

VANCOUVER REGION
SITKA SPRUCE WEEVIL SURVEY RESULTS
(1982-1983)
WITH RECOMMENDATIONS FOR PLANTING SITKA SPRUCE
by
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SUMMARY

This report summarizes the results of surveys for Sitka spruce weevil (Pissodes strobi) conducted within the Vancouver Forest Region over the two year period 1982-83. A total of 3 788 hectares of susceptible Sitka spruce (Picea sitchensis) plantations (5 years and older) were surveyed.

Results from the survey indicate a consistent pattern of attack over the Region. A low incidence of weevil infestation was found over the northern tip of Vancouver Island and the northern coast of the mainland and a generally high incidence of weevil infestation was found over the remaining portion of the Vancouver Forest Region.

On the basis of this apparent pattern of occurrence and its associated risks of weevil infestation in new plantations, recommendations concerning the planting of Sitka spruce within the Vancouver Forest Region are presented.

ACKNOWLEDGEMENTS

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INTRODUCTION

Although many field observations by Forest Insect and Disease Survey (Canadian Forestry Service), Ministry of Forests, and Licensee personnel have indicated that Sitka spruce weevil (Pissodes strobi) is a serious plantation pest in the Vancouver Forest Region, its distribution and intensity were not well known. To remedy the situation, a region wide survey for spruce weevil was conducted with the following objectives:

1. To determine the incidence and intensity of Sitka spruce weevil infestations in Sitka spruce plantations throughout the Vancouver Forest Region.
2. To chart the incidence by intensity level and, thereby, determine patterns of intensity in the Region.

All susceptible (five years and older) Sitka spruce plantations within the Vancouver Forest Region (excluding Tree Farm Licences and the newly added Mid Coast Forest District) were surveyed over the two year period 1982-83 for a total of 3 788 hectares. The results from this survey are being used to:

1. Assess the current and potential impact of the Sitka spruce weevil on Regional timber supplies.
2. Help assess the reliability of Sitka spruce as an acceptable species for regeneration throughout the Region.
3. Aid the development of appropriate cost effective protection and silviculture strategies for the management of Sitka spruce weevil.

METHOD OF SURVEY

All Sitka spruce plantations five years and older from the date of establishment within the Vancouver Forest Region were scheduled to be surveyed over the two year period 1982-83. The Sitka spruce weevil on the coast has generally not been observed to attack plantations younger than about five years of age.

Further survey criteria required that the plantations to be surveyed contain Sitka spruce as a major species, i.e. comprising approximately 20 percent or more of the stand component. It was felt that a spruce composition of less than this would be insufficient to warrant survey expenditures.

Due to the unhomogeneous (clumped) distribution of Sitka spruce weevil within a plantation and the considerable difficulty in determining its distribution beforehand, a simple strip survey method was devised. Ten metre wide transect lines were run at two hundred metre intervals to obtain a minimum sampling intensity of five percent of the total area. All spruce within the strip greater than or equal to one metre in height were tallied. All current and previous year's attacks on trees within the strip were also tallied. Tallied data was then summed for every one hundred metres along the transect line.

Where current (less than or equal to three years old) regeneration data was not available, four metre radius stocking survey plots were established to determine the species composition (percentage of spruce). These plots, located at one hundred metre intervals on the transect lines tallied all acceptable trees greater than or equal to one metre in height. A minimum of 0.25 percent of each plantation area was sampled by these plots.

2 835 hectares of Sitka spruce plantations on the west coast of Vancouver Island were not included in this survey because they have been subject to operational control trials for the Sitka spruce weevil and, therefore, weevil populations were artificially low.

RESULTS

All Sitka spruce plantations in the Vancouver Forest Region (excluding Tree Farm Licences and the Mid Coast Forest District) meeting survey criteria were surveyed with minor exceptions (due to heavy brush or inaccessibility) over the two year period 1982-83 for a total of 148 plantations covering 3 788 hectares.

Of this total, only 38 plantations (811 hectares, 21.5 percent) were found to be weevil free. Many of these plantations were young (under 10 years) and had weevil sources nearby indicating a high potential for future infestation.

71 of the plantations surveyed (2 045 hectares, 54 percent) had low levels of infestation (less than or equal to 5 percent of the Sitka spruce stems with current attack).

27 plantations (660 hectares, 17.5 percent) had high levels of infestation (greater than 10 percent of the Sitka spruce stems with current attack). (Table 1, Figure 1, Appendix).

Study of the survey data shows that the northern end of Vancouver Island, from roughly Brooks Peninsula across to Malcolm Island and north, appears to have consistently low level weevil infestations while the rest of the Island has infestation levels ranging from no current infestation to high. The mainland also has levels of infestation ranging from no current infestation to high except for the northern portion of the coastal mainland from Broughton Island northwest, where it appears to be consistently low. Figure 2 shows these generalized areas of weevil incidence in the Vancouver Forest Region.

TABLE 1

Area (ha), in each infestation class surveyed for
Sitka Spruce Weevil in Vancouver Forest Region
Timber Supply Areas.¹

T.S.A.	% Stems Infected						totals
	0	0.01- 2.0	2.01- 5.0	5.01- 10.0	10.01- 25.0	25.10+	
<u>NOOTKA</u> ²	175	489	160	111	246	209	1,390
<u>KINGCOME</u>	597	1,050	264	90	123	82	2,206
<u>QUADRA</u>	39	65	---	71	---	---	175
<u>S00</u>	Ss plantations in Tree Farm Licence only (not surveyed)						
<u>FRASER</u> ³	---	10	7	---	---	---	17
TOTALS	811	1,614	431	272	369	291	3,788

¹ See the Appendix for a more complete presentation of the survey data.

² 2 835 ha of Sitka spruce plantation in the Nootka Timber Supply Area have not been included because this area was subject to leader clipping control trials and weevil populations were, therefore, artificially low.

³ 8 plantations in the Fraser TSA remain unsurveyed but have had preliminary assessments --- weevil infestations were found in only one of these small plantations at the south end of Harrison Lake.

