. Nearly 90% of infested area was mapped in the Quesnel, Chilcotin, and Central Cariboo Districts. The largest increases in area were also observed in these three Districts. Nearly all Districts experienced an increase in mountain pine beetle, with the exception of Cascades, Headwaters, and Rocky Mountain Districts. This is the third consecutive year with annual expansions of this magnitude; current infestation levels in the Southern Interior Region have grown by nearly 18 times since 2001 (Table 4, Figure 3).

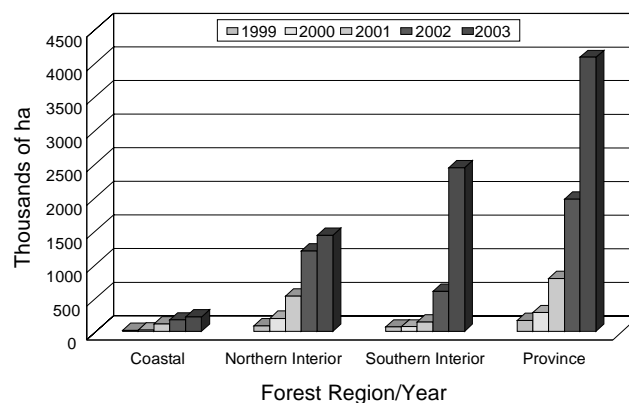


Figure 3. Hectares affected by mountain pine beetle, 1999-2003, in all Regions.

Table 3. Green:red mountain pine beetle ratios for the Southern Interior Forest Region, 2003.

Forest District	Average Green:red Ratio
Kamloops	5.2:1
Cascades	2:1
Okanagan Shuswap	4.4:1
Headwaters	no data
Columbia	4.8:1
Rocky Mountain	6:1
Arrow Boundary	3:1
Kootenay Lake	1:1
Quesnel	20.7:1
Chilcotin	25.3:1
Central Cariboo	11.1:1
100 Mile House	11:1
Regional Average	8.6:1

The total number of polygon infestations has risen to over 13,000, while the average polygon size has more than doubled, to 192 hectares. The number of spot infestations (under 0.5 hectares and/or less than 50 trees) fell slightly from 2002 levels (Table 4, 5). In general, populations are expanding into larger, more continuous areas, especially in the Quesnel, Central Cariboo, and Chilcotin Districts, where green:red attack ratios were very high (Table 3). This will severely limit management options in many areas.

Area of attack in Parks has increased to 86,400 ha, most of which is in the Quesnel and Chilcotin Forest Districts (Table 6, 7).

Beetle Management Unit (BMU) management strategies are re-assessed each year. Several BMUs have been downgraded from Suppression to Holding Action.

Table 4. Area infested, number of polygons, and average polygon size, for mountain pine beetle in the Southern Interior Forest Region, 2001-2003.

Year	Area infested	# polygons	Average polygon size (ha)	# of spot infestations	# trees killed in spot infestations
2001	141,176	4,760	29.7	3,672	37,074
2002	612,054	7,349	83.3	6,308	56,054
2003	2,525,722	13,133	192.4	5,270	42,372



Table 5. Number of spot infestations of mountain pine beetle in the Southern Interior Forest Region over time, by District.

District	# spots 2002	# trees 2002	# spots 2003	# trees 2003
Kamloops	483	5,140	262	2,905
Cascades	528	4,945	374	3,407
Okanagan Shuswap	306	2,485	407	3,992
Headwaters	323	3,182	547	5,675
Columbia	40	286	177	2,655
Rocky Mountain	958	9,765	428	6,420
Arrow Boundary	695	7,031	311	4,665
Kootenay Lake	349	3,490	137	2,055
Quesnel	821	5,481	99	528
Chilcotin	750	5,388	1,245	5,546
Central Cariboo	667	5,747	711	2,355
100 Mile House	375	3,010	572	2,169
Total	6,295	55,950	5,270	42,372



Mountain pine beetle mortality near Quesnel

Table 6. Area of mountain pine beetle in Parks in the Southern Interior Forest Region.

Old Region Designations	number of parks	total park area	hectares MPB in parks
Cariboo	393	837,221	79,257
Kamloops	743	454,004	2,867
Nelson	174	708,314	2,440
Prince George (Robson Valley)	243	848,942	1,836
Total	1,553	2,848,481	86,400

Table 7. List of Parks in the Southern Interior Region with area (hectares) of mountain pine beetle mapped in the 2003 aerial overview surveys.

Park Name	Forest District	park area (ha)	ibm in park (ha)
Itcha Ilgachuz	Quesnel, Chilcotin	108,517	27,840
Kluskoil Lake	Quesnel	15,362	12,940
Bowron Lake	Quesnel, Headwaters	134,824	10,576
Nazko Lake	Chilcotin	12,052	9,141
Nunsti	Chilcotin	20,534	5,014
Tweedsmuir (South)	Chilcotin	13,149	4,295
White Pelican	Chilcotin	4,026	2,552
Schoolhouse Lake	100 Mile House	4,702	2,345
Churn Creek	Central Cariboo	36,746	2,013
Syringa	Arrow Boundary	4,447	1,809
Mount Robson	Headwaters	219,374	1,434
Chasm	100 Mile House	3,135	1,027
Lac Du Bois Grasslands	Kamloops	15,434	933
Arrowstone	Kamloops	6,159	538
Narcosli Lake	Quesnel	1,083	521
West Arm	Kootenay Lake	25,088	459
Mount Robson (Swift Current River)	Headwaters	5,953	379
Silver Star	Okanagan Shuswap	6,084	361
Moose Valley	100 Mile House	2,389	303
Dunn Peak	Headwaters, Kamloops	19,567	275
Snowy	Okanagan Shuswap	25,649	255
Wendle	Quesnel	207	181
Cathedral	Okanagan Shuswap	33,172	151
Wells Gray	Headwaters, 100 Mile House	540,178	146
Bull Canyon	Chilcotin	343	110
Ten Mile Lake	Quesnel	255	108
Cariboo Mountains	Quesnel, Central Cariboo	112,703	102
Tunkwa	Kamloops	5,161	83
Granby	Arrow Boundary	40,586	75
Gladstone	Arrow Boundary	39,446	69
Pinnacles	Quesnel	124	61
Edge Hills	100 Mile House	11,502	32
Flat Lake	100 Mile House	4,261	28
Goat Range	Kootenay Lake, Arrow Boundary	78,771	28
Cascade	Cascades	12,848	27
Horsefly Lake	Central Cariboo	153	23
Fintry	Okanagan Shuswap	362	22
Mount Savona	Kamloops	382	20
Ruth Lake	100 Mile House	27	18
Jackman Flats	Headwaters	615	17
Harry Lake Aspen	Kamloops	327	13
Barkerville	Quesnel	66	12
Paul Lake	Kamloops	724	9
Finger Tatuk	Quesnel	9	9
Blue Earth Lake	Kamloops	689	8
Spruce Lake	Cascades	70,973	7
Stein Valley	Cascades	108,399	7
Brent Mountain	Okanagan Shuswap	4,337	6
Emar Lakes	Kamloops	1,593	6
Rearguard Falls	Headwaters	46	6
Eakin Creek Floodplain	Kamloops	123	5
McConnell Lake	Kamloops	102	2
Oregon Jack	Kamloops	224	1
Lac La Hache	100 Mile House	24	1
Total			86,400



WESTERN BALSAM BARK BEETLE, *DRYOCOETES CONFUSUS*

WBBB infested area remained fairly constant in 2003, at 208,381 hectares, down slightly from 217,702 hectares in 2002. However, the spatial distribution of mortality changed significantly in many areas. Very large increases were observed in parts of the Quesnel District, while the large infestations in the northern portion of the Headwaters District, and in the Central Cariboo District declined significantly.

DOUGLAS-FIR BEETLE, *DENDROCTONUS* *PSEUDOTSUGAE*

Douglas-fir beetle infestations continued to expand, totalling 22,944 hectares. This is more than double the 2002 levels of 8,177 hectares. Most increases have been in the Central Cariboo and 100 Mile House Districts; these two Districts account for almost 85% of Douglas-fir beetle mortality in the Region. A further 13,533 trees were killed in 1,870 spot infestations (Table 8).

WESTERN SPRUCE BUDWORM, *CHORISTONEURA OCCIDENTALIS*



The area of western spruce budworm defoliation remained relatively unchanged from 2002 levels, with just over 506,000 hectares affected. Most damage continued to occur in the Central Cariboo, 100 Mile House, and Cascades districts, with a small amount in the Kamloops District.

In the fall of 2003, 377 sites in the Central Cariboo, 100 Mile House, Cascades, and Kamloops Districts, were sampled for western spruce budworm egg masses. Of the sites sampled, 152 predict populations to cause light defoliation, 164 predict moderate defoliation, 37 sites severe defoliation, and 15 sites showed no expected defoliation in 2004 (Table 9).

SPRUCE BEETLE, *DENDROCTONUS RUFIPENNIS*

Spruce Beetle infestations continued to increase, to 31,795 hectares, from 2002 levels of 18,206 hectares. Most expansions were in the Central Cariboo and 100 Mile House Districts. Infestations in the northern portion of the Headwaters District declined. Infested area has expanded nearly 15-fold since 2001.

Table 8. Number of "spot" infestations of Douglas-fir beetle in the Southern Interior Forest Region, by District.

