FIDS Report 94-11

FOREST INSECT AND DISEASE SURVEY

PEST REPORT ON SPECIAL PROJECTS

QUEEN CHARLOTTE ISLANDS

1993

Prepared for:
South Moresby Forest Replacement Account (SMFRA)

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INTRODUCTION

As part of a continuing Memorandum of Understanding (MOU) between the Ministry of Forests (MOF) and Canadian Forest Service (CFS)-Natural Resources Canada (NRCan), several long term projects, initiated under the agreement in 1991, continued in 1993. The results from the 1991 assessments are available from the FIDS Report 92-11, while the 1992 results are reported in FIDS Report 93-8. The main focus in 1993 was again on Project 13.3 "Alternative Silviculture Systems for Environmentally Sensitive Sites on Steep Slopes:-Operational Trial." The FIDS (Forest Insect and Disease Survey) objectives in this project were: 1. to get an overview of forest health conditions at the two project sites prior to disturbance, 2. to establish a network of permanent plots and gather baseline health conditions of trees within those plots, and 3. to monitor and evaluate both short term and long term health effects on plot trees relating to various harvesting regimes. Initially (1991) the assessment of the trial locations consisted of a general pest survey of the Gregory Creek and Hangover Creek sites. In 1992, after completion of the demonstration trails and the 250 reference control points at each site, 10 permanents plots were established at each location to monitor the long term effects of various harvesting methods on forest health. The plot system was designed along the permanent trail system for incorporation in any future demonstration plans through the life of the project (Appendix A). Trees and regeneration were assessed for pests and mapped for retrieval after harvest (Appendix B). The 1993 activities were directed at re-establishing the plots after harvest and assessment of post harvest plot conditions.

Other projects including PSS (permanent sampling station) sampling, western blackheaded budworm damage appraisal work and monitoring of spruce aphid plots were also continued and are also mentioned in this report but are mostly detailed in the FIDS Report 94-6. Results of 1993 field surveys are discussed and proposed 1994 follow-up surveys mentioned. All projects were incremental to information normally collected by FIDS during regular surveys on the Queen Charlotte Islands.

PROJECT 13.3:

Locations: Area #1 - Gregory Creek in Rennell Sound (QCI).
Area #2 - Hangover Creek in Rennell Sound (QCI).

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SUMMARY

Of the 20 plots established in 1992, 19 were found and plot centres tagged in 1993. A total of 56% of trees were felled and at most plots most trees or stumps were found and tagged. Regeneration was assessed and approximately 54% was lost to logging. One hundred fourteen recently planted seedlings were located in the plots. One was dead; all were mapped.

At the PSS's, few larvae were collected; at the blackheaded budworm plot increment cores showed growth reductions during the infestation period. At the three sites assessing affects of spruce aphid attack, continued damage was evident but 1993 feeding activity was reduced.

Projects proposed for the 1994 survey period under the SMFRA banner are listed.

METHOD

At both Gregory and Hangover creeks, 10-100 m^2 circular plots were established a minimum of 100 m apart, to develop long term pest assessment study plots in this alternate harvesting methods trial project. Plots were located in all treatment types. At Gregory Creek Trail A, plot 1 and 2 were located in the single tree selection treatment, 3, 4 and 5 in the patch clearcut (25%) treatment. At Trail B, plot 6, 7 and 8 were in treatment #3, patch clearcut (50%), and plot 9 and 10 were located in the clearcut treatment area. At Hangover Creek, plot 1, 2 and 3 were in the single tree selection treatment, plot 4 and 5 in the patch clearcut (25%), plot 6 and 7 in the clearcut, plot 8 and 9 in the patch clearcut (50%) and plot 10 in the control area (Appendix A). All trees and regeneration over 0.5 m in the plots were assessed in the summer of 1992, prior to harvest, to determine baseline conditions for plot areas with which post harvest and longer term effects could be compared. The demonstration trails along which the plots were to be located were in place and 250 permanent reference points per site had been established and flagged. The trails and reference points were used as a guide for locating plot centers. Proximity to the demonstration trails was considered an essential element so that these plots could be incorporated into future demonstration projects.

After harvest, the trails had been re-established at or near their original line. Unfortunately, minor changes in trail locations at some points affected some plots which had been established at mileage posts on the original trail. Plot centres were however located. The permanent reference markers were also relocated after harvest and these were most commonly used as plot centres. All plot centers once relocated were marked with aluminum stakes and yellow numbered tags. Using the 1992 plot maps, plot trees (or in many cases stumps) were tagged with blue numbered tags and regeneration (over 0.5 m in height) was relocated and its presence or absence noted. Cedar and spruce seedlings were planted after harvest and, where they occurred in the plots, they were added to the plot maps (Appendix B).

Assessments in the plots consisted mainly of determining effects of logging such as scarring, blowdown resulting from opening of the stands, determining survival and condition of regeneration and condition of recently planted seedlings. As disease conditions were unlikely to change over a single season, a detailed survey of this element was not conducted.

RESULTS AND DISCUSSION

Of the total of 122 plot trees in the 20 plots established, 54 trees remained standing and healthy, 62 trees were harvested or at least felled, two standing trees were damaged by harvesting, one of which died, and six trees were windthrown, presumably after harvest (table). The regeneration was also affected by the harvest. Some were cut by fallers, some smashed under felled trees and many buried under the heavy slash which predominated all active areas. Overall, approximately 54% of regen. (over 0.5 m tall) was lost due to logging. This loss average includes a control plot as well as three other plots in leave areas of patch clearcuts, all of which had 100% survival of regeneration. Percent losses in active areas within the two blocks was much higher. In six plots which were either in the clearcuts or in the active segments of the patch clearcuts, 100% of the regeneration was lost.

Table Locations and contents by treatment type of pest monitoring plots at Gregory and Hangover Creeks, QCI, Vancouver For. Reg. 1993.

Location/Plot		No. trees		No. regeneration		Seedlings planted		
Plot	Ref. loc.	before	after	before	after	spruce	cedar	Treatment
Gregory Creek								
1	180	3	1	8	4	3	5	Single tree
2	188	10	5	0	0	3	6	Single tree
3	0+533 m	9	0	5	0	0	2	Patch (25%)
4	113	8	3	22	0	2	6	Patch (25%)
5	104	10	10	10	10	3	6	Patch (25%)
6	0+182 m	4	0	2	0	-	-	Patch (50%)
7	0+314.8 m	12	12	10	10	-	-	Patch (50%)
8	74	7	0	12	0	-	-	Patch (50%)
9	37	7	0	27	?	?	?	Clearcut
10	48	12	0	0	0	2	5	Clearcut
Hangover Creek								
1	213	5	3	3	1	3	4	Single tree
2	230	4	3	5	3	3	5	Single tree
3	249	4	3	4	2	2	5	Single tree
4	0+528.9 m	3	3	2	1	-	-	Patch (25%)
5	181	3	3	9	6	3	5	Patch (25%)
6	134	3	0	1	1	3	6	Clearcut
7	132	1	0	6	0	3	6	Clearcut
8	85	8	3	15	7	3	5	Patch (50%)
9	89	4	0	19	19	3	6	Patch (50%)
10	35	5	5	18	18	3	3	Control
TOTALS		122	54	178	82	39	75	

As part of the long term plan, spruce and cedar seedlings were planted at predetermined locations and densities. A total of 114 seedlings were found in the plots of which one was dead, probably due to planting problems.