Figure 1. Survey results summary

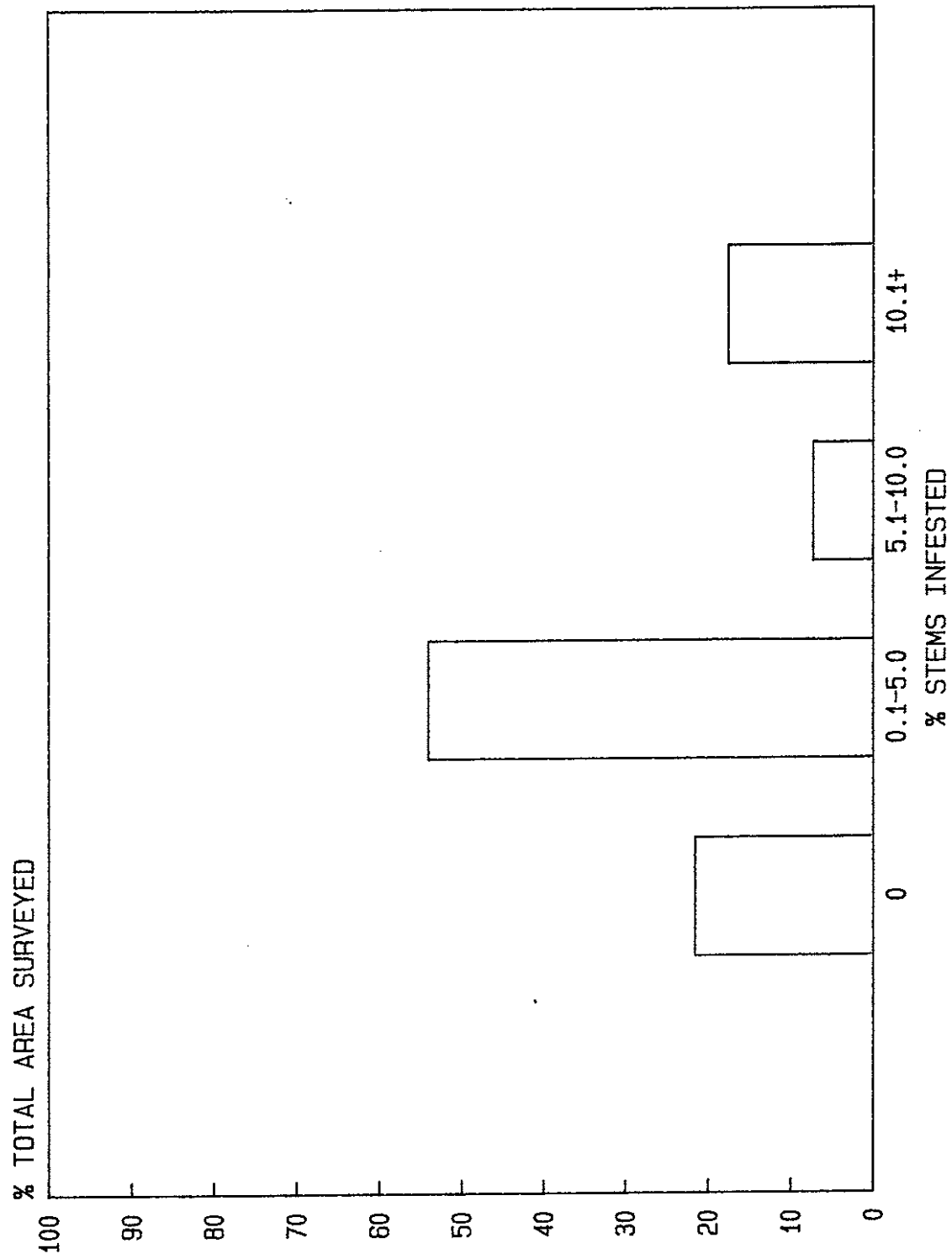
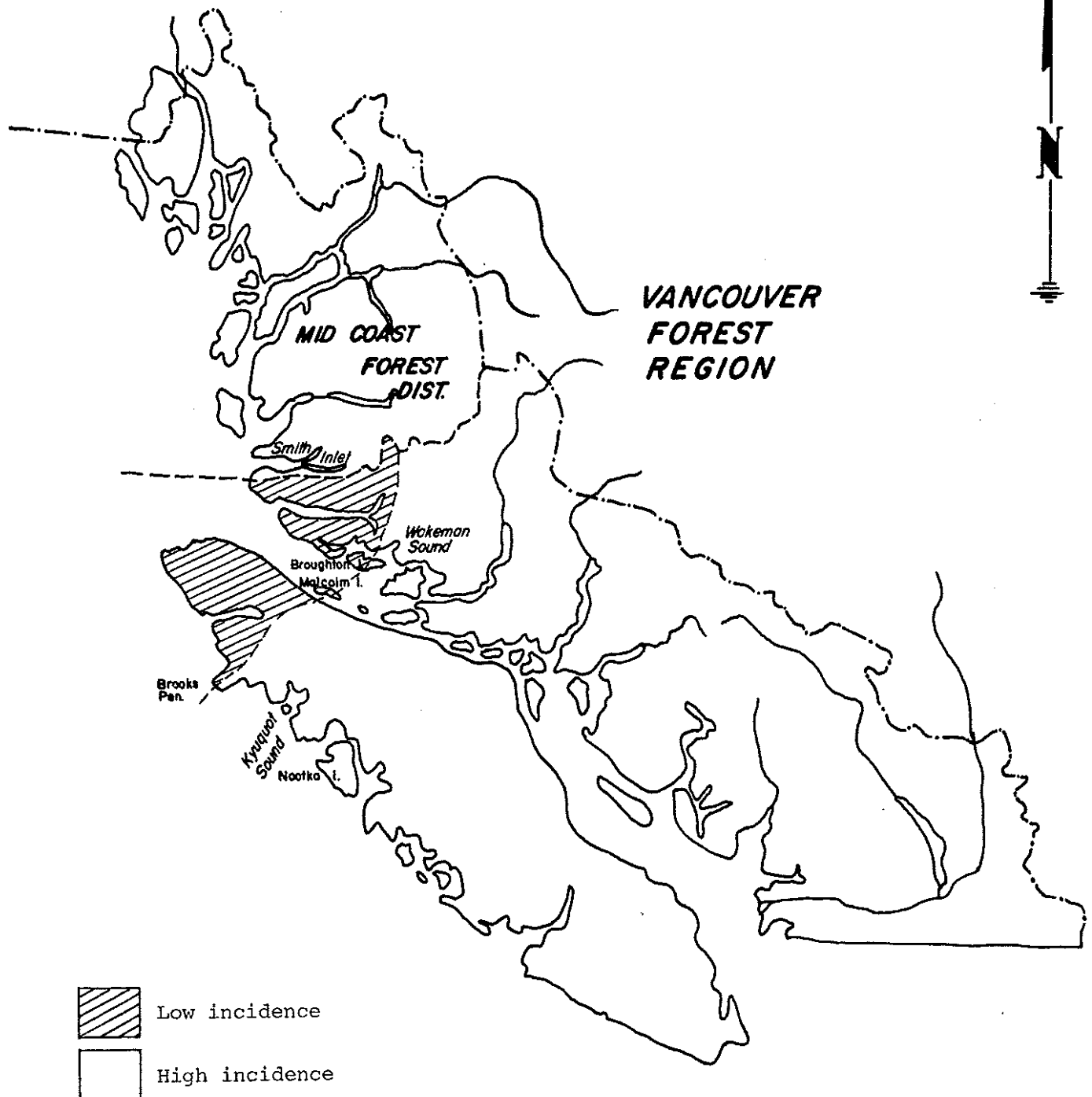