District	# spots	# trees
Kamloops	45	385
Cascades	134	966
Okanagan Shuswap	287	2,046
Headwaters	149	1,250
Columbia	13	195
Rocky Mountain	122	1,830
Arrow Boundary	119	1,785
Kootenay Lake	33	495
Quesnel	5	18
Chilcotin	142	573
Central Cariboo	322	1,313
100 Mile	499	2,677
Total	1,870	13,533

Table 9. Summary of Southern Interior Forest Region fall 2003 western spruce budworm egg mass sampling results, showing predicted 2004 defoliation.

District	Number of sites in each defoliation category				Total number of sites	Average # egg masses/10m ² foliage
	Nil	Light	Moderate	Severe		
Kamloops	1	20	21	9	51	83.6
Cascades	7	45	67	20	139	81.5
Chilcotin	0	3	2	0	5	54.0
Central Cariboo	5	38	22	6	71	59.4
100 Mile House	2	55	52	2	111	65.6
Total	15	152	164	37	377	68.8

Nil = no egg masses found; Light = 1-50 egg masses/10 m² foliage; Moderate = 51-150 egg masses/10m² foliage; Severe = >150 egg masses/10m² foliage



Western spruce budworm 2003 aerial spray program

High priority sites were identified for aerial spraying with *Bacillus thuringiensis* var. *kurstaki* (*B.t.k.*) in 2003. The *B.t.k.* product used was Thuricide 48LV at 2.4 litres per ha. Approximately 21,840 ha in 17 spray blocks were sprayed between June 17-20, 2003. Blocks 1-7 and 14 were in the Central Cariboo District totalling 15,117 ha, and blocks 10-13 and 15-17 were in the 100 Mile House District totalling 7,023 ha (Table 10). *B.t.k.* was applied with a fixed-wing aircraft equipped with micronaires for a total flight time (application and ferry time) of 44.4 hours.

Significant reductions in population were seen in areas treated with *B.t.k.* The budworm population has expanded significantly over the past two years in the Cariboo and it is anticipated that additional areas of high value Douglas-fir will need treatment in 2004.

Table 10. List of spray blocks treated with *B.t.k.* in the Cariboo for western spruce budworm.

Block	Location	ha sprayed	date treated
1	Williams Lake	546	June 19, 2003
2	Williams Lake	654	June 17, 2003
3	Williams Lake	1,320	June 17, 2003
4	Williams Lake	480	June 17, 2003
5	Williams Lake	1,186	June 17, 2003
6	Chimney Lake	1,388	June 17, 2003
7	Chimney Lake	4,647	June 17-18, 2003
10	Clinton	485	June 20, 2003
11	Clinton	462	June 20, 2003
12	Clinton	2,711	June 19-20, 2003
13	Clinton	2,105	June 19, 2003
14	Chimney Lake	4,894	June 18-19, 2003
15	Clinton	282	June 19-20, 2003
16	Clinton	77	June 20, 2003
17	Clinton	601	June 20, 2003
Total		21,840	



Aerial application of *B.t.k.* in the Cariboo - AirTractor AT-802F



WESTERN HEMLOCK LOOPER, *LAMBDINA FISCELLARIA LUGUBROSA*

Western hemlock looper defoliated 39,395 hectares in 2003, down slightly from 2002 levels of 41,775 hectares. Most of the damage was recorded in the Central Cariboo, Okanagan Shuswap, and Columbia Districts, with small amounts observed in the 100 Mile House and Kamloops Districts. In the fall of 2003, western hemlock looper egg sampling was conducted by collecting lichen samples from priority sites throughout the Southern Interior Region. Dr. Imre Otvos, with Natural Resources Canada, Canadian Forest Service, Pacific Forestry Centre, is processing the lichen samples and assessing populations and parasitism levels. Data will be available from the Regional Entomologist in 2004.

Of the 15 permanent trapping sites for western hemlock looper (6-trap clusters) in the old Kamloops Region, 10 had decreased trap catches from 2002 and 5 had significant increases in numbers of moths caught (Table 11). Larval beatings were conducted at 18 locations (near trapping sites) in August to determine relative larval abundance. All but two of the 18 sites had positive collections, with the highest numbers occurring in the sites near the upper Shuswap River, Perry River, Crazy Creek, Scotch Creek, and Tumtum Lake. In general, the number of larvae collected was significantly higher than in 2002, when positive collections were made at only 9 of 18 sites.



Western hemlock looper defoliation in Douglas-fir near Shumway Lake

Table 11. Average number of western hemlock looper moths caught per 6-trap cluster over time in the Southern Interior Forest Region.

Site	Location	Average Trap Catches		
		2001	2002	2003
1	Serpentine	19	156	77
2	Thunder River	33	172	69
3	Mud Lake	34	505	71
4	Murtle Lake Road	32	433	150
5	Finn Creek	34	271	29
6	Tumtum	40	207	no traps
7	Scotch Creek	30	954	567
8	Yard Creek	29	273	780
9	Crazy Creek	23	315	1110
10	Perry River	38	1,294	1471
11	Three Valley Gap	27	374	238
12	Perry River	29	1,084	958
13	Kingfisher Creek	32	1,203	203
14	Noisy/Kingfisher Creek	36	128	145
15	Shuswap River	34	347	457
16	Greenbush Lake	38	302	2860
17	Adams River	34	189	no traps
Average for all sites		31.8	483	612

*traps were changed in 2002 & 2003 to plastic Unitraps, which have a much higher capacity than wing traps used in previous years.



2003 Western Hemlock Looper Program - Revelstoke and Inks Lake

The summer of 2002 marked year one of the current western hemlock looper outbreak. Over 41,770 hectares of defoliation in old, mature western hemlock were mapped in 2002 with an additional 585 ha mapped in Interior Douglas-fir types. Egg surveys were conducted in the fall of 2002 to predict defoliation at various sites throughout Nelson and Kamloops areas. Of 79 sites surveyed, 38 sites were predicted to sustain severe defoliation in 2003, while at 11 sites, moderate defoliation was predicted. Predicted defoliation is based upon the number of viable eggs found in 100 grams of lichen.



Western hemlock looper moth.



Results of 2002 western hemlock looper defoliation in the Revelstoke Lake drainage.

Hazard and risk assessments were conducted to determine the potential impact and dynamics of the western hemlock looper (WHL) in critical caribou habitat areas in the Columbia Forest District. Numerous key caribou corridors were severely defoliated in 2002 with scattered levels of tree mortality. Due to the likelihood of further mortality occurring in 2003, plans were initiated to protect this valuable habitat.

In 2002, WHL was added to the label of Foray 48B (*Bacillus thuringiensis* var. *kurstaki*). Prior to this, there were no *B.t.k.* products registered for use against the WHL. Based on the need to protect critical caribou habitat in the Columbia District, a control program using *B.t.k.* was organized for 2003. Short-term direct control measures are taken only when WHL, or other defoliating species, reach population levels that threaten stewardship goals.

Two fully replicated trials were developed at Inks Lake (in Douglas-fir), near Kamloops where a combination of WHL and false hemlock looper, *Nepytia freemani*, were active, and in the Columbia drainage near Revelstoke (in western hemlock)(Table 12). Key habitat corridors were identified in the Columbia drainage and the spray blocks were overlaid on these areas. In each trial, 2 treatment regimes, based on established dosage rates and number of applications for the eastern hemlock looper, *Lambdina fiscellaria fiscellaria*, and a control area were designated. The treatments were:

- 1) one early instar application @3.2 litres/ha (40 BIU/ha);
- 2) one early instar application plus a second application about 10 days later each @3.2 litres/ha (40 BIU/ha); and,
- 3) control or no treatment.





Some of the defoliators found in the treatment areas included western false hemlock looper, western hemlock looper, saddleback looper, and various sawflies (clockwise from top left).

Table 12. Listing of 2003 western hemlock looper spray blocks in the Kamloops and Revelstoke areas, showing number of applications and number of hectares treated.

Block #	Location	1st spray		2nd spray	
		Date	Ha	Date	Ha
Kamloops blocks					
	Inks Lake	15-Jun-03	955	27-Jun-03	450
Revelstoke blocks					
1	Carnes Creek	16-Jun-03	430		
2	Frisbee Ridge	16-Jun-03	220		
3	Frisbee Ridge	16-Jun-03	520		
4	Big Eddy Creek	17-Jun-03	90		
5	Big Eddy Creek	17-Jun-03	385		
6	Big Eddy Creek	17-Jun-03	225	26-Jun-03	225
7	Downie Creek	18-Jun-03	765	26-Jun-03	765
8	Downie Creek	25-Jun-03	120		
9	Bourne Creek	17-Jun-03	270		
10	Downie Creek	17-Jun-03	550		
11	Downie Creek	18-Jun-03	105		
12	Fissure Creek	18-Jun-03	845	26-Jun-03	845
13	Fissure Creek	19-Jun-03	565	26-Jun-03	565
14	Goldstream River	25-Jun-03	100	26-Jun-03	100
15A	Goldstream River	25-Jun-03	185	26-Jun-03	185
15B	Goldstream River	25-Jun-03	280		
16	Scrip Creek	25-Jun-03	270		
Block totals			6,880		3,135
Total (1st + 2nd spray)			10,015		



At Inks Lake, approximately 505 ha received one and 450 ha received two applications of *B.t.k.*, respectively. In Revelstoke, 3,240 ha received one and 2,685 ha received two applications of *B.t.k.*, respectively (Table 12). Spray efficacy was assessed in a number of ways: impact plots to evaluate tree damage and survival, larval and pupal sampling to determine insect mortality, and frass collections to evaluate insect population and relative feeding among treatments.