The primary immediate effect of harvesting was the loss overall of the majority of the regeneration. While some regeneration survived in some of the plots, where active logging occurred, in the six plots where no regeneration remained as many as 22 saplings were destroyed, indicating questionable value if this material were to be considered as host for the next rotation in these types of operations. Blowdown reduced the number of plot trees by six, averaging 10% of leave trees, and occurred in plot one and six at Gregory Creek in the single tree and 50% patch clearcut treatments respectively.

Conditions have changed throughout both sites. Blowdown may yet affect some plots in the near future. The increased light, heat and wind exposure could certainly affect especially regeneration and planted seedlings in various ways. The opening of the canopy and increased light may over the long term affect the development and spread of mistletoe in those areas where it occurs. Affects of harvesting on the activities of other pests are undetermined but should be monitored over time.

OTHER PROJECTS

Several other special projects were also assessed. The permanent sampling areas were sampled using the standard three-tree beating method (2.5 m pole over a 2x3 m sheet to dislodge defoliating insect larvae from branches of each of three trees). At Gregory Creek only one hemlock sawfly larva was found while at Hangover Creek six hemlock sawfly larvae were collected. These results were similar to 1992 and mirror the general findings throughout the district.

A third in a series of western blackheaded budworm damage appraisal surveys in young stands was conducted, this time near South Bay in plots established in 1985 by B.C. Forest Service. This is a continuing effort to assess growth and survival effects of the 1985-88 infestations. Cores from each of 10 trees at each of two sites were taken and later read into a digimic. Results clearly indicated a sharp reduction in growth increment during the infestation period. Report of this survey is detailed in the Queen Charlotte Islands section of the 1993 Vancouver Region report on "Forest Insect and Disease Conditions" (FIDS Report 94-6, Appendix C).

At the spruce aphid plots in the young stand at Heather Lake, trees were again assessed for aphid activity and loss of foliage and growth, while near Chinukundl Creek and at Gray Bay, 20 semi-mature trees were once again monitored for activity and damage. Aphid activity was much reduced in 1993 at all sites, but damage continued to be apparent. One tree at Gray Bay was killed by a combination of severe aphid feeding in 1992, followed by attack by the bark beetle, Dryocoetes affaber. Details on these surveys is also available in FIDS Report 94-6 (Appendix C).

PROPOSALS FOR 1994

1. A final annual survey of Gregory and Hangover creeks is proposed to locate the missing plot and to map any seedlings overlooked previously. In addition to this, all seedlings will be examined because of their sensitivity to environmental stresses at this early stage and also for certain specific seedling pests. All plots will also be assessed primarily for evidence of further blowdown which may have occurred over the winter of 1993/94. This could be followed by monitoring of these sites at less frequent intervals, possibly every five years.

2. The PSS's at the above locations will continue to be monitored annually and any dramatic increase in defoliator larval numbers will be used to signal surveys within the project plots even if unscheduled.

3. Survey of the spruce aphid plot at Heather Lake should continue, to identify attack levels and measure growth rates. This could continue for 1-2 more years to chart the recovery period should low aphid populations continue.

4. Semi-mature trees flagged and assessed at Gray Bay and Chinukundl Creek for the spruce aphid, should continue to be monitored to note recovery or further mortality.

5. Partial aerial surveys that were done in 1993 could be complemented in 1994 by a survey of those areas not examined. The opportunity to examine any special areas of concern or to increase surveys if early results indicate this, might be considered.

REFERENCES

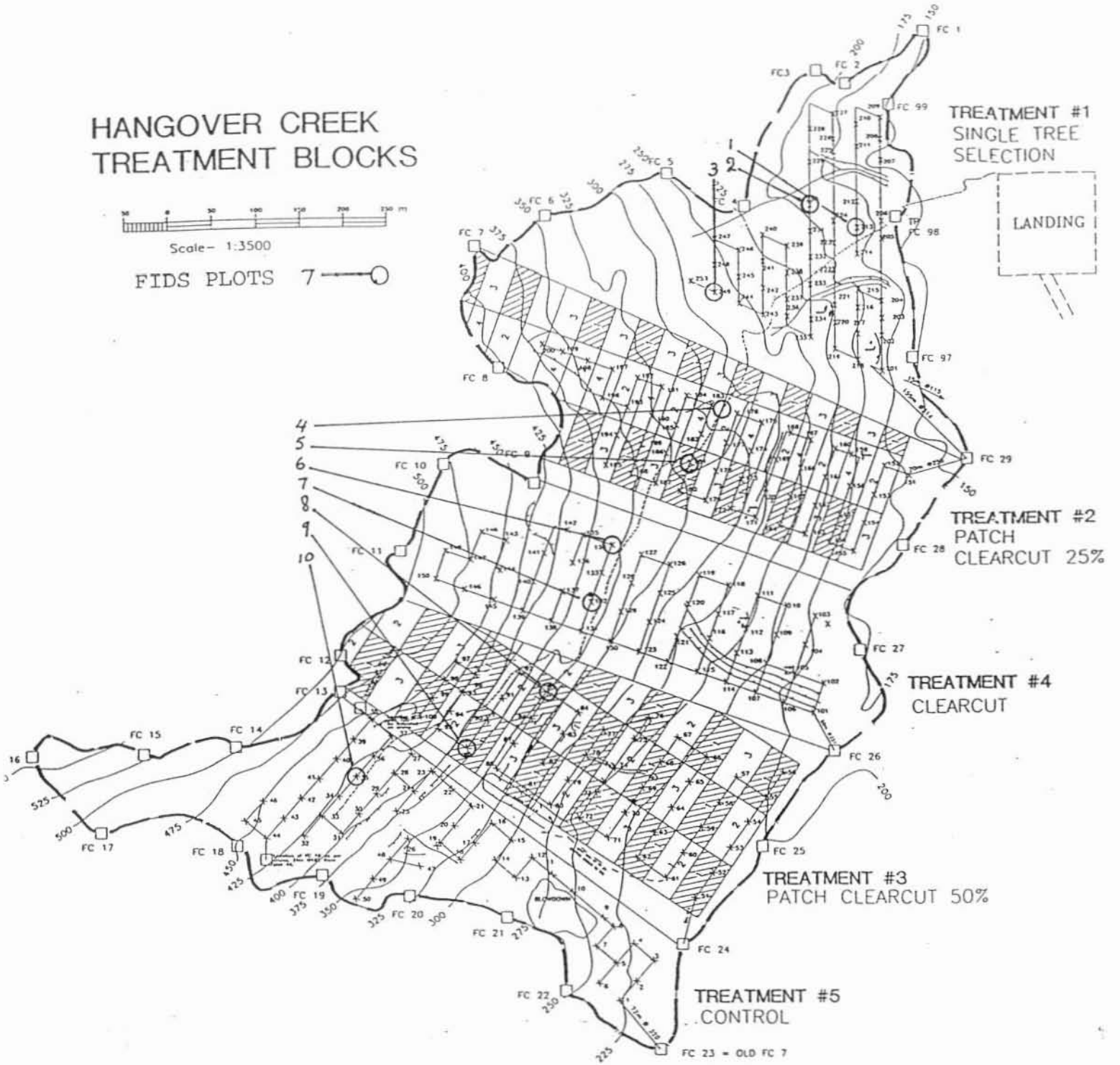
Pendl F.T.; D'Anjou B.N. 1991. Alternative Silvicultural Systems for Environmentally Sensitive Sites on Steep Slopes:- Operational Trial. Forest Sciences Section, Vancouver Forest Region - Working Plan. Project 13.3. 22p.