Figure 2: Generalized levels of Sitka spruce weevil incidence in the Vancouver Forest Region



Note: The Mid Coast Forest District has not been surveyed. Reported observations indicate low incidence on the coastal (west) portion of the District and high incidence on the transitional (east) portion of the District.

DISCUSSION

The apparent division of the Vancouver Forest Region, as noted in the survey results, into two areas of generalized weevil incidence, one containing low levels of weevil incidence and one containing high levels of incidence, may provide evidence of possible risk or hazard zones associated with the Sitka spruce weevil.

Sitka spruce plantations on northern Vancouver Island, from roughly Brooks Peninsula across to Malcolm Island, and the northern coastal portion of the Vancouver Forest Region, from roughly Broughton Island north to Smith Inlet, consistently were found to contain low levels of weevil infestation in these surveys. McMullen (1976) also found a general low incidence of weevil damage on northern Vancouver Island. Reported observations from Forest Service personnel of weevil attack in the Mid Coast Forest District also noted low infestation levels on the coastal portion of the District.

These low levels of infestation also appear to remain relatively static at low levels. Young plantations of Sitka spruce (5-10 years) surveyed within this area of low incidence, if infested at all, were generally found to contain only low levels of infestation. Table 2 shows infestation levels for plantations within both the low and high weevil incidence areas.

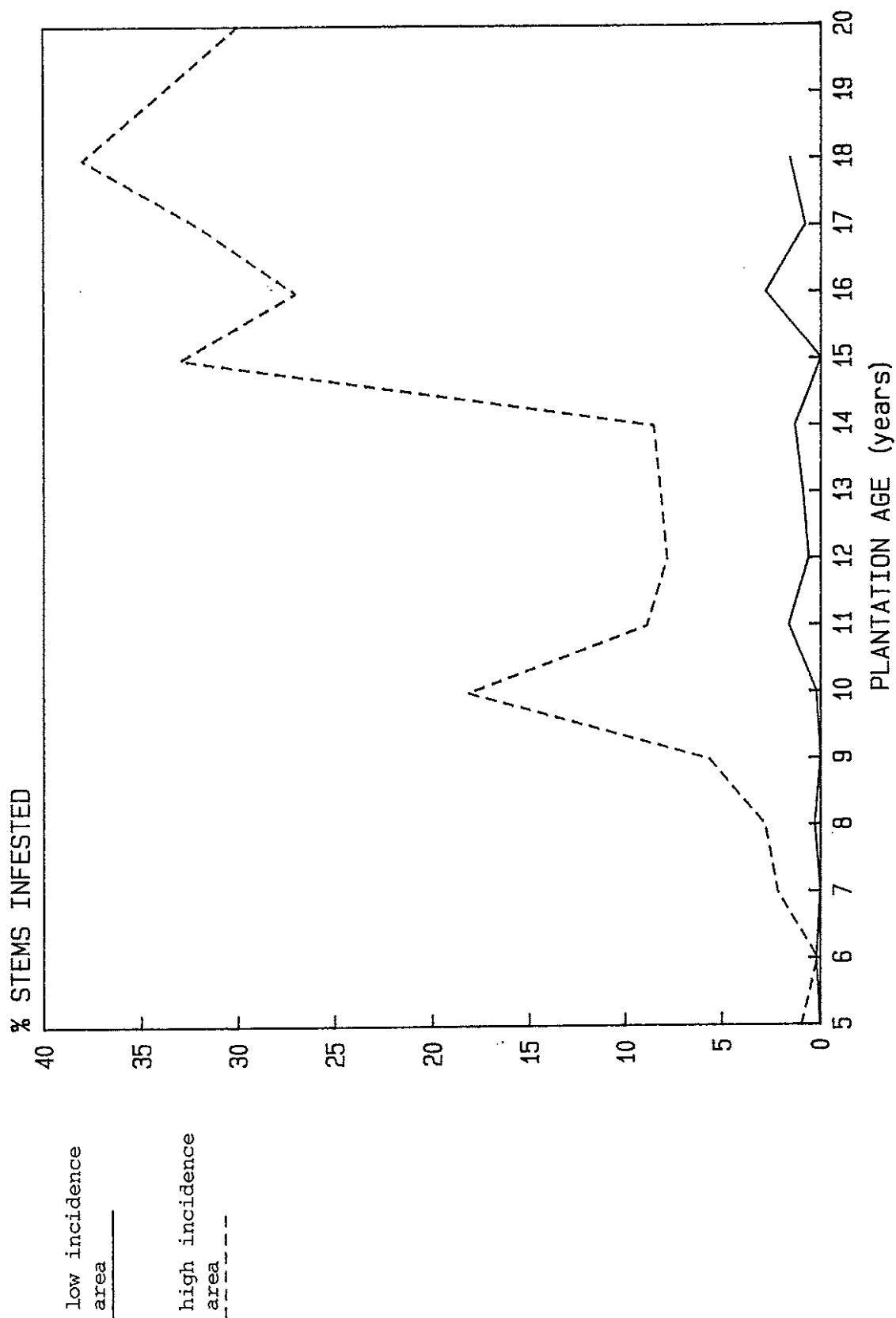
Similarly, older plantations (10+ years) within the same area were also generally found to contain low levels of infestation if they were infested at all (Table 2). The assumption is that these older plantations have been susceptible to weevil attack for a sufficiently long period to allow weevil populations within the plantations to build to high levels. However, they have remained low. Figure 3 provides a schematic representation of these relatively static levels of infestation over a range of years within this area of low weevil occurrence. Although this graph is not

TABLE 2

Survey results summary for young and older plantations
within the high and low weevil incidence areas

Weevil incidence rating on area	Range of ages	Number of plantations surveyed	number of hectares surveyed	Mean infestation levels (% stems infested)	Range of infestation levels (% stems infested)
low	5 - 10	28	639.0	0.1	0.0 - 1.0
low	11 - 18	20	642.0	1.0	0.0 - 3.3
high	5 - 10	49	1226.5	6.0	0.0 - 48.5
high	11 - 20	38	1007.5	11.3	0.0 - 67.0

Figure 3: Mean infestation level for each age in both the high and low weevil incidence areas.



completely valid statistically, i.e. uneven age distribution, miscellaneous plantation sizes and locations, etc., it does provide a useful approximation.