Circular impact plots were established within the three treatments at both the Revelstoke and Inks Lake locations to assess defoliation and mortality (Table 13). The target number of trees in each circular plot was 10-20 overstory trees. Defoliation assessments were made prior to treatment in all areas to determine relative levels of defoliation from 2002 feeding. Plots in the Revelstoke area were assessed again after the end of the larval feeding period, to determine relative levels of current (2003) defoliation. Plots in the Inks Lake (Kamloops) area will be assessed for levels of 2003 defoliation in the spring of 2004.

Population sampling (larval and pupal) was also conducted to determine efficacy of treatments. Larval numbers were estimated by counting the larvae that were dislodged from trees with a ± 3 m pole onto a 1.4 m x 1.5 m beating sheet. Beating samples were taken at 1 to 4-days pre-spray and at ± 10 day intervals post-spray until late instar larvae were present. At the final sampling time, the pupal population was sampled using the burlap trapping method (a procedure by which sample trees are wrapped with burlap (Otvos 1974)).

Table 13. Summary of impact plots showing live, dead and total stems per ha and percent total tree defoliation before and after spray.

Block	Location	Treatment	avg. stems/ha			avg. % defoliation	
			live	dead	Total	2002	2003
Revelstoke							
1	Carnes Creek	single	330	0	330	7	4
15B	Goldstream River	single	415	0	415	34	26
8	Downie Creek	double	477	0	477	30	21
6	Big Eddy Creek	double	379	0	379	63	51
control	Pitt Creek	control	315	15	330	57	56
control	Downie Creek	control	584	0	584	23	32
Inks Lake							
1	Inks Lake	double	2,193	913	3,106	16	N/A
2	Inks Lake	double	2,683	159	2,842	37	N/A
3	Inks Lake	double	2,034	229	2,263	39	N/A
4	Inks Lake	single	1,719	134	1,853	34	N/A
5	Inks Lake	single	810	0	810	18	N/A
6	Inks Lake	single	2,375	0	2,375	20	N/A
control	Mowich Lake	control	2,051	83	2,134	48	N/A
control	Mowich Lake	control	3,175	83	3,258	38	N/A
control	Inks Lake	control	2,153	67	2,220	38	N/A
control	Inks Lake	control	3,680	440	4,120	42	N/A

References:

Otvos, I.S. 1974. A collection method for pupae of *Lambdina fiscellaria fiscellaria* (Lepidoptera: Geometridae). Can. Entomol. 106: 329-331.

In addition to the direct larval and pupal population sampling, frass collections were made to determine relative levels of larval feeding, and by extension, relative larval populations. Frass collections were made by placing frass “traps” beneath host trees about 3-5 m apart. Trap sites, with 3 frass traps per site, were established in each block at Inks Lake for a total of 240 traps (90 traps each in the single spray and double spray blocks, and 60 in the control blocks)(Table 14). Due to access difficulties in the Revelstoke project, there were fewer blocks sampled but the same number of traps (90 traps each in the single spray, double spray and control blocks, respectively). When most insects had pupated, the frass was collected, dried and weighed.



Frass trap (left) and frass on forest floor (right).

Table 14. Distribution of frass traps at the Revelstoke and Kamloops sites showing dates of placement and collection.

Block	Location	Treatment	Date Deployed	Date Collected	# traps
Revelstoke					
15A	Goldstream River	single	May 30/03	Sept 04/03	90
8, 6	Downie/Big Eddy	double	May 31/03	Sept 03/03	90
control	Downie Creek	control	May 30/03	Sept 04/03	90
Kamloops					
1, 2, 3	Inks Lake	double	May 30/03	Aug 14/03	90
4, 5, 6	Inks Lake	single	May 30/03	Aug 12/03	90
control	Inks Lake	control	May 31/03	Aug 13-14/03	60

Results

Approximately 955 ha were sprayed with *B.t.k.* at the Inks Lake site on June 15th (Table 1) and 450 ha were given a second application on June 27th, 2003. Weather was calm and warm on both dates providing optimal conditions. Approximately 4,970 ha in Revelstoke were given the first application of *B.t.k.* between June 15-19, 2003. Due to rain, treatment did not resume until June 25th when the first application was completed (955 ha). These blocks were the farthest north and larval development was slightly behind that of the more southerly blocks. The second application of *B.t.k.* was applied on June 26th to 2,685 ha. Larvae were a mix of first and second instars at the time of first application.

Larval counts from treatment plots were compared to counts from control plots with similar pre-spray (initial larval) population densities. Due to very low numbers in treatment blocks post-spray, Abbott's corrected mortality was not calculated and just absolute larval numbers are reported here.

At the Inks Lake study area, pre spray averages of 1,788, 1,829, and 2,464 larvae/block were found in the unsprayed, double sprayed, and single sprayed blocks, respectively. At the first post spray sampling, these numbers decreased to averages of 153 larvae/double spray block and 97 larvae/single spray block; however, the unsprayed block remained high with an average of 2,129 larvae/block. Average number of larvae continued to decrease dramatically at the second and third post-spray samplings. In contrast, numbers of larvae remained high in the control block at the second and third post-spray samplings (Fig. 4).

At the Revelstoke study area, pre-spray averages of 2,240, 1,684, and 133 larvae/block were found in the unsprayed, double sprayed, and single sprayed blocks, respectively. These numbers decreased at the first post spray sampling to averages of 27.7 larvae/double spray block and 10.3 larvae/single spray block; however, the unsprayed block larval average remained high at 2,016 larvae. Larval averages in both the single and double sprayed blocks continued to drop dramatically at the second, third, and fourth post-spray samplings. The control blocks exhibited somewhat lowered numbers of larvae with 218, 198, and 102 larvae/block found in the second, third, and fourth post-spray sampling, respectively (Fig. 5). Larval averages decreased in the control blocks post spray due to the fact that the looper was in its second year of outbreak and natural population reduction was occurring. Natural mortality causes larval numbers to decrease over the feeding period. However, at the time of the last post-spray sampling, the control block still had significantly higher larval averages than the spray blocks.

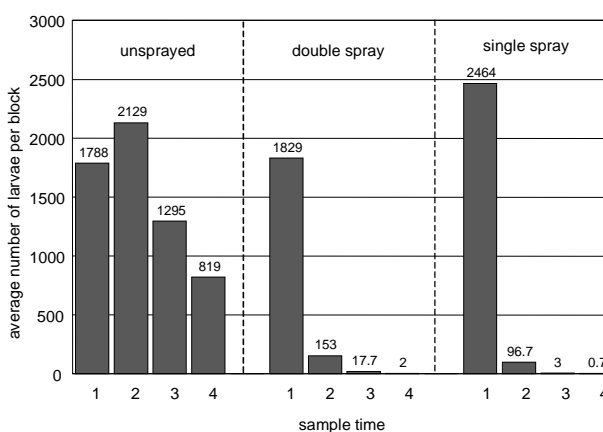


Figure 4. Number of western hemlock looper larvae counted in pre-, and 1st, 2nd, and 3rd post-spray (sample time 1, 2, 3, and 4, respectively) beatings in single sprayed, double sprayed, and unsprayed blocks in the Kamloops area.

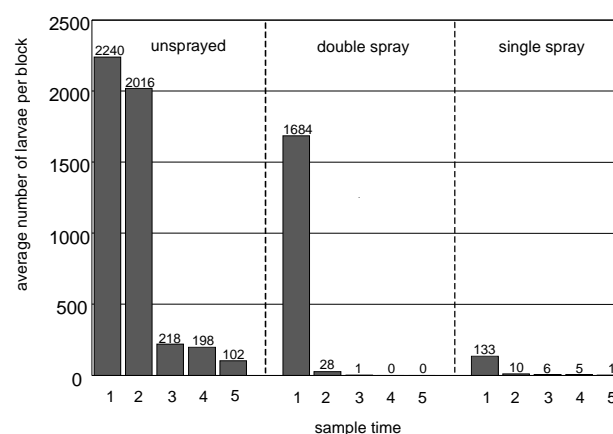


Figure 5. Number of western hemlock looper larvae counted in pre-, and 1st, 2nd, 3rd, and 4th post-spray (sample time 1, 2, 3, 4, and 5, respectively) beatings in single sprayed, double sprayed, and unsprayed blocks in the Revelstoke area.



Using the burlap wrap technique (Otvos 1974), an average of 0.5 pupae/spray block and 51.1 pupae/control block were found in the Inks Lake area. In the Revelstoke study area, there was an average of 0.2 pupae/spray block and 107.3 pupae/control block. Pupal sampling gives more reliable population estimates than larval sampling, which tends to be highly variable due to the mobility of larvae and limitations of sampling methodology. The results of the pupal sampling showed that populations were reduced in all spray blocks.



Western hemlock looper pupa.

The average frass collection from the Inks Lake spray blocks was 0.258 grams/trap versus 3.133 grams/trap in the Inks Lake control blocks. The spray blocks in Revelstoke had average frass collections of 0 grams/trap for the spray blocks and 1.781 grams/trap for the control blocks (Fig. 6). The frass collection showed that feeding was significantly reduced in all of the spray blocks.

Results from the 2003 spray program for western hemlock looper clearly demonstrated that a single application of *B.t.k.* applied at 3.2 litres/ha was just as effective in meeting our objectives as a double application, as shown by the larval, pupal, and frass sampling results. In future control programs, we may be able to reduce the application rate to less than 3.2 litres/ha based upon the results we observed in 2003 (e.g. down to 2.4 litres/ha, the rate used for western spruce budworm). This would greatly decrease the cost per hectare for treatment while still achieving the objective of foliage protection.