Vallentgoed J. 1992. Forest Insect and Disease Survey Pest Report on Special Projects, Queen Charlotte Islands, 1991. FIDS Report 92-11. 9p.

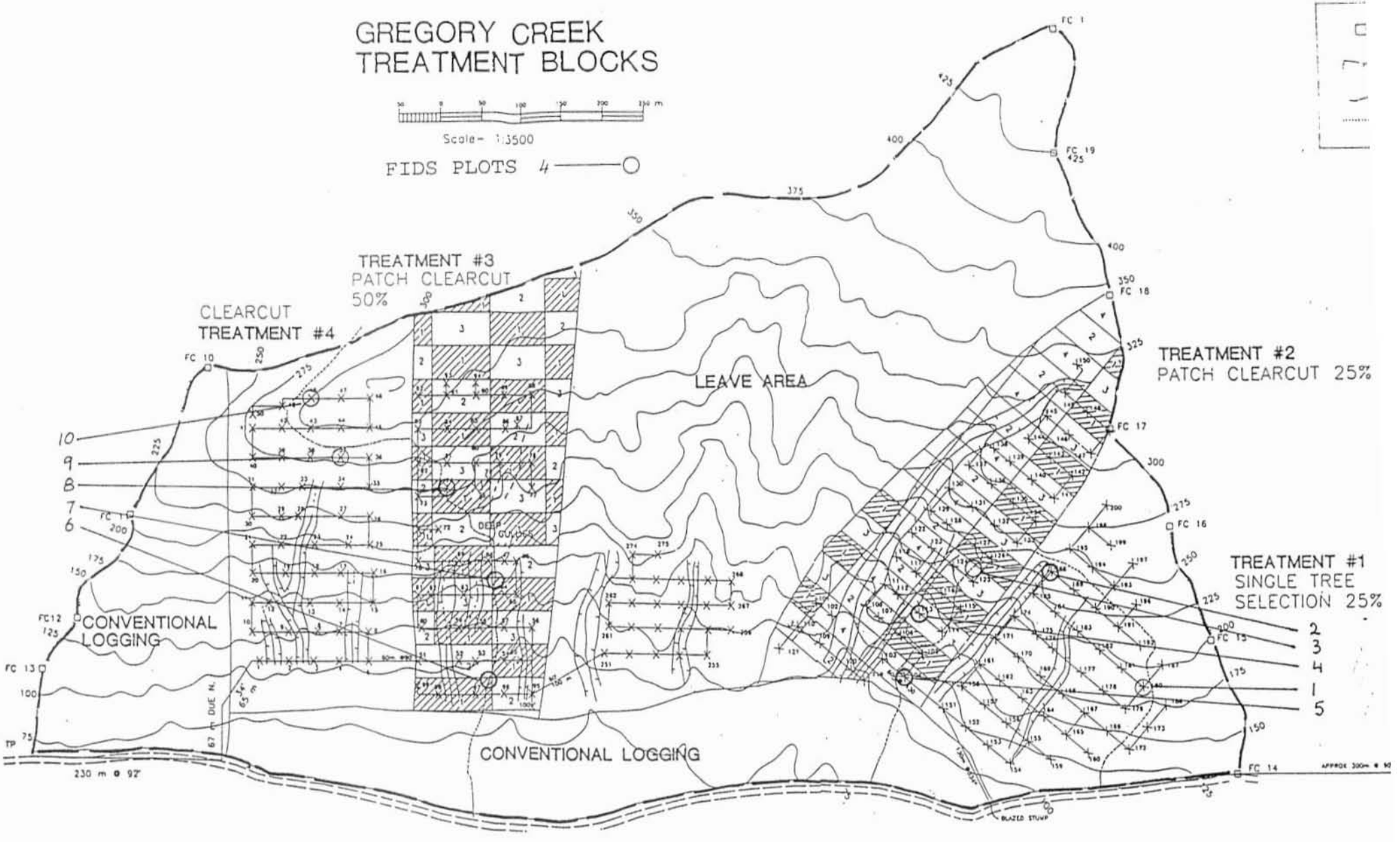
Vallentgoed J. 1993. Forest Insect and Disease Survey Pest Report on Special Projects, Queen Charlotte Islands. 1992. FIDS Report 93-8. 14p.

Turnquist R.; Wood C. 1993. Forest Insect and Disease Conditions - Vancouver Forest Region. FIDS Report 94-6. 48p.

Appendix A


HANGOVER CREEK
TREATMENT BLOCKS
Scale- 1:3500
FIDS PLOTS 7
TREATMENT #1
SINGLE TREE
SELECTION
LANDING
TREATMENT #2
PATCH
CLEARCUT 25%
TREATMENT #4
CLEARCUT
TREATMENT #3
PATCH CLEARCUT 50%
TREATMENT #5
CONTROL
FC 1
FC 2
FC3
FC 99
FC 98
FC 97
FC 29
FC 28
FC 27
FC 26
FC 25
FC 24
FC 23 = OLD FC 7
FC 22
FC 21
FC 20
FC 19
FC 18
FC 17
FC 15
FC 14
FC 13
FC 12
FC 11
FC 10
FC 9
FC 8
FC 7
FC 6
FC 5