Further evidence can be obtained from the survey data showing relatively static low levels of infestation over a number of successive years within a plantation throughout this area of low weevil incidence (Examples from the Appendix: surveys from San Josef River, Stranby River, Nahwitti River, Nahwitti Lake, Coal Harbour, and Buck Creek).

Observations from District personnel over numerous years also concur with the general low level of weevil incidence throughout the northern Vancouver Island/northern coastal Mainland area, including the coastal portion of the Mid Coast Forest District.

Based on the preceeding evidence, it would appear that the risks of weevil damage in Sitka spruce plantations within this area are low.

Sitka spruce plantations throughout the remaining portion of the Vancouver Forest Region, Vancouver Island from Brooks Peninsula across to Malcolm Island and south, and the coastal Mainland from Wakeman Sound and south, were found to contain high levels of weevil infestation or ranges of infestation from no infestation to high levels. Similar levels of infestation were found within plantations subject to operational control trials on Nootka Island and the Kyuquot Sound area. Within the Mid Coast Forest District, reported observations of high levels of weevil attack have been primarily from the eastern portion (forest transition zone between coastal and continental influences) of the District's inlets and associated drainages.

Within this area of relatively high weevil incidence, numerous plantations have weevil populations that expand as the plantation ages. Young plantations (5 to 10 years) surveyed within this area were generally found to contain low levels of infestation, while older plantations (>10 years) often had high levels (Table 2, Figure 3). Also with this area, infestation levels have been observed to increase rapidly from low to high in as short a period as three years. Figure 4 illustrates a typical example of this phenomenon.

Based on the evidence that this area generally has a high incidence of weevil attack and that weevil populations here appear to have the ability to expand within a plantation to high levels of attack within a short period of time, it would appear that the risks of weevil damage in Sitka spruce plantations within this area are generally high.

Research conducted by McMullen (1976) relating summer heat accumulation (degree-days) with weevil hazard, predicted low hazards on northern Vancouver Island and along its extreme western coastline. This area of low hazard, as predicted by McMullen, coincides closely with the Southern Hypermaritime Coastal Western Hemlock Biogeoclimatic Subzone Variant (CWHd1) as described by Klinka, et. al., (1985) and Nussdorfer, et. al., (1985).

McMullen, in the same 1976 report, also speculated that on the coastal mainland there would be a narrow strip north of Vancouver Island that would have a low hazard of damage. This strip likewise coincides with the northern portion of the CWHd1 and also the Central Hypermaritime Coastal Western Hemlock Biogeoclimatic Subzone Variant (CWHd2) (Figure 5).

The survey results from this report tend to concur with the above described low hazard zones and the associated biogeoclimatic zones

Figure 4: Sitka spruce weevil infestation expansion within a Sitka spruce plantation near Kaouk River on Vancouver Island.