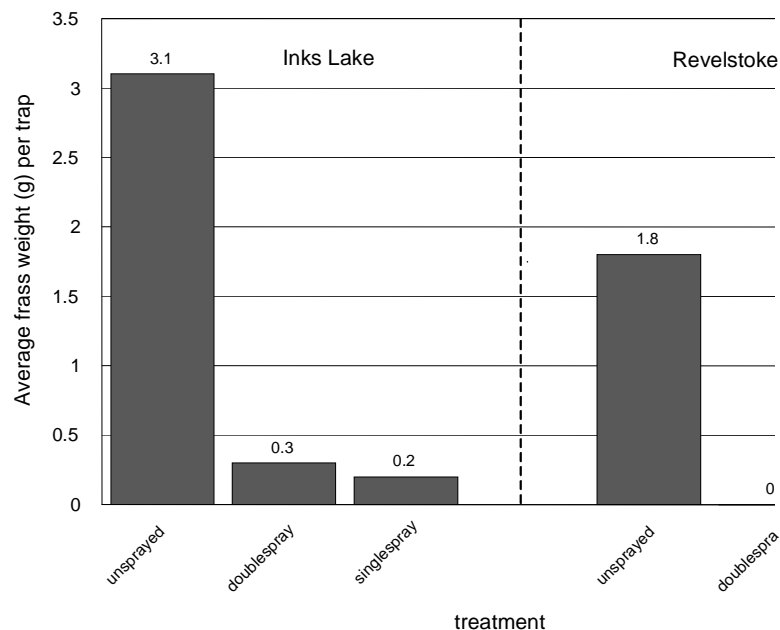


Figure 6. Average frass collections, in grams dry weight, by treatment in the Inks Lake (left) and Revelstoke (right) spray and control blocks.

TWO-YEAR CYCLE BUDWORM, *CHORISTONEURA BIENNIS*

As 2003 was an 'off' year in the feeding cycle of this insect in most areas of the Southern Interior Region, defoliated area decreased to 36,145 hectares, down from 142,525 hectares in 2002. The 2003 area of mapped defoliation shows an increase of nearly 50% from the last 'off' year (2001). This may reflect an expanding population, some of the population switching to a one year cycle or going "off-cycle". Most defoliation (this also corresponds to areas where the population is in an alternate feeding cycle) was observed in the Quesnel and Central Cariboo Districts, in the Willow River, Niagara Creek, Horsefly River, and Mitchell Lake areas.

DOUGLAS-FIR TUSsock Moth, *ORGYIA PSEUDOTSUGATA*



Douglas-fir tussock moth continued to produce a few small, localized pockets of severe defoliation, totalling 37 ha, in the Scottie Creek area. Ground surveys confirmed that the population levels in the area are declining. However, the 6-trap cluster trap catches were up sharply, with an average of 30 moths per trap across all 21 sites. The highest catches were in the Kamloops District sites, and the sites near Spences Bridge and Vernon (Table 15). Each year approximately 250 single traps are placed in additional high hazard tussock moth areas. In 2003, 223 single traps were assessed (some were burned in wildfires) with only 4 high catches in the old Vernon District (2 sites near Lavington), and low to moderate catches in the Cascades, Penticton and Salmon Arm Districts. The old Kamloops District had the most tussock moth activity with 48 of the 98 single traps in the district catching >25 moths; 27 of these traps had over 40 moths. The main areas of high trap catches were in the Stinking Lake, Scottie Creek, Maiden Creek, and Veasy Lake areas, and near Duck Range Road and Barnhartvale east of Kamloops (Table 16). Larval beatings were conducted in early July to determine relative larval abundance; positive collections were only made at one site, near Veasy Lake. 250 traps were placed in the 100 Mile House District in clusters of 1-6 traps; the average catch per trap was only 2.3 moths.

Table 15. Average number of Douglas-fir tussock moths caught per 6-trap cluster over time in the Southern Interior Forest Region.

Site	Location	Average trap catches			
		2000	2001	2002	2003
1	McLure	0	1.3	0.2	6
2	Heffley Creek	2	13.8	6.7	76
3	Cherry Creek	0	9.7	7.8	30
4	Six Mile	2	8.2	3.5	67
5	Battle Creek	1	17.2	10.7	68
6	Barnes Lake	5	39.2	10.3	52
7	Carquille/Veasey Lk.	5	56.7	16.3	83
8	Pavilion	2	17.7	1.0	10
9	Stump Lake	2	3.8	0.0	3
10	Robbin's Range/Monte Creek	1	5.5	3.5	11
11	Chase	6	14.2	28.0	36
12	Yankee Flats	1	0.7	1.7	1
13	Vernon	4	19.6	28.8	25
14	Winfield/Wood Lake	7	6.8	0.3	1
15	Kelowna	34	6.2	0.5	no traps - fire
16	Summerland	8	16.8	1.5	0
17	Kaleden	6	5.7	1.2	0
18	Blue Lake	1	4.2	2.7	9
19	Stemwinder Park	18	49.3	2.5	1
20	Ashnola River	19	46.7	1.2	0
21	Spences Bridge	1	19.7	0.7	21
Regional Average		11.1	6.0	17.3	30



Table 16. Average number of Douglas-fir tussock moths caught per trap (single trap per site) over time in the Southern Interior Forest Region.

Year	Forest District				
	Okanagan Shuswap			Cascades	
	Kamloops (±100 traps)	Vernon (±46 traps)	Penticton (27-30 traps)	Merritt (±30 traps)	Lillooet (15 traps)
1994	19.5	NT	NT	0.1	8.0
1995	10.4	0.9	3.6	2.6	NT
1996	1.9	1.5	4.4	1.9	1.2
1997	17.0	2.5	9.3	17.0	1.6
1998	25.8	10.6	24.4	25.8	4.9
1999	4.8	6.8	27.0	19.7	2.5
2000	3.6	5.9	19.3	17.0	2.0
2001	3.1	1.9	4.9	4.8	1.0
2002	15.2	5.4	6.6	13.8	2.4
2003	26	12	5	6	5

NT= no traps placed

SATIN MOTH, *LEUCOMA SALICIS*

Satin moth defoliation declined to 36,578 ha, from 45,395 ha in 2002. Some damage was observed in most Districts, with the bulk of the defoliation in the Quesnel, Chilcotin, Central Cariboo, and Columbia Districts.

BIRCH LEAF MINER, *FENUSA PUSILLA*

11,300 ha of paper birch were defoliated in 2003, down from 2002 levels of 18,183 ha. Most of the activity was in the Okanagan Shuswap and Kamloops Districts.

LARCH NEEDLE BLIGHT, *HYPODERMELLA LARICIS*

Larch needle blight caused light to moderate damage on 32,478 ha. The majority occurred in the Arrow Boundary District, with smaller areas affected in the Kootenay Lake, Rocky Mountain, and Okanagan Shuswap Districts.

PINE NEEDLE CAST, *LOPHODERMELLA CONCOLOR*

Damage from pine needle cast infection dropped to 40,940 ha, nearly all of which occurred in the 100 Mile House District.

WILDFIRE

2003 was one of the worst fire seasons on record in terms of area burned. Preliminary mapping indicates that just over 225,000 hectares were burned in the Southern Interior Region, in approximately 1,885 fires. More accurate totals will be available from Protection Branch in 2004. Most of the affected area was in the Kamloops, Okanagan Shuswap, Rocky Mountain, Chilcotin, Kootenay Lake, Arrow Boundary, and Columbia Districts. Many of the large fires occurred in lower elevation stands containing a preponderance of Douglas-fir, ponderosa pine, lodgepole pine mixed with some spruce and other species. The possibility of future insect damage and build-up is likely in many areas. The main concerns are Douglas-fir beetle (*Dendroctonus pseudotsugae*) in Douglas-fir, and mountain pine beetle (*D. ponderosae*), western pine beetle (*D. brevicomis*), and turpentine beetle (*D. valens*) in ponderosa pine. Significant woodborer and secondary bark beetle attack has already been observed within many of the burned areas.

Other forest health factors mapped during the 2003 aerial overview surveys includes: 257 ha of Ips beetle in Arrow Boundary District; 105 ha of western pine beetle, *Dendroctonus brevicomis*, in Kamloops, Arrow Boundary, and Rocky Mountain Districts; 151 ha of western blackheaded budworm, *Acleris gloverana*, in Kootenay Lake District; 187 ha of white pine blister rust, *Cronartium ribicola*, in Arrow Boundary and Kootenay Lake Districts; and small areas of abiotic factors such as drought, frost damage, windthrow, flooding, and landslides.



NELSON SUMMARY

The 2003 Nelson Aerial Overview Surveys were conducted between July 27 and August 8, 2003, and required 61.6 hours over 9 flight days. The surveys covered the area of the old Nelson Region, and were completed by contract personnel. The timing of the survey was critical this year with the severe drought and fire hazard conditions experienced in the Southern Interior Forest Region of the province. Due to the potential build up of smoke and hazy conditions this year, attempts were made to target the more mountainous terrain of the Columbia District and the Rocky Mountain District first. Historically these areas have been problematic because of smoke and cloud that linger among the high peaks and within the deep valleys. Kootenay Lake and Arrow District were surveyed last as they are generally less affected by poor weather conditions.