GREGORY CREEK
TREATMENT BLOCKS

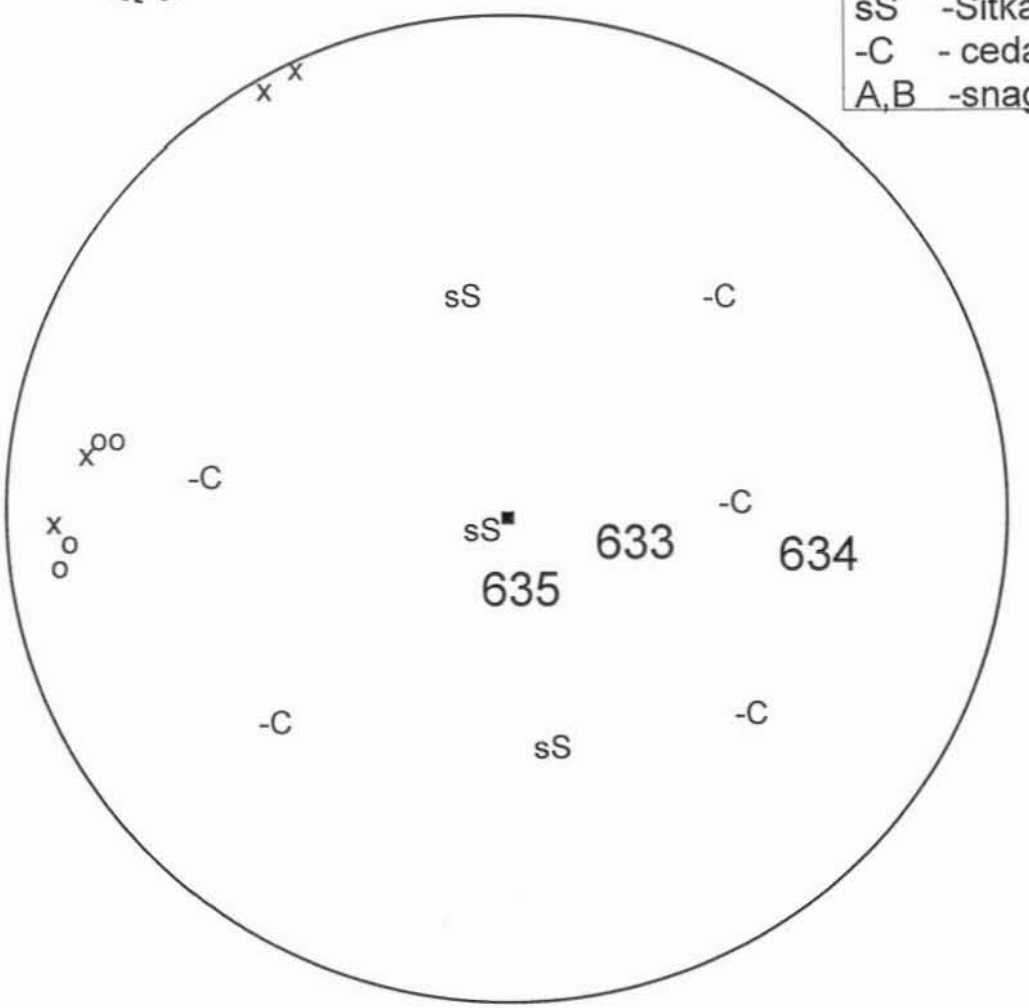


Appendix B
Gregory Creek - Demonstration Trail B
Plot 1

Canadian Forest Service

FOREST INSECT & DISEASE SURVEY

LEGEND
999 - tagged tree #
xx - natural regen.
oo - regen. destroyed
sS -Sitka spruce seedling
-C - cedar seedling
A,B -snags

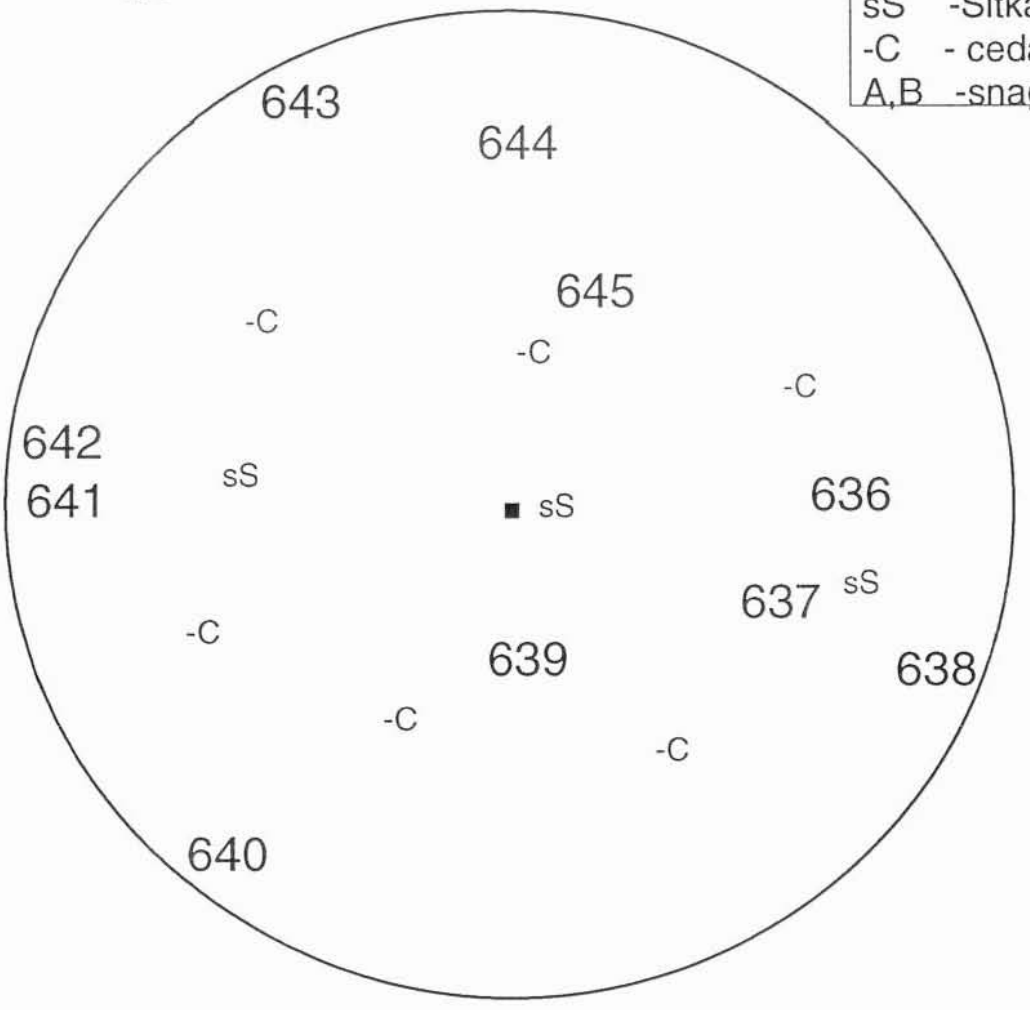


Original tree no.	New tree no.	Species	DBH	Status
1	633	wH	43	healthy, scar
2	634	wH	18	sweep, logged
3	635	wH	24	sweep, logged
xx		wH		majority under slash

Gregory Creek - Demonstration Trail B
Plot 2

Canadian Forest Service
FOREST INSECT & DISEASE SURVEY

LEGEND
999 - tagged tree #
xx - natural regen.
oo - regen. destroyed
sS -Sitka spruce seedling
-C - cedar seedling
A,B -snags



Original tree no.	New tree no.	Species	DBH	Status
1	636	wH	27	lean
2	637	wH	29	lean, logged
3	638	wH	25	logged
4	639	wH	35	
5	640	wH	34	logged
6	641	wH	12	
7	642	wH	12	healthy, dead standing
8	643	wH	32	logged
9	644	wH	41	logged
10	645	wH	28	