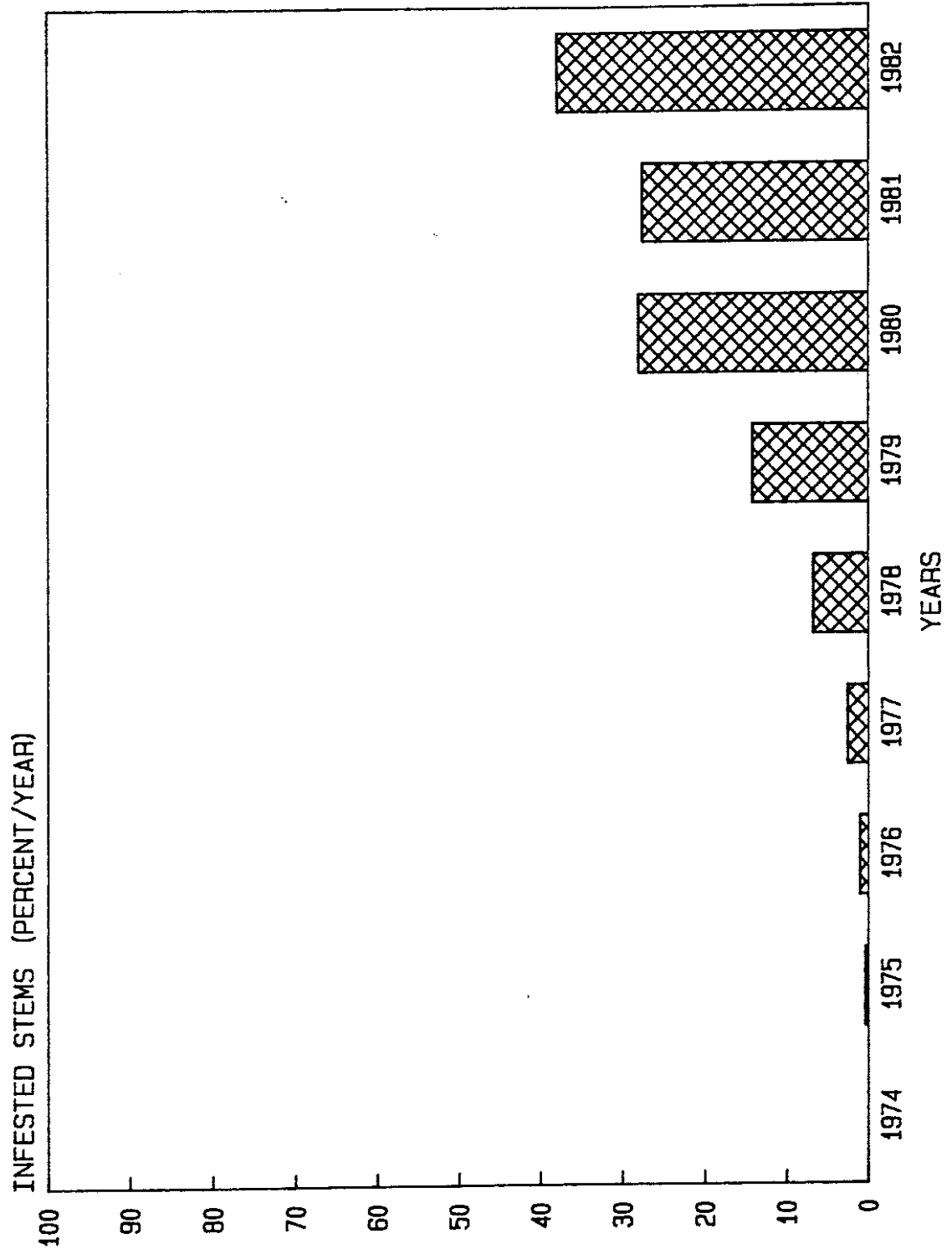
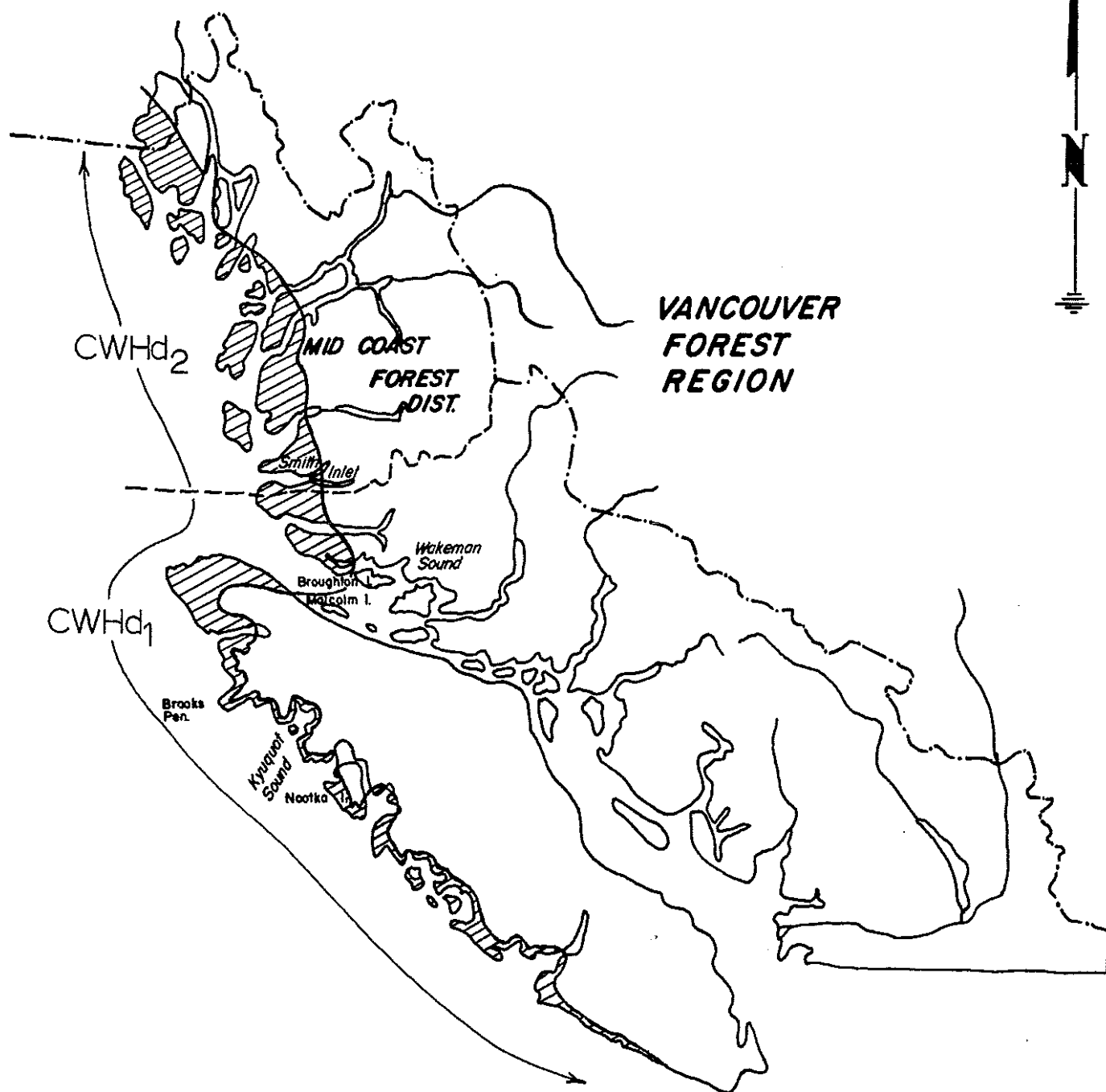


Figure 5: The Central (CWHd2) and Southern (CWHd1) Hypermaritime Coastal Western Hemlock Biogeoclimatic Subzone Variants.