Weather conditions this year were variable throughout the survey area. Several large wildfires within and surrounding the survey area created haze in the valleys. Visibility varied from good to poor, progressively getting worse as the flights proceeded. The SE corner of the Rocky Mt. District (Sage Creek / Waterton Lakes National Park) was not surveyed as thick smoke from fires in Crowsnest Pass and U.S. Glacier National Park presented 0% visibility. Poor visibility and safety issues were justification for not flying this small portion of the Region.

ARROW BOUNDARY FOREST DISTRICT

Mountain Pine Beetle

Total area of infestation has risen from 3,697 ha in 2002 to 11,632 ha in 2003, over 80% of which was classed as moderate or severe mortality. In addition, 4,665 trees were killed in 311 spot infestations. The largest increases in mortality were seen in areas near Syringia Park, the Slocan River, Jewel Lake, Cayuse Creek, and in the Salmo area. Other significant infestations were noted in the following geographic locations: Mt. O'Leary, Eagle Creek, Wilson Creek, Snow Creek, Burton Creek, Ice Creek, Caribou Creek, Whatshan Lake, Springer Creek, Lemon Creek, Trozzo Creek, Winlaw Creek, Eagle Creek, Pass Creek (Boundary), Renata, Bowman Creek, Perry Ridge, Ymir Creek, Porcupine Creek, Tulip Creek, Ladybird Creek, Blueberry Creek, Murphy Creek, Sheep Creek and Beaver Creek. Green red ratios ranged from a high of 15:1 to a low of 0.2:1, with an overall average of 3:1.

Douglas-fir Beetle

Total area of infestation has risen from 356 ha in 2002, to 485 ha in 2003. A further 1,785 trees were killed in 119 spot infestations. Significant areas of infestation were noted in the following geographic locations: Beavertell, South of Gilpin along the U.S. border, Christina Lake, McRae Creek and Big Sheep Creek.

Satin Moth

Satin moth defoliated 2,063 ha of aspen in the District in 2003, down from 5,118 ha in 2002. Most activity was in the Bonanza Creek and Inonoaklin Creek areas.



Satin moth.

Western Balsam Bark Beetle

Western balsam bark beetle caused significant mortality on 2,278 ha, up from 138 ha in 2002. The largest areas of mortality were near Grassy Mountain, Ymir Creek, Granby Park, and Inonoaklin Creek. Significant areas of infestation were also noted in the following geographic locations: Perry's Ridge, Bulldog Creek, Porcupine Creek, Mt. Arthurs, Octopus Creek and Mt. Faith.

Ips Beetle

258 hectares of lodgepole pine suffered light to moderate mortality from Ips beetle attack in the Pend D'Oreille River area, southeast of Montrose. This is an increase from 2002 levels of 11 ha.

Birch Leaf Miner

This insect defoliated 1,430 ha of paper birch in 2003, down from 2002 levels of 3,552 ha. Most defoliation occurred at Beaton Creek, Fitzubbs Creek, Whatshan Lake, and in scattered pockets along both sides of Lower Arrow Lake.



Larch Needle Blight

Nearly 22,000 hectares of larch needle blight were mapped in 2003. Most of the damage was in the Rock Creek - Conkle Lake Park, West Kettle River, and Koch Creek - Greasybill Creek areas. Significant areas of infection were also noted in the following geographic locations: Halfway River, St. Leon Creek, Mt. Sloan, Salmo River, Erie Lake, Mt. Faith, Kelly Creek, Carmi Station, Trapping Creek, and Grizzly Creek.

Wildfire

Approximately 210 wildfires burned 13,300 hectares, most of which was in 2 fires, near Saddle Mountain and Halfway River.

Other forest health factors observed in the Arrow Boundary District in 2003 were: western pine beetle (71 ha), western hemlock looper (19 ha), white pine blister rust (61 ha), bear damage (8 ha), and abiotic factors such as drought (317 ha), windthrow (46 ha), and landslide.

COLUMBIA FOREST DISTRICT

Western Hemlock Looper

Western hemlock looper defoliation expanded to 18,558 ha from 10,592 ha in 2002. The majority of the damage was classified as moderate. Most activity continued to be along both sides of Lake Revelstoke, in the Pat Creek, Scrip Creek, Big Mouth Creek, Goldstream Creek and Downie Creek areas. Refer to the Regional Overview section for details on the spray program for western hemlock looper.

Mountain Pine Beetle

Mountain pine beetle mortality was 4,250 ha, almost unchanged from 2002 levels of 4,157 ha. The number of spot infestations, however, increased nearly 4-fold killing a further 2,665 trees in 177 spots. Most infestations were noted in the following geographic locations: Coursier Lake, Columbia Reach, Gold River, Bachelor Creek, the mouth of the Beaver River, Kicking Horse River, Beaverfoot River, Glenogle Creek (Yoho National Park) and the Columbia River valley bottom from South of Moberly to Kapistro Mt. Green:red ratios averaged 4.5:1; this along with the increase in the number of spot infestations indicate that populations are expanding.

Satin Moth

Satin moth defoliation was mapped on 8,490 ha, near Revelstoke, and along Revelstoke Lake between Downie Creek and La Forme Creek.

Douglas-fir Beetle

The total area of infestation has risen from 16 ha in 2002, to 126 ha in 2003. The number of spot infestations fell, however, to 13, killing a further 195 trees. There was continued mortality in small, scattered pockets along Arrow Lake, south of Revelstoke, and in the Golden area.

Spruce Beetle

Mortality was mapped on 95 ha, up from 19 ha in 2002. Most of the activity occurred in Cummins Lake Park, and in the Frisby Ridge area.

Wildfire

178 wildfires burned approximately 7,900 ha. Most of the major fires were along the west side of Revelstoke Lake north of Downie Creek.

Other forest factors observed were western balsam bark beetle (242 ha), birch leaf miner (246 ha), bear damage (63 ha), windthrow (49 ha), and landslide (40 ha).

ROCKY MOUNTAIN FOREST DISTRICT

Mountain Pine Beetle

Mountain pine beetle mortality was mapped on 8,491 ha, down from 12,258 ha in 2002. In addition, the number of spot infestations dropped significantly, from 958 (9,765 trees) in 2002, to 428 (6,420 trees) in 2003. The most significant reductions in mortality were seen in the Kootenay River area south of Kootenay National Park, the Elk River north of Sparwood and south of Fernie, Perry Creek, and the Lost Dog Creek area north of Kimberley. Most other areas of infestation remained relatively unchanged in terms of area attacked, and included: Spillimacheen River, Bobbie Burns Creek, Vowell Creek, Bugaboo Creek, the east slopes of the trench from Kapistro Mt. south to Edgewater, the west side of the Columbia River from Spillimacheen to Steamboat Mt., Horsethief Creek, Cross River, Pinto Mt., Palliser River, Toby Creek, Dutch Creek, Buhl Creek, Skookumchuck Creek, Lussier River, Elk River from Fording River south to Fernie, Wild Horse River, St. Mary, Hellroaring Creek, Moyie River and the Cranbrook area. Green:red ratios averaged 6:1.

Western Balsam Bark Beetle

Mortality has expanded to 1,800 ha from 605 ha in 2002. Most activity is in the Mt. Glen, Skookumchuck Creek, White Creek, Quinn Creek, Lussier River, Bull River, and Wild Horse River areas.



Douglas-fir Beetle

Douglas-fir beetle infestations have expanded to 816 ha in 2003, from 325 ha in 2002. 1,830 trees were killed in 122 spot infestations. Most activity was in Shuswap Creek, Windermere Creek, Lodgepole Creek and the Steeples areas.

Satin Moth

Satin moth defoliation was observed on 822 ha, near Lamb Creek, Lussier River, Fort Steele, and Skookumchuck.

Larch Needle Blight

Larch needle blight damage was mapped on 2,710 ha, mainly around White Creek, St. Mary River, Gilnockie Creek, and the Yahk River.

Wildfire

Five large fires were responsible for most of the 40,590 ha burned in the District in 2003. These fires were in the Moyie Lake – Lamb Creek, White River, Ram Creek, Plumbob Mountain, and Magnesite Creek areas.

Other forest health factors observed included scattered pockets of spruce beetle (91 ha), western pine beetle (25 ha), drought (115 ha), windthrow (53 ha), and landslide (115 ha).

KOOTENAY LAKE FOREST DISTRICT

Mountain Pine Beetle

The total area of infestation has risen from 1,346 ha in 2002 to 2,499 ha in 2003, with over half of the mortality classed as severe. The number of spot infestations has dropped from 350 (3,490 trees) to 137 (2,055 trees). This indicates a building population with larger areas of concentrated infestation and fewer spots. Significant areas of infestation were noted in the following geographic locations: Trout lake, Healy Creek, Balfour, Kokanee Creek, Lasca Creek, Powder Creek, Crawford Creek, Fort Nine Creek, Kuskonook Creek, Blazed Creek, Five Mile Creek, Selous Creek and Anderson Creek. Green: red ratios averaged 1:1 in the District.

Douglas-fir Beetle

Douglas-fir beetle populations have declined dramatically throughout District, with only 18 ha of mortality mapped. Spot infestations have decreased as well, from 187 (1,890 trees) to 33 (495 trees).

Western Balsam Bark Beetle

Significant mortality was observed on 3,625 ha, up sharply from 2002 levels of 134 ha. Most activity was scattered through the south-central portion of the District, at Healy Creek, Howser Creek, Keen Creek, Woodbury Creek, Shuttly Bench, Lendrum Creek, Coffee Creek, Sitkum Creek, Grohman Creek, Houghton Creek, Wilson Creek, Five Mile Creek, Lasca Creek, Selous Creek, Narrows Creek, La France Creek and Hawkins Creek.