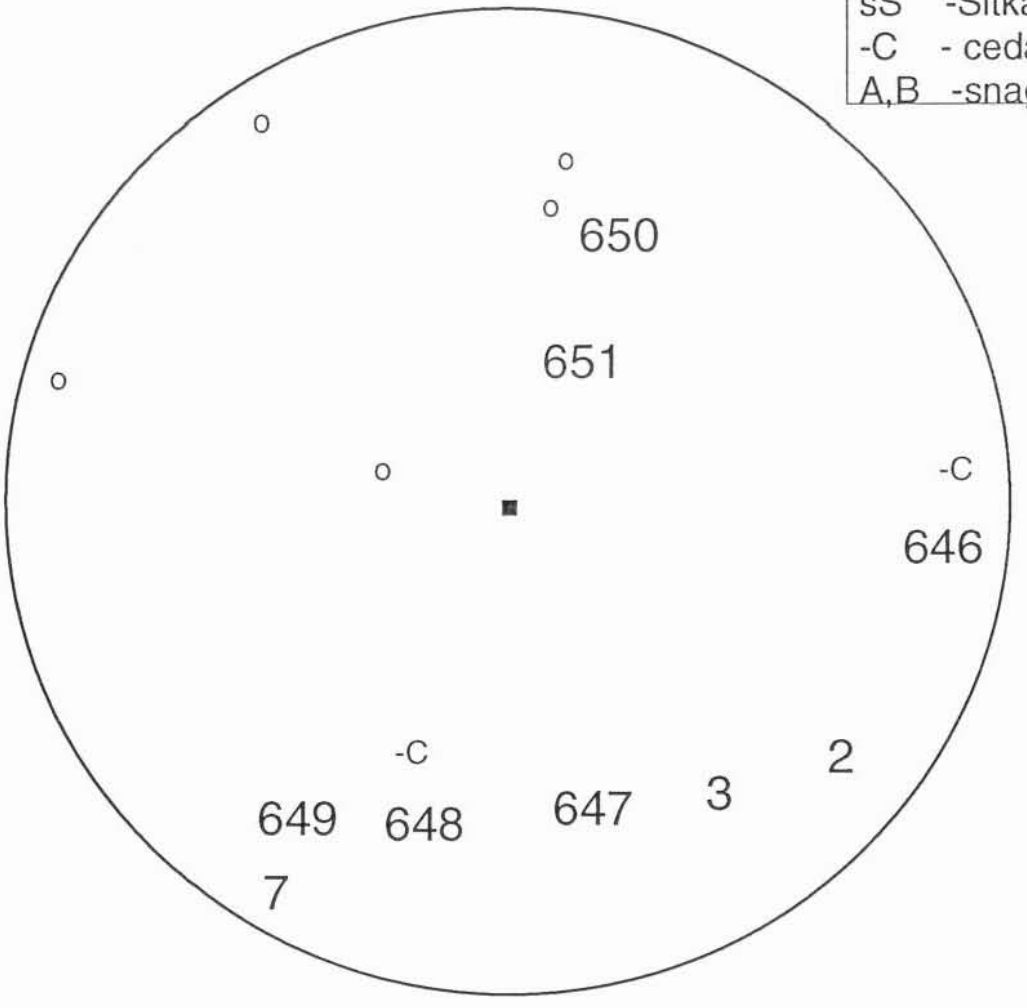
Gregory Creek - Demonstration Trail B

Plot 3

Canadian Forest Service

FOREST INSECT & DISEASE SURVEY

LEGEND
999 - tagged tree #
xx - natural regen.
oo - regen. destroyed
sS -Sitka spruce seedling
-C - cedar seedling
A,B -snags



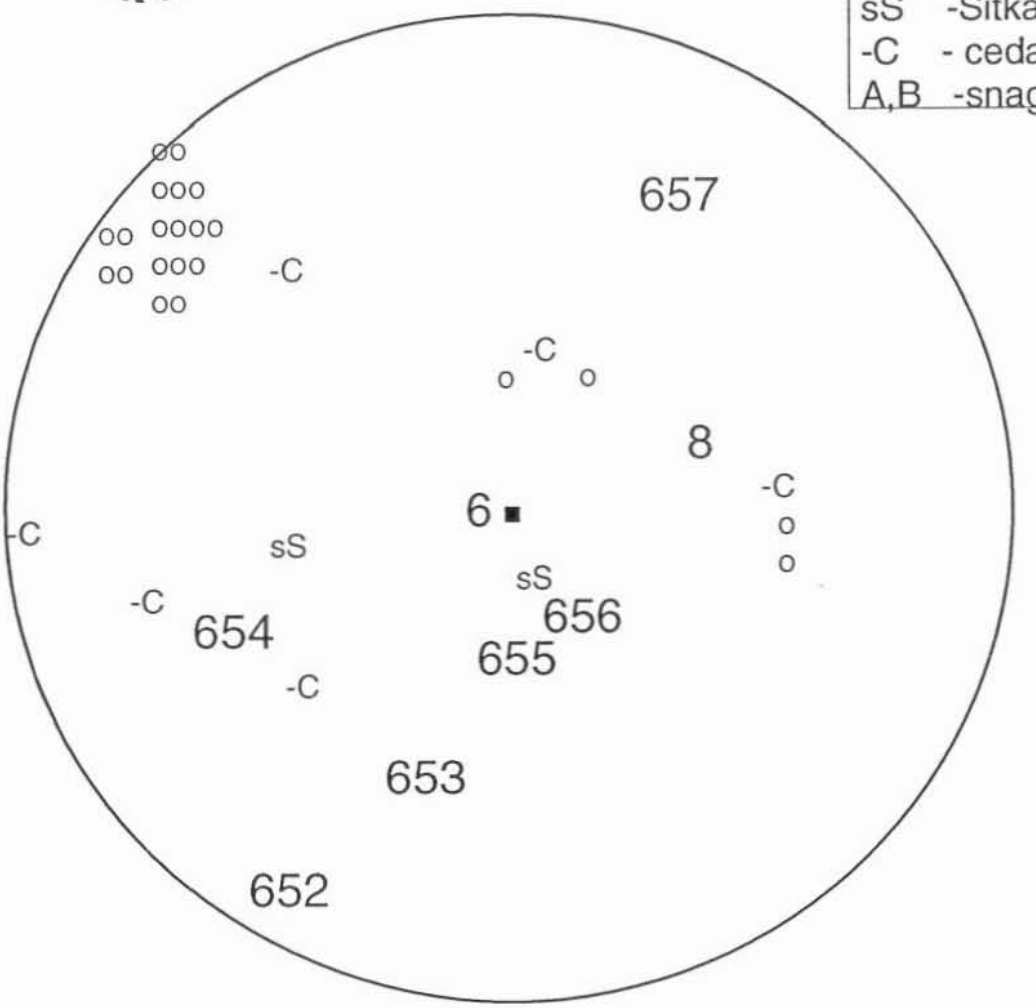
Original tree no.	New tree no.	Species	DBH	Status
1	646	wrC	96	fork, logged
2		wH	12	mistletoe (1), felled, not found
3		wH	9	felled, not found
4	647	wH	9	logged
5	648	wrC	143	dead top, logged
6	649	wH	7	sweep, logged
7		wH	11	felled, not found
8	650	wH	95	mistletoe suspect, logged
9	651	wH	11	mistletoe (1), logged
xx		wH		destroyed, under slash