- from Nuszdorfer et.al. 1985

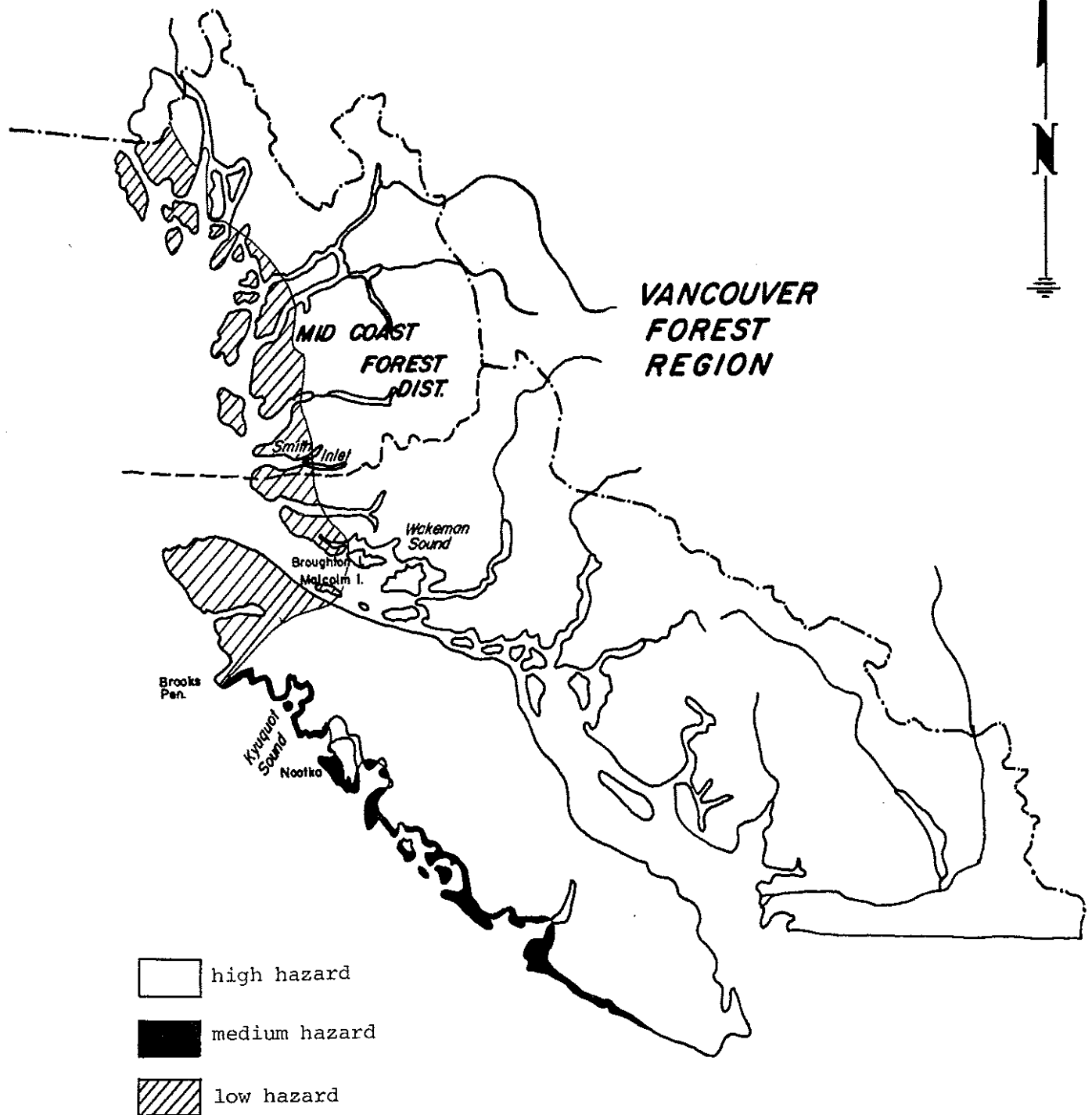


with the exception of Nootka Island and the Kyuquot Sound area on the west coast of Vancouver Island. High levels of infestation were found in these areas. Nuszdorfer's map showing Biogeoclimatic units of the Vancouver Forest Region (Nuszdorfer, et. al., 1985) shows, however, most of the area of high infestation on Nootka Island outside of CWHd1. This may account for the anomaly and also imply the need for continued work regarding hazard zones as initiated by McMullen.

From the results of this survey and the preceeding discussion, there appears to be evidence supporting the existance of hazard zones associated with Sitka spruce weevil. It appears that northern Vancouver Island and the northern coastal mainland are within an area of low hazard while the remaining portion of the Vancouver Region is within a high hazard zone. That portion of the CWHd1 on Vancouver Island south of Brooks Peninsula may be viewed as an area of medium hazard due to the uncertainties associated with weevil attack on Nootka Island and the Kyuquot Sound area (Figure 6). Problems assessing weevil hazard in this area have also been compounded by the fact that most of the Sitka spruce plantations here have been treated for weevil attack in an operational control trial.

In assessing the acceptability of Sitka spruce as a species suitable for regeneration in the Vancouver Forest Region, it is apparent that the crop reliability of Sitka spruce will be substantially reduced if established within an area of high risk of weevil damage. Infestation levels within high risk areas often become severe enough to reduce stocking levels to 'not satisfactorily restocked' (NSR). Alternative tree species do exist for these areas. Although they may not be as productive as unweevilled Sitka spruce, the alternatives will provide a sufficient harvest at rotation. (Klinka et. al. 1985).

Figure 6: Speculated hazard zones for Sitka spruce weevil in the Vancouver Forest Region.



The area within the southern portion of CWHd1, from Brooks Peninsula south, which may be considered to have a moderate risk of weevil attack, contains the best growing sites (benchmark) for Sitka spruce in the Vancouver Forest Region.¹ Sitka spruce is also the most productive tree species in the area. Because of these facts, it is difficult and probably unwise to completely restrict the planting of Sitka spruce within this area. It may be acceptable to plant Sitka spruce as a minor component (less than 20 percent) providing that the target stocking of acceptable alternative species is maintained. The denser stocking may help reduce heavy branching on weevilled spruce, thereby allowing adjacent trees to more easily overtop and suppress the damaged tree¹. It may also force the apical dominance of one leader in weevil damaged spruce, thereby enhancing the chance of recovery. These effects, however, may not come into account until the stand reaches crown closure.

¹ F.C. Nuszdorfer. 1984. Research Forest Ecologist. Ministry of Forests, Vancouver Forest Region. personal communication.

CONCLUSIONS AND RECOMMENDATIONS

The Sitka spruce weevil poses a serious plantation pest problem for Sitka spruce management in the Vancouver Forest Region. Most Sitka spruce plantations established since 1965 are either infested or threatened with damage from this insect pest. Many are damaged to the point of being not satisfactorily restocked (NSR) with others rapidly approaching this condition.

Not only is the management of existing plantations being affected but also, the threat of weevil attack is affecting the establishment of future plantations of Sitka spruce, which is often the most productive tree species in many of these areas. In response to these concerns, the following recommendations are presented.

Recommendations

1. Sitka spruce can be planted within the low weevil hazard area as presented in Figure 6 of this report in accordance with the guidelines, "Site Diagnosis, Tree Species Selection and Slashburning Guidelines for the Vancouver Forest Region, B.C.", Klinka et al. 1985.
2. Due to the inadequacy of present weevil control techniques, it is recommended that Sitka spruce not be planted within the high hazard zone shown in Figure 6 of this report. The exception being that portion of the Southern Hypermaritime Coastal Western Hemlock Biogeoclimatic Subzone Variant (CWHd₇) south of Brooks Peninsula on Vancouver Island, which may be considered to have a moderate risk of weevil damage.
3. Within that portion of the CWHd₁ considered to have a moderate risk of weevil damage, it is recommended that the planting of Sitka spruce remain optional. It may be acceptable to plant

Sitka spruce as a minor species, comprising not more than 20 percent of the stand composition, providing that target stocking levels of acceptable alternative species are maintained.