Western balsam bark beetle attack

Larch Needle Blight

Damage was noted on 7,047 ha, in the following areas: Cooper Creek, Crawford Creek, La France Creek, north of Beasley, Midge Creek, Next Creek, Summit Creek, Corn Creek, Goat River and Kianuku Creek.

Satin Moth

Satin moth defoliation was mapped on 2,442 ha, around Duncan Lake, Kaslo River, and along the east side of Kootenay Lake north of Crawford Bay.

Wildfire

Wildfire burned nearly 24,000 ha, in 142 fires. The largest fires were in West Arm Park (Kutetl Creek), near Kuskanook, and near the northern end of Duncan Lake.

Other forest health factors include birch leaf miner (632 ha), 151 ha of western blackheaded budworm in Gray Creek, spruce beetle (38 ha), white pine blister rust (126 ha), and landslide (159 ha).





KAMLOOPS SUMMARY

The Kamloops portion of the Aerial Overview surveys was completed between July 29 and August 30, and required 55 hours of flying over 14 days. Flights covered the area of the old Kamloops Region, as well as the old Robson Valley District. Mapping was completed by Ministry of Forests Region staff and contractors. Flying conditions were generally poor, mainly as a result of haze and smoke from the many large wildfires that occurred during the summer. Additionally, aircraft availability continued to be an issue as in past years. There are very few companies which possess suitable aircraft. As well, these companies provide Fire Patrol duties to the local Fire Centre on a daily basis during periods of high fire hazard. As a result, surveys usually commenced by 8:30 – 9:00 am, and had to be completed by 1:00 pm. This left a maximum of 4 – 4.5 hours of daily surveying time, including ferry time, and caused much of the surveying to be performed outside of the recommended window of 10:00 am – 3:00 pm. The effects of smoke and haze are especially pronounced outside of this window, when sunlight is at a low angle. Additionally, surveyors were prevented from playing “catch up” when conditions were periodically more favourable. As a result, a few areas did not receive the usual level of coverage, particularly the Robson Valley.

KAMLOOPS FOREST DISTRICT

Mountain Pine Beetle

Mountain pine beetle infested area nearly doubled from 2002 levels, to 27,490 hectares, 60% of which sustained moderate or severe mortality. Expansions were observed in most areas, especially in the northwest portion of the District, in the Scottie Creek and upper Deadman River areas.

The number of spot infestations decreased, from 483 (5,140 trees) in 2002, to 262 (2,905 trees) in 2003. The average size of polygon infestations increased from 17.0 hectares to 24.4 hectares, while the number of polygons increased only slightly from 1,007 to 1,128. This reverses the trend of high numbers of smaller infestations that had been occurring for several years, and indicates that many areas of previously scattered attack are coalescing into larger, more continuous areas of attack, especially in the vicinity of Scottie Creek, Deadman River, and Criss Creek. In these areas, attack has begun to spread into large areas of higher hazard, leading pine forest types, out of the lower hazard, more mixed stands that were the primary areas of infestation in the past. In the Tunkwa BMU, the green: red ration averaged 6:1, with the highest expansion seen near Barnes Creek averaging 9.5:1. The average green: red ratio in the Hat Creek BMU was 4.3:1 and this was a fairly constant expansion rate seen throughout the BMU. In the Parks within Kamloops District, Walloper Park had a green: red ration of 4.1:1; Lac le Jeune Park was 6.7:1; and McConnell Park was 6.6:1.



*Mountain pine beetle mortality
in the Red Plateau area near
Kamloops*



Western Balsam Bark Beetle

WBBB infestations have dropped slightly from 2,690 ha in 2002, to 2,330 ha in 2003. This decrease may be in part due to the poor surveying conditions experienced in the District this year. WBBB typically produces scattered, low level attack, which was at times difficult to detect. Infestations continue to be scattered throughout several areas, including Chu Chua Creek, the Bonaparte Plateau, and Mount Martin.

Douglas-fir Beetle

Infestation area increased slightly, from 100 ha in 2002, to 115 ha in 2003. The number of spot infestations fell from 163 (1,150 trees) to 45 (385 trees). Increased activity was seen in the Durand Creek area south of Savona, while the number of small, scattered infestations in the Hat Creek area declined.

Western Spruce Budworm

Western spruce budworm defoliation expanded slightly, from 6,100 ha in 2002, to 7,125 ha in 2003. Most of the defoliation was classed as light. Damage was observed near Hat Creek, along the north side of Highway 99, and in the Maiden Creek and Scottie Creek areas, where it has not been detected since 2001. Defoliation in the Stump Lake area decreased, while infestations near Pukaist Creek, Logan Lake, and Roche Lake remained relatively unchanged. No direct control program was undertaken for budworm in 2003.

Predictive egg mass sampling was completed during the fall; results are summarised in the Regional Overview section. Areas sampled around Highland Valley had egg mass numbers that indicate severe defoliation in 2004, Scottie Creek had moderate defoliation predicted for 2004, whereas most of the other sites sampled in the Kamloops District predicted only light defoliation.



Western Hemlock Looper

Western hemlock looper populations increased in 2003, and caused 725 ha of light to severe defoliation. Most activity was in the Inks Lake area, where defoliation expanded into the upper Peterson Creek area, and towards Kamloops. These areas continued to contain a significant proportion of false hemlock looper. A few other scattered populations caused defoliation, in the Mowich Lake, Six Mile, and Carabine Creek – Red Lake areas. Defoliation was significantly less widespread than was expected, as large numbers of moths were observed in many areas during the 2002 flight period.



Western hemlock looper mortality in Douglas-fir near Inks Lake

Birch Leaf Miner

Area defoliated by birch leaf miner increased slightly in 2003, to 3,850 ha, from 3,547 ha in 2002. Most of the defoliation continued to be detected in the northeast part of the District, in the Barriere River, Fadear Creek, and Adams Lake areas.

Wildfire

Five large fires burned the majority of the 55,395 ha hit by wildfires in the District. These fires were in the McLure – Barriere, Strawberry Hill, Niskonlith Lake, Oregon Jack Creek, and East Barriere Lake areas.

Other forest health factors included 37 ha of Douglas-fir tussock moth defoliation in the Scottie Creek area; 11 ha of spruce beetle, and scattered western pine beetle in the Kamloops area.



CASCADES FOREST DISTRICT

Mountain Pine Beetle

Mountain pine beetle infestation area dropped from 12,765 ha in 2002, to 9,069 ha in 2003. The proportion of moderate and severe attacks dropped as well. The number of spot infestations dropped from 534 (5,000 trees) to 374 (3,400 trees). This observed decrease in mountain pine beetle occurred in both the old Merritt and Lillooet portions of the new Cascades District. The ongoing infestation in the Whipsaw Creek – Willis Creek area declined significantly. Populations in the area appear to be declining rapidly as the available host is depleted. Reduced infestation levels were also observed in other areas, including Red Creek, Guichon Creek, Skuhun Creek, Pimainus Creek, Sleetsis Creek, Murray Creek, and many areas in the north western portion of the old Lillooet District. Mortality in the Copper Creek/Manning Park Eastgate area, and in the Clapperton Creek area northeast of Merritt, continues to expand. Highly scattered infestations continue to result in significant mortality throughout the area between Aspen Grove, Princeton, and the upper Tulameen River. The highest green:red ratio in the Cascades District was in the Clapperton and Plateau BMU's at 9.9:1 and 4.7:1, respectively. In general the expansion rates were less than 2:1 in the remaining BMUs.

Spruce Beetle

Spruce beetle mortality expanded slightly, from 1,000 ha in 2002, to just over 1,200 ha in 2003. Most activity continues to be west of Lillooet, near Tommy Creek, Bob Creek, Lost Valley Creek, and Copper Creek.

Western Balsam Bark Beetle

Western balsam bark beetle infestations declined by nearly 40%, to 3,298 ha. Decreases in area of attack were observed in all areas of the District, especially in the old Lillooet District portion. Due to the very hot dry conditions during the summer of 2003, even in the subalpine ecosystems, the WBBB had a much reduced and delayed flight; infestation levels are expected to remain stable in 2004.



Douglas-fir Beetle

Douglas-fir beetle mortality decreased slightly, from 441 ha in 2002 to 376 ha in 2003. An additional 965 trees were killed in 134 spot infestations. Most activity continued to be in the Fraser River area (the greatest declines in mortality were in this area), and in the vicinity of Carpenter Lake, Pavilion Lake, and the lower Nicola River, with a few infestations scattered throughout other dry, low elevation fir stands in the District.

Western Spruce Budworm

Defoliation increased slightly from 64,280 ha in 2002 to 66,645 ha in 2003. The majority of the defoliation was classified as light. Damage expanded over three-fold in the old Lillooet District, to 12,667 ha. Defoliated area dropped slightly in the old Merritt District to 53,370 ha. The greatest expansions were at Gun Lake, Carpenter Lake, Seton Portage – Shalath, Anderson Lake, along the west side of the Fraser River north of Lillooet, Spius Creek, and along the Nicola River between Lower Nicola and Skuhun Creek. Eggmass sampling results from the fall of 2003 indicate Peter Hope Lake and Glimpse Lake will have light defoliation in 2004, whereas sites near Gordon and Spius Creeks have moderate defoliation predictions.

Other forest health factors included wildfire (4,070 ha), and a small area of flooding (7 ha).