Gregory Creek - Demonstration Trail B
Plot 4

Canadian Forest Service

FOREST INSECT & DISEASE SURVEY

LEGEND
999 - tagged tree #
xx - natural regen.
oo - regen. destroyed
sS -Sitka spruce seedling
-C - cedar seedling
A,B -snags



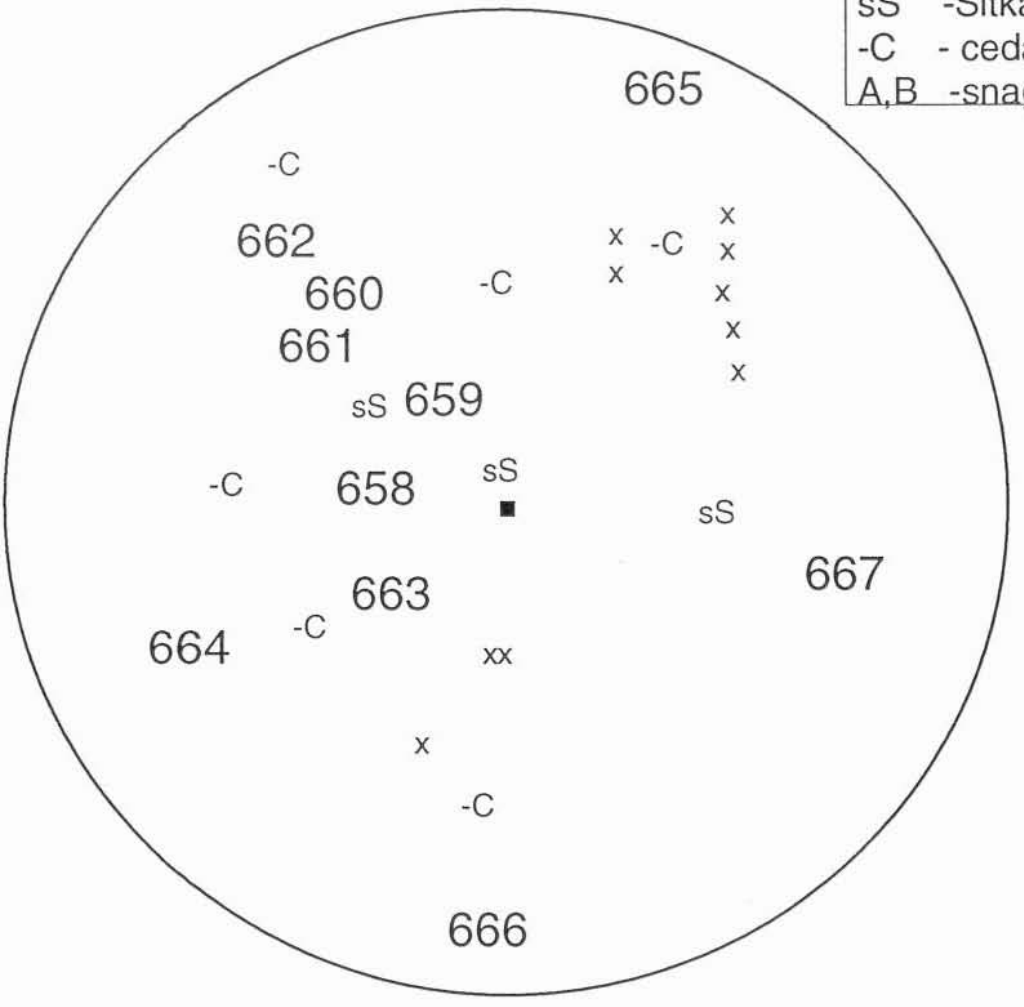
Original tree no.	New tree no.	Species	DBH	Status
1	652	wH	48	mistletoe (3)
2	653	wH	14	mistletoe (1)
3	654	wH	11	lean, mistletoe (2)
4	655	wH	13	mistletoe (2), logged
5	656	wH	15	mistletoe (2), logged
6		wH	11	mistl. (1), logged, not fnd
7	657	wrC	70	brk. top, logged
8		wH	6	mistl. (1), logged, not fnd
xx		wH		destroyed, heavy slash

Gregory Creek - Demonstration Trail B
Plot 5

Canadian Forest Service

FOREST INSECT & DISEASE SURVEY

LEGEND
999 - tagged tree #
xx - natural regen.
oo - regen. destroyed
sS -Sitka spruce seedling
-C - cedar seedling
A,B -snags



Original tree no.	New tree no.	Species	DBH	Status
1	658	wH	8	mistletoe (1)
2	659	wH	20	mistletoe (3)
3	660	wH	45	mistletoe (3)
4	661	wH	42	mistletoe (3)
5	662	wH	54	mistletoe (3), rec. dead
6	663	wH	77	mistletoe (2)
7	664	wH	15	
8	665	wH	26	mistletoe (1)
9	666	wH	120	mistletoe (3)
10	667	wH	16	mistletoe (1)
xx		wH		