4. The problems posed by the weevil in established plantations still remain. A recommended report entitled, "Interim Guidelines for the Management of Sitka Spruce Weevil in the Vancouver Forest Region", Forest Service Internal Report PM-V-4, was developed to help deal with the weevil problem and is available from the Vancouver Regional Office in Burnaby.
5. It is recommended that all Sitka spruce plantations over five years of age within the Mid Coast T.S.A. and all Vancouver Forest Region T.F.L.s be surveyed for Sitka spruce weevil. The additional data from these surveys would be of great benefit towards the further development of weevil hazard zones.
6. Additionally, it is recommended that all young Sitka spruce plantations in Vancouver Region T.S.A.s not previously surveyed, be surveyed for weevil after attaining five years of age (many plantations were too young to be surveyed during the 1982-83 surveys).
7. It is recommended that research be undertaken to more accurately define weevil hazards. Specifically, work initiated by McMullen (1976) should be continued to measure summer heat accumulation in various spruce plantations throughout the Vancouver Forest Region. In conjunction, site/stand characteristics and other biological factors which could be associated with weevil hazards should also be examined.

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Appendix: Sitka Spruce Weevil Survey Data

Location and Map Notation	Age (Year) as of Date of Last Survey	Area (ha)	Percent Stems Infected			
			1980	1981	1982	1983
<u>Kingcome TSA</u>						
<u>San Josef River</u>						
102I070-002	6	5	0.0	0.0	0.0	---
-003	6	7	---	0.0	0.5	---
-007	12	24	---	0.5	0.5	---
-010	10	49	---	0.2	0.2	---
-011	12	8	---	0.0	0.2	---
-012	12	12	---	0.5	0.5	---
-012	8	26	---	0.5	0.7	---
-013	12	124	---	0.0	0.4	---
-015	14	122	---	1.3	1.3	---
-016	12	18	0.0	0.0	0.0	---
-017	12	43	0.0	0.0	0.0	---
-017	11	6	0.0	0.0	0.0	---
-018	11	94	---	0.1	1.4	---
-020	12	12	---	0.0	0.9	---
-021	8	19	---	0.0	0.3	---
102I069-003	5	6	0.0	0.0	0.0	0.0
102I079-001	5	7	0.0	0.0	0.0	0.0
-002	5	19	0.0	0.0	0.0	0.0
<u>Strandby River</u>						
102I080-001	8	60	0.0	0.0	0.0	---
-002	5	37	0.0	0.0	0.0	0.1
-003	10	73	0.0	0.0	0.0	---
-004	5	9	0.0	0.0	0.0	0.0

Location and Map Notation	Age (Year) as of Date of Last Survey	Area (ha)	Percent Stems Infected			
			1980	1981	1982	1983
<u>Nahwitti River</u>						
102I090-001	15	11	0.0	0.0	0.0	---
-002	15	11	0.0	0.0	0.0	---
<u>Nahwitti Lake</u>						
92L062-009	10	8	0.0	0.0	0.2	---
-011	10	15	0.4	0.4	0.6	---
-013	16	7	2.8	3.0	2.8	---
<u>Coal Harbour</u>						
92L053-003	11	31	---	1.5	1.8	---
-004	11	4	---	---	3.3	---
-005	11	21	---	---	1.3	---
<u>Buck Creek</u>						
92L031-004	5	25	0.0	0.0	0.0	0.0
92L032-004	5	19	0.0	0.0	0.0	0.0
-007	5	15	0.0	0.0	0.0	0.0
<u>Malcolm Island</u>						
92L066-019	8	28	0.0	0.0	0.2	---
-032	10	11	0.0	0.0	0.0	---
-033	17	30	0.0	0.4	0.8	---
-037	10	44	---	0.9	0.6	---
-039	18	32	0.2	0.2	0.3	---
-050	10	22	0.0	0.0	0.0	---
<u>Pack Lake</u>						
92M013-001	9	71	0.0	0.0	0.0	0.0
-002	12	44	---	---	2.5	2.5

Location and Map Notation	Age (Year) as of Date of Last Survey	Area (ha)	Percent Stems Infected			
			1980	1981	1982	1983
<u>Seymour River</u>						
92M027-003	6	14.5	---	---	0.0	1.0
-005A	6	5	0.0	0.0	0.0	0.0
-005B	6	8.5	---	---	0.0	0.0
-010	6	2	0.0	0.0	0.0	0.0
-013	6	23.5	---	---	0.1	0.0
<u>Warner Bay</u>						
92M005-006	7	10	0.0	0.0	0.0	0.0
<u>MacKenzie Sound</u>						
92L097-006	18	12	---	---	2.8	2.8
<u>Wakeman River</u>						
92M028-003	8	15	---	---	3.0	8.2
-012	9	68	---	---	1.0	5.9
-014	10	12	---	---	26.8	48.5
-015	10	11	(10% Ss, 80% of these were weevilled)			
<u>Shoal Harbour</u>						
92L078-022	9	19	0.0	0.0	0.0	---
-029	14	57	---	0.1	0.1	---
-039	12	7	0.0	0.0	0.5	---
-045	12	43	---	0.4	1.2	---

Location and Map Notation	Age (Year) as of Date of Last Survey	Area (ha)	Percent Stems Infected			
			1980	1981	1982	1983
<u>Kingcome River</u>						
92M010-009	7	4	---	---	4.0	42.0
92M020-004	7	4	---	---	2.2	2.2
92L100-001	9	15	---	---	---	some ¹
-002	9	16	---	---	---	some ¹
<u>Atlatzi River</u>						
92M010-012	14	2.5	0.0	0.0	0.0	0.0
-016	10	33	---	---	11.0	24.1
-017	9	4	0.0	0.0	0.0	0.0
-019	10	7	---	---	3.4	9.3
-020	10	22	---	---	1.7	2.9
-023	10	34	---	---	9.1	19.2
92N001-001	5	37	0.0	0.0	0.0	some ²
-003	5	17	0.0	0.0	0.0	some ²
<u>Clear Creek</u>						
92M009-017	10	28	---	---	6.1	27.3
-018	10	37	---	---	2.6	18.8
92M010-002	10	19	---	---	0.5	10.1
<u>Meers Creek</u>						
92M010-030	10	16	---	---	1.4	3.6
-034	9	8	0.0	0.0	0.0	2.7

¹ Unknown % - not surveyed - brush. However, a few attacked trees were observed.