OKANAGAN SHUSWAP FOREST DISTRICT

Mountain Pine Beetle

Area affected by mountain pine beetle more than doubled, to 10,495 ha, from 5,010 ha in 2002. The number of spot infestations increased from 306 (2,985 trees) to 407 (3,990 trees). The greatest increases were within TFL #49, where large numbers of small, scattered, new infestations were detected. Other increases were observed in the Chase Creek and Monashee Pass areas, and in the Ashnola River valley, where the number of spot infestations and small patches continues to increase. Small, scattered, new infestations appeared in many areas of the District where little or no activity was detected in 2002. T.F.L. #49 had an average green:red ratio of 3:1, but this does not fully reflect the situation as many green stands were heavily attacked (>30%), presumably from beetles flying in from surrounding areas that were severely infested in 2002. Green:red ratios ranged from 1:1 to 20:1 with an average of 4.4:1.

Western Balsam Bark Beetle

Mortality due to western balsam bark beetle remained nearly unchanged, at 20,050 ha. Most activity continued to be in the Graystokes Plateau – Kettle River area; other areas of significant activity were scattered throughout the Districts' high elevation, leading balsam stands.

Douglas-fir Beetle

Douglas-fir beetle mortality continued to decline throughout the District. Infestations were mapped on 491 ha in 2003, down from 600 ha in 2002. The number of spot infestations also dropped, to 287 (2,046 trees).

Spruce Beetle

Spruce beetle mortality was mapped on 806 ha in 2003; no mortality was visible in 2002. This increase was likely due to the colour change of spruce foliage being uncharacteristically noticeable in 2003. Most of the spruce beetle activity was in the southern portion of the old Pentiction District, in the Snowy Protected Area and Cathedral Park.

Western Hemlock Looper

Defoliation was mapped on just over 4,400 ha, up from 3,450 ha in 2002. Most of the expansion was observed in the upper Shuswap River, Perry River, and Ratchford Creek areas.

Western Spruce Budworm

Western spruce budworm populations expanded in the Trout Creek and Peachland Creek areas, and new infestations appeared in Eneas Creek, Trepanier Creek, and along Okanagan Lake in the Fintry - Carrs Landing areas. Defoliated area totalled 2,616 ha, all classed as light.

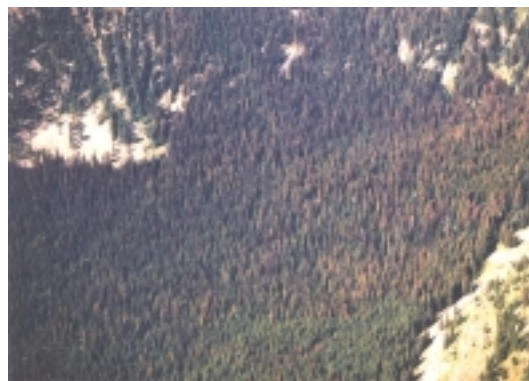
Birch Leaf Miner

Defoliated area declined, from 5,025 ha in 2002, to 4,215 ha in 2003. Most of the defoliation continued to be in the old Vernon District, in the Cherryville – Shuswap Lake areas.

Wildfire

42,750 ha were burned in 345 wildfires in the District. The majority of the area was burned in a few large fires: Okanagan Mountain Park/Kelowna, Vaseaux Creek, Anarchist Mountain, Falkland, Perry River, and the upper Seymour River.

Other forest health factors mapped include satin moth (149 ha), pine needle cast (293 ha), and drought mortality (17 ha).



Spruce beetle in Cathedral Park



HEADWATERS FOREST DISTRICT

Mountain Pine Beetle

Mountain pine beetle infested area fell from 17,183 ha in 2002, to 5,122 ha in 2003. This decrease is mainly attributed to a change in mapping tolerances within the old Robson Valley District portion, rather than an actual decrease in infestation levels – in 2002, 45 separate polygons were mapped, with an average area of nearly 370 ha. In 2003, 301 polygons were mapped, with an average area of 14 ha. 2002 surveyors used more of a ‘broad brush’ approach to mapping. As well, the number of spot infestations nearly doubled in this portion of the District, to 517 (5,437 trees). Within the entire Headwaters District, the number of infestations (both polygons and spots) more than doubled from 2002 levels, from 418 to 903. This demonstrates that mountain pine beetle populations are expanding in the District; most of the mapped area falls within Mount Robson Provincial Park, between Moose Lake and the western park boundary. Active infestations were also observed around Valemount, Tete Jaune Cache, and along both sides of the main Fraser Valley corridor, as far north as Crescent Spur. The infestations outside of Mount Robson Park are scattered throughout high hazard pine stands. Significant mortality also occurred in the Joseph Creek and Harbour Creek areas, and there was an increase in scattered mortality in the Raft River area.

Western Balsam Bark Beetle

Western balsam bark beetle was mapped on 10,386 ha in the District, down from 66,290 ha in 2002. Again, as with mountain pine beetle, much of this decrease is attributed to a change in mapping tolerances within the old Robson Valley District area. In 2002, surveyors undertook to record all mortality, even in stands where attack levels were very low. In 2003, surveyors used the method which has more historically been used in the south of the province; namely, that WBBB is only mapped when it is causing mortality higher than the typical, <1 – 1% range. As most stands sustain this level of mortality annually, this ensures that so called ‘endemic’ levels of attack are not recorded; rather, surveyors look for areas that are sustaining a significantly higher than average attack rate. Most of the significant mortality was in the Goat River – Milk River area, and in the Raft River, Mad River, and Murtle Lake areas.

Spruce Beetle

Spruce beetle mortality was mapped on 3,542 ha, down from 12,441 in 2002. Nearly all of this years mortality was in the old Clearwater District portion (mainly within Wells Gray Park), whereas in 2002, most of the damage was in the Robson Valley District portion. Most of the local increases and decreases are likely attributable to changing visibility – spruce trees often exhibit little to no colour change symptoms after attack; differing conditions and flight timing can change the visibility from year to year. Most of the mortality was mapped in the Lickskillet Creek and Flourmill Creek areas.

Douglas-fir Beetle

Douglas-fir beetle infestations continued to decline slightly in the District, with mortality mapped on 823 ha, down from 1,048 ha in 2002. Most activity continues to be in the southern end of Wells Gray Park, near Helmcken Falls; mortality levels are beginning to fall off in this area as the suitable host is depleted. Active populations were also noted in the Mahood Lake, Birch Island, Vavenby, and lower Raft River areas. The number of spot infestations in the old Robson Valley District has risen from just 5 in 2002 to over 40 in 2003, mainly along Canoe Reach, in Robson Valley Park, and in scattered spots in the McBride – Crescent Spur area.

Two-Year Cycle Budworm

Light defoliation was mapped on only 1,760 ha on TFL #18. 2003 was an ‘off’ year in this insects’ feeding cycle; the current infestation covers approximately 70,000 ha in the District.

Western Hemlock Looper

Defoliation was observed on only 57 ha in the District, in scattered pockets near Silence Lake, and Falls Creek, Azure Lake, and Hobson Lake in Wells Gray Park.



Birch Leaf Miner

Birch leaf miner defoliated 923 ha, mainly around Adams Lake, Cayenne Creek, and Vavenby.

Other forest health factors mapped included 3,313 ha of wildfire, mainly from 2 fires in Hellroar Creek and Barella Creek.

CARIBOO SUMMARY

The Cariboo portion of the Aerial Overview Surveys was conducted between July 28 and September 27, 2003. The surveys required 145.7 hours of flying time. Mapping was a co-operative effort by Ministry of Forests District and Region staff and contractors. Flying conditions were variable; smoke from wildfires was especially a problem in the 100 Mile House District Area.



QUESNEL FOREST DISTRICT

Mountain Pine Beetle

Mountain pine beetle infestations now cover just over 1,000,000 ha, or over half of the total District land base, and over 75% of the land base west of the Fraser River. Infested area has nearly tripled from 2002 levels, and over 12-fold from 2001 levels. Average polygon size has increased from 140 ha in 2002 (2,600 polygons) to 240 ha (4,207 polygons) in 2003, while the number of spot infestations has dropped from over 800 to under 100. This illustrates the large, widespread, continuous nature of MPB infestations in the District. The most severe infestations are in the Nazko River, Eucharik River, West Road River, Narcolsi Creek, and Pantage Creek areas; however, nearly all areas of the District with a significant lodgepole pine component are experiencing significant mortality. With green:red ratios averaging 20:1, it is expected that the mortality rates in all stands will increase substantially in 2004.

Western Balsam Bark Beetle

Western balsam bark beetle infestations have nearly doubled from 2002 levels, to 84,550 ha. The majority of the activity is in the eastern portion of the District, in the Swift River, Lightning Creek, Willow River, Bowron Lakes Park, and Ghost Lake areas.

Spruce Beetle

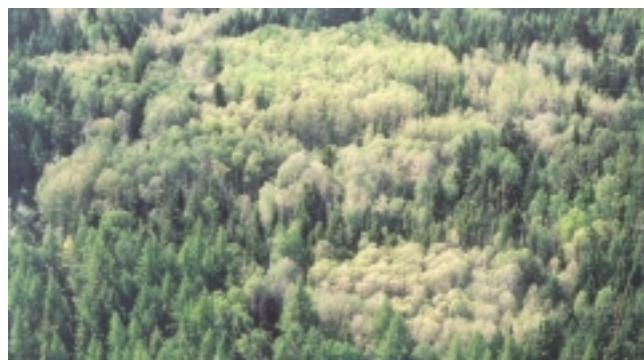
Spruce beetle mortality increased to 296 ha, up from 43 ha in 2002, with most mortality in Long John Creek.