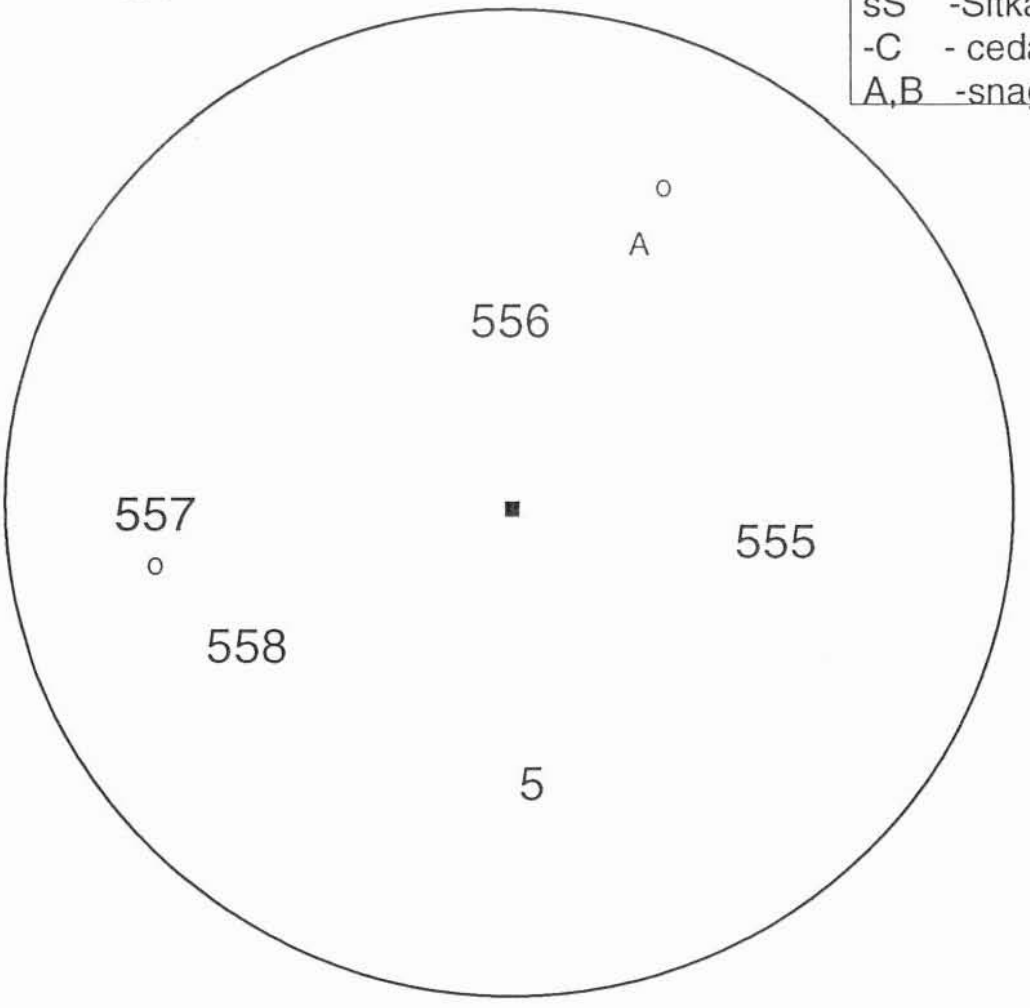
Gregory Creek - Demonstration Trail A

Plot 6

Canadian Forest Service

FOREST INSECT & DISEASE SURVEY

LEGEND	
999	- tagged tree #
xx	- natural regen.
oo	- regen. destroyed
sS	-Sitka spruce seedling
-C	- cedar seedling
A,B	-snags



Original tree no.	New tree no.	Species	DBH	Status
1	555	wH	96	mistletoe (1),windt.
2	556	wH	15	mistletoe (1), windt.
3	557	wH	49	mistletoe (1), windt.
4	558	wH	48	mistletoe (1), windt.
5		wH	17	buried under slash
A				snag, knocked down
xx		wH		under slash, not found

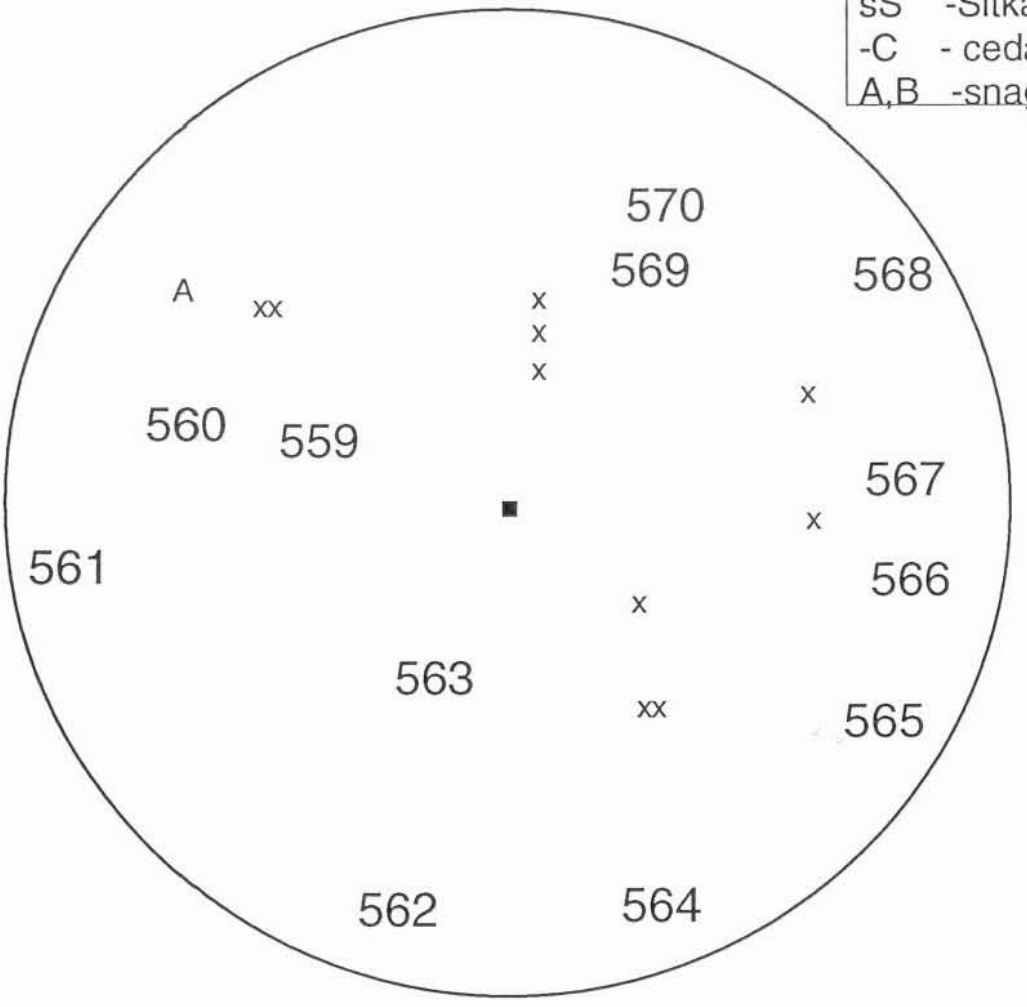
Gregory Creek - Demonstration Trail A

Plot 7

Canadian Forest Service

FOREST INSECT & DISEASE SURVEY

LEGEND
999 - tagged tree #
xx - natural regen.
oo - regen. destroyed
sS -Sitka spruce seedling
-C - cedar seedling
A,B -snags



Original tree no.	Neew tree no.	Species	DBH	Status
1	559	wH	27	mistletoe (3)
2	560	wH	16	mistletoe (1)
3	561	wH	14	mistletoe (1)
4	563	wH	12	healthy
5	562	wH	16	healthy
6	564	wH	11	healthy
7	565	wH	11	healthy
8	566	wH	12	mistletoe (1)
9	567	wH	23	mistletoe (2)
10	568	wH	13	mistletoe (1)
11	569	wH	14	mistletoe (2)
12	570	wH	20	mistletoe (2)
xxx		wH		

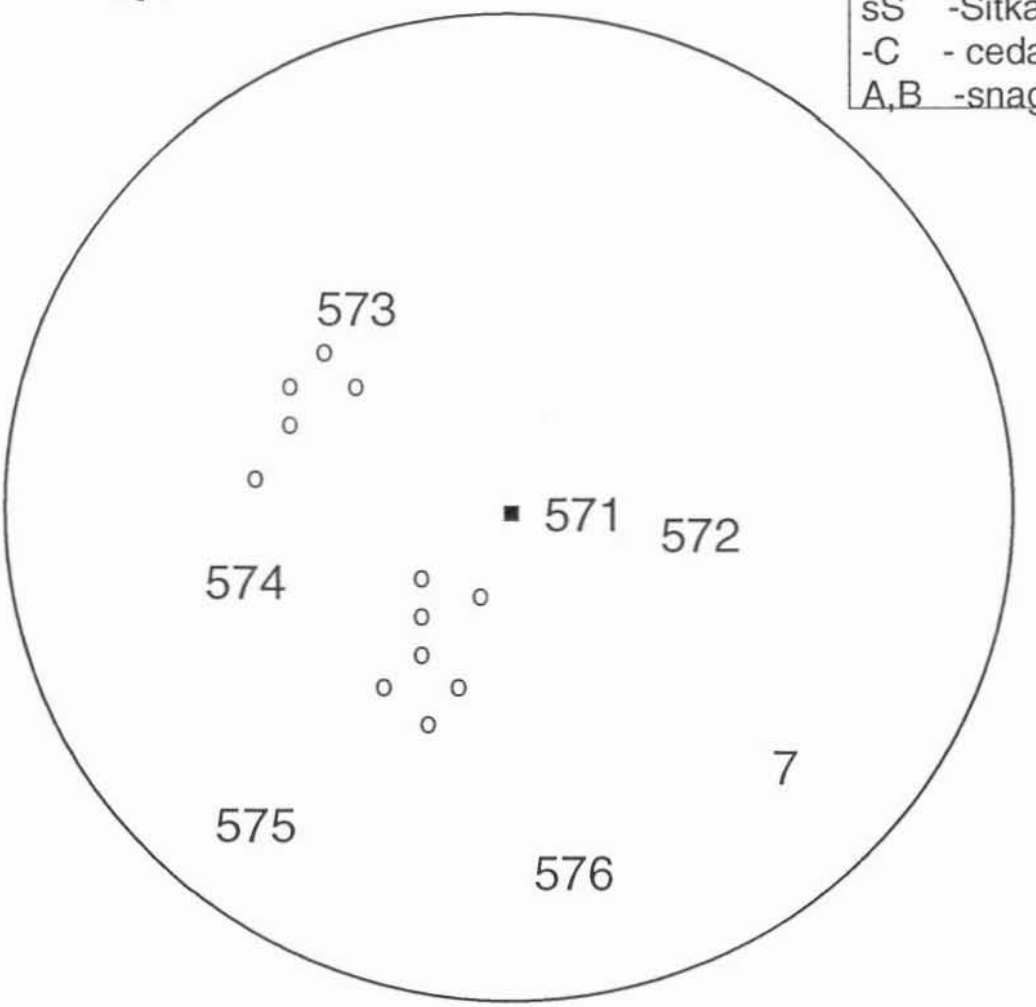
Gregory Creek - Demonstration Trail A

Plot 8

Canadian Forest Service

FOREST INSECT & DISEASE SURVEY

LEGEND
999 - tagged tree #
xx - natural regen.
oo - regen. destroyed
sS -Sitka spruce seedling
-C - cedar seedling
A,B -snags



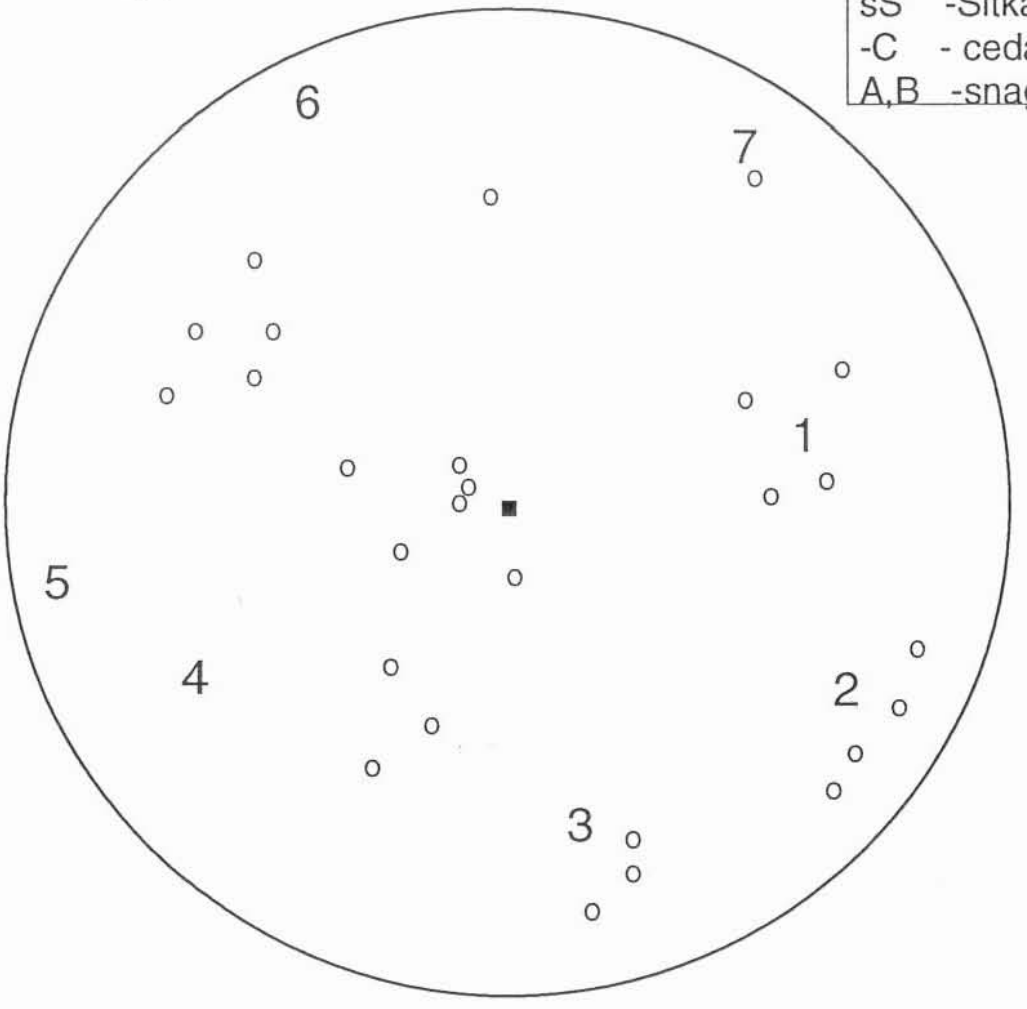
Original tree no.	New tree no.	Species	DBH	Status
1	571	wH	41	lean, logged
2	572	wH	120	dead top, logged
3	573	wH	20	logged
4	574	wH	37	lean, logged
5	575	wH	38	logged
6	576	wH	31	fork, logged
7		wH	14	crook, not found
xx		wH		destroyed, heavy slash

Gregory Creek - Demonstration Trail A
Plot 9 (plot not found)

Canadian Forest Service

FOREST INSECT & DISEASE SURVEY

LEGEND
999 - tagged tree #
xx - natural regen.
oo - regen. destroyed
sS -Sitka spruce seedling
-C - cedar seedling
A,B -snags



Original tree no.	New tree no.	Species	DBH	Status
1	plot not found	wH	10	crook, logged
2	plot not found	wH	17	crook, logged
3	plot not found	wH	23	sweep, logged
4	plot not found	wH	42	logged
5	plot not found	wH	24	crook, logged
6	plot not found	wH	59	lean, logged
7	plot not found	wH	43	logged
xx		wH		destroyed, under slash