² No attacked trees tallied in the survey, but a few were observed within the plantation.

Location and Map Notation	Age (Year) as of Date of Last Survey	Area (ha)	Percent Stems Infected			
			1980	1981	1982	1983
<u>Stasalla River</u>						
92M020-015	5	48	0.0	0.0	0.0	0.0
<u>Ahnuhati River</u>						
92K082-006	6	15	0.0	0.0	0.0	0.0
<u>Thompson Snd</u>						
92K081-020	8	10	0.0	0.0	0.0	0.3
-024	6	18	0.0	0.0	0.0	0.0
-031	6	8	0.0	0.0	0.0	0.0
<u>Knight Inlet</u>						
92N012-001	5	66.5	0.0	0.0	0.0	3.5
-004	5	19	0.0	0.0	0.0	1.8
-005	5	12	0.0	0.0	0.0	0.5
-006	6	49	0.0	0.0	0.1	0.6
-009	7	31	---	---	0.6	3.8
-009	7	23	0.0	0.0	0.3	2.6
92N013-004	11	27	(10% Ss - 90% of these were weevilled)			
92N022-012	5	26	0.0	0.0	0.0	2.1
<u>Kakweikan River</u>						
92K081-010	7	4	0.0	0.0	0.0	0.0
-018	8	18	0.0	0.0	0.0	0.1
-023	6	14	0.0	0.0	0.0	0.0
-029	6	8	0.0	0.0	0.0	0.0

Location and Map Notation	Age (Year) as of Date of Last Survey	Area (ha)	Percent Stems Infected			
			1980	1981	1982	1983
<u>Nootka TSA</u>						
<u>Tashish River</u>						
92L015-020	16	16	---	17.0	17.0	---
-022	9	48	---	27.0	60.0	---
-029	16	28	---	43.0	37.0	---
92L025-008	9	16	---	3.9	12.4	---
-009	9	5	---	4.9	13.1	---
<u>Kauwinch River</u>						
TL 9564, #94	14	14	9.0	9.0	25.0	---
#62	14	11	7.0	4.0	5.7	---
TL 9595, #1	12	32	---	21.0	7.1	---
#2(a)	12	21	2.0	1.0	2.0	---
#2(b)	12	7	6.1	5.0	24.3	---
TL 9604, #12(a)	14	23	---	2.0	0.0	---
#12(b)	14	10	---	0.0	1.2	---
#13(a)	11	23	---	11.0	20.0	---
#13(b)	11	19	---	3.5	3.5	---
#14(a)	11	18	---	6.0	6.4	---
#14(b)	11	67	1	---	2.0	---
#14(c)	11	26	---	7.0	2.5	---
TL 9605, #4	14	32	---	16.0	30.0	---
#5	11	34	---	21.0	24.0	---
#6(a)	12	24	---	0.0	1.8	---
#6(c)	12	12	---	3.0	3.0	---
#7	14	46	---	13.0	22.0	---
#8	14	39	---	18.0	24.0	---
#9(a)	12	42	---	1.0	2.3	---
#9(b)	11	15	0	0.0	0.0	---

Location and Map Notation	Age (Year) as of Date of Last Survey	Area (ha)	Percent Stems Infected			
			1980	1981	1982	1983
<u>Port Eliza</u>						
92E085-005	8	3	---	0.5	0.5	---
92E085-009,017	5	83	0.0	0.0	0.0	---
<u>Oktwanch River</u>						
92E099-009	12	21	---	3.0	0.0	---
-010	12	37	---	2.0	0.0	---
-011	12	57	---	0.0	0.0	---
-012	12	20	---	0.0	0.0	---
-013	12	26	1.0	1.0	1.0	---
92E100-018	12	24	---	---	67.0	---
<u>Kaouk River</u>						
92L005-028, 029	11	23	---	---	4.0	---
-032, 044	11	29	---	---	18.0	---
-033, 035 036, 037	14	25	---	---	0.1	---
-041	18	19	---	---	38.0	---
-045	15	29	---	---	33.0	---
-046	20	29	---	---	30.0	---
<u>Stewardson Inlet</u>						
92E049-003	8	40	---	4.0	1.9	---
-005	8	38	---	4.0	3.7	---
-010	8	17	---	0.0	13.0	---
-011	8	7	---	4.0	2.0	---
-012	8	15	---	2.0	0.0	---
<u>Toquart Bay</u>						
92F004-011	5	28	---	2.0	0.0	---
-012	8	50	---	1.3	0.4	---
<u>Sombrio Creek</u>						
92C059-012, 015	8	92	---	---	1.1	---

Location and Map Notation	Age (Year) as of Date of Last Survey	Area (ha)	Percent Stems Infected			
			1980	1981	1982	1983
<u>Quadra TSA</u>						
<u>Clowhom River</u>						
92G13A-15-2	8	27.0	---	0.8	0.4	---
-15-5	8	2.5	0.0	0.0	0.0	---
92G14D-18-1	9	35.5	---	3.3	5.4	---
-18-3	8	2.5	---	6.1	6.9	---
-18-5	8	16.0	---	0.7	0.0	---
-18-9	8	12.5	---	2.3	5.5	---
-18-12	5	6.0	---	0.0	0.3	---
-18-14	6	15.5	---	0.2	1.2	---
<u>Homathko River</u>						
92N003-001	11	12.5	1.8	2.4	7.2	---
<u>Southgate River</u>						
92K015-003-L	6	7.8	---	2.4	9.6	---
<u>Eldred River</u>						
92K029	15	36.7	0.0	0.0	0.0	---

6 plantations (40 ha) in the Skwawka/Hunaech area were not surveyed --- no access, road washout.

Location and Map Notation	Age (Year) as of Date of Last Survey	Area (ha)	Percent Stems Infected			
			1980	1981	1982	1983
<u>Fraser TSA</u>						
<u>Twin Lakes</u>						
92G039-017	15	7.3	---	1.0	3.2	---
-020	8	10.0	---	0.0	0.1	---

8 plantations in the Fraser TSA remain unsurveyed.

- preliminary assessments found weevil infestation in only one small plantation at the south end of Harrison Lake.
- weevil infestation was also found in a natural stand of Ss in the upper Pitt River Valley.

Location and Map Notation	Age (Year) as of Date of Last Survey	Area (ha)	Percent Stems Infected			
			1980	1981	1982	1983
<u>Soo TSA</u>						

Sitka spruce plantations in Tree Farm Licence #38 only.

- not surveyed, however, weevil infestations have been reported in the area.