Two Year Cycle Budworm

Defoliated area increased to nearly 19,000 ha, up from 13,000 ha in 2002. Different populations in the District appear to have unsynchronized life cycles; as a result, for the last several years, different geographic areas have had distinctly different 'on' and 'off' years in the overall feeding cycle. Most defoliation in 2003 was in the Willow River area.

Satin Moth

Satin moth defoliation has declined significantly, from 24,360 ha in 2002, to 8,350 ha in 2003. Most activity is along the Quesnel River, between Quesnel and Gravelle Ferry.



Other forest health factors mapped included small areas of western spruce budworm (111 ha), wildfire (283 ha), flooding (21 ha), and frost damage.



CENTRAL CARIBOO FOREST DISTRICT

Mountain Pine Beetle

Infested area grew by almost 4-fold, to just over 450,000 ha in 2003. An additional 710 spot infestations killed 2,355 trees. As in most other Districts in the Cariboo, average polygon size has increased, from 92 hectares (1,290 polygons) to 210 hectares (2,146 polygons), while the number of spot infestations has remained relatively stable. The greatest increases were seen in the central portion of the District, in the Horsefly, McIntosh Lake, Moffat Creek, and Beaver River areas. Large increases in attacked areas were also seen in the Gaspard Creek, Churn Creek, and Big Creek areas. Red:green ratios averaged 11:1 in the District in 2003, indicating that mortality levels will continue to increase in 2004.

Western Balsam Bark Beetle

Western balsam bark beetle mortality decreased slightly, from 61,350 ha in 2002 to 47,500 ha in 2003. Most infestations are in the higher elevations of the eastern portion of the District.

Douglas-fir Beetle

Large increases in mortality were observed in the 140 Mile House and Churn Creek Park areas. Affected area now totals over 12,200 ha, up over 4-fold from 2002 levels of 2,700 ha. A further 322 spot infestations killed 1,300 trees.

Spruce Beetle

Mortality has increased significantly throughout the Horsefly River area. Affected area increased to 4,175 ha from just 278 ha in 2002.

Western Spruce Budworm

Overall, area affected increased to 230,400 ha, up from 165,350 ha in 2002. Increases were seen in the Gaspard Creek, Churn Creek, 150 Mile House, and McLeese Lake areas. 15,111 ha were treated with *B.t.k.* in June 2003 to reduce population levels in high value stands. See Regional Overview section for a spray program summary, and a summary of eggmass sampling results.

Western Hemlock Looper

Defoliation due to western hemlock looper was mapped on 15,412 ha in 2003, down from 2002 levels of 23,657 ha. Egg sampling was initiated during the fall to determine expected defoliation in 2004; results will be available from the Regional Entomologist in 2004.

Two Year Cycle Budworm

Defoliation decreased to 15,241 ha, down from 47,812 ha in 2002. This year was an off year in the feeding cycle of this insect; it is expected that more widespread damage will occur in 2004.

Satin Moth

Satin moth defoliation was observed on 3,228 ha, down from 2002 levels of 8,883 ha. Most activity was in the Horsefly River area.

Other forest health factors included 685 ha of wildfire.

CHILCOTIN FOREST DISTRICT



Mountain Pine Beetle

Mountain pine beetle infestations have expanded enormously, from just 34,325 ha in 2002, to nearly 880,000 ha; over 96% of all attack was classified as light. Most of the new infestations are in the northeastern and northwestern portions of the District, and in many cases consist of very scattered, very light attack (less than 1% current attack). This is reflected in the average polygon size of 373 ha. Most of the moderate and severe mortality is in the northwest, in the Dean River area, in the Clusko River area, and in the lower elevation areas of the Chilanko, Chilko, and Chilcotin Rivers. An average green:red ratio of 25.3:1 indicates that populations are increasing rapidly, and significantly higher levels of mortality can be expected in all infested areas in 2004.

Western Balsam Bark Beetle

Western balsam bark beetle continues to cause significant mortality throughout many high elevation areas in the southwest portion of the District. Affected area remained relatively unchanged at 10,456 ha.

Douglas-fir Beetle

Mortality increased to 289 ha, up from 27 ha in 2002. A further 573 trees were killed in 142 spot infestations. Most activity was in the lower Chilcotin River and Tatlayoko Lake areas.

Spruce Beetle

Expanding populations in the Chilko Lake area resulted in 418 ha of mortality, up from only 9 ha in 2002.



Satin Moth

Satin moth defoliation remained relatively unchanged, at 8,265 ha. Most activity continued to be in the southwest area of the District, around Chilko Lake, Tatlayoko Lake, and Mosley Creek.

Wildfire

Just over 31,280 ha of forest were burned in 2003; the majority of this (29,200 ha) occurred in one large fire northeast of Chilko Lake.

Other forest health factors observed in the District included 2-year cycle budworm (87 ha), western spruce budworm (25 ha), western hemlock looper (152 ha), and minor amounts of armillaria root disease and frost damage.

100 MILE HOUSE FOREST DISTRICT

Mountain Pine Beetle

Mountain pine beetle infestations expanded by nearly 7-fold, to 106,347 ha, the majority of which was classified as light attack. The average polygon area nearly doubled, from 54 ha to 104 ha. The number of spot infestations also increased, from 375 to 572. New infestations were seen in most areas of the District, with the greatest increases in the northern portion, in the 100 Mile House, Lac La Hache, Eagle Creek, and Canim Lake areas, and in the southern portion, around Loon Lake and Clinton. Scattered, light attack is now present in almost all areas of the District. Average green:red ratios of 11:1 indicate that mortality levels and area will increase significantly in 2004.

Spruce Beetle

Spruce beetle infestations expanded nearly 4-fold, from 4,355 ha in 2002, to 20,989 ha in 2003, mainly as a result of a recent increase in windthrow events. Most activity was in the eastern wetbelt portion of the District, in the Hendrix Creek, Deception Creek, and Spanish Creek areas. Scattered infestations were also observed throughout the area between Canim Lake and Machete Lake.

Western Balsam Bark Beetle

Western balsam bark beetle mortality levels decreased slightly, from 23,140 ha in 2002, to 20,935 ha in 2003. Most activity was in the eastern, high elevation areas of the District, near Hendrix Lake and Deception Creek.

Scattered mountain pine beetle attack.

Douglas-fir Beetle

Douglas-fir beetle infestations expanded over 3-fold, to 7,183 ha. A further 2,677 trees were killed in 500 spot infestations. Significant mortality was observed in the Fraser River, Deception Creek, Canim Lake, Bonaparte River, Loon Lake, and Clinton areas, and scattered throughout the area between Canim Lake and Egan Lake.

Western Spruce Budworm

Western spruce budworm activity remained widespread in the District in 2003, although total area affected fell to just under 200,000 ha, from 236,650 ha in 2002. 7,023 ha were treated with *B.t.k.* in June 2003 to reduce population levels in high value stands; see regional summary section for a spray program summary, and a summary of eggmass sampling results and expected population trends for 2004.

Satin Moth

Satin moth continued to be active in the eastern portion of the District, mostly in the area between Canim, Bonaparte, and Green Lakes. Total defoliated area was 2,767 ha.

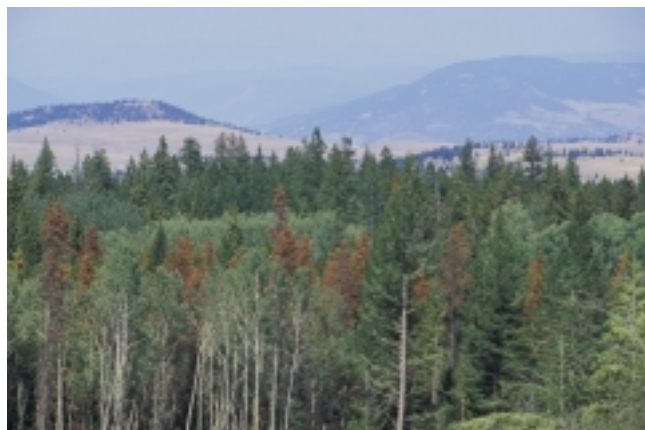
Pine Needle Cast

Pine needle cast affected 40,650 ha in 2003, up from 35,053 ha in 2002. Defoliation was observed southwest of Flat Lake Park, and in the Green Lake and Clinton areas.

Wildfire

Wildfire affected 1,710 ha in the District. Most of this area was in a large fire south of Bonaparte Lake (1,500 ha).

Other forest health factors observed in the District were small areas of 2-year cycle budworm (132 ha), and western hemlock looper (66 ha).



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Acknowledgements:

We would like to acknowledge the aerial surveyors:

*Mike Ferguson and Julie Castonguay - Nelson area
Leo Rankin and Joe Cortese - Cariboo area
Kevin Buxton and Shane Collingridge - Kamloops area*

and the District staff that accompanied them.

*We would also like to acknowledge the Forest Health district staff that made contributions to this report
and Kelly Hicks for assisting in technical preparation.*

photo credits:

Dion Manastyrski - cover photo; pp. 10, 12, 13, 14, 16, 18, 19, 23, 25, 26, 28, 30, 31
Lorraine Maclauchlan - pp. 21, 24, 29
Kevin Buxton - pp. 8, 25, 27, 29
Leo Rankin - pg. 11

Line Drawings by Lynn Kristmanson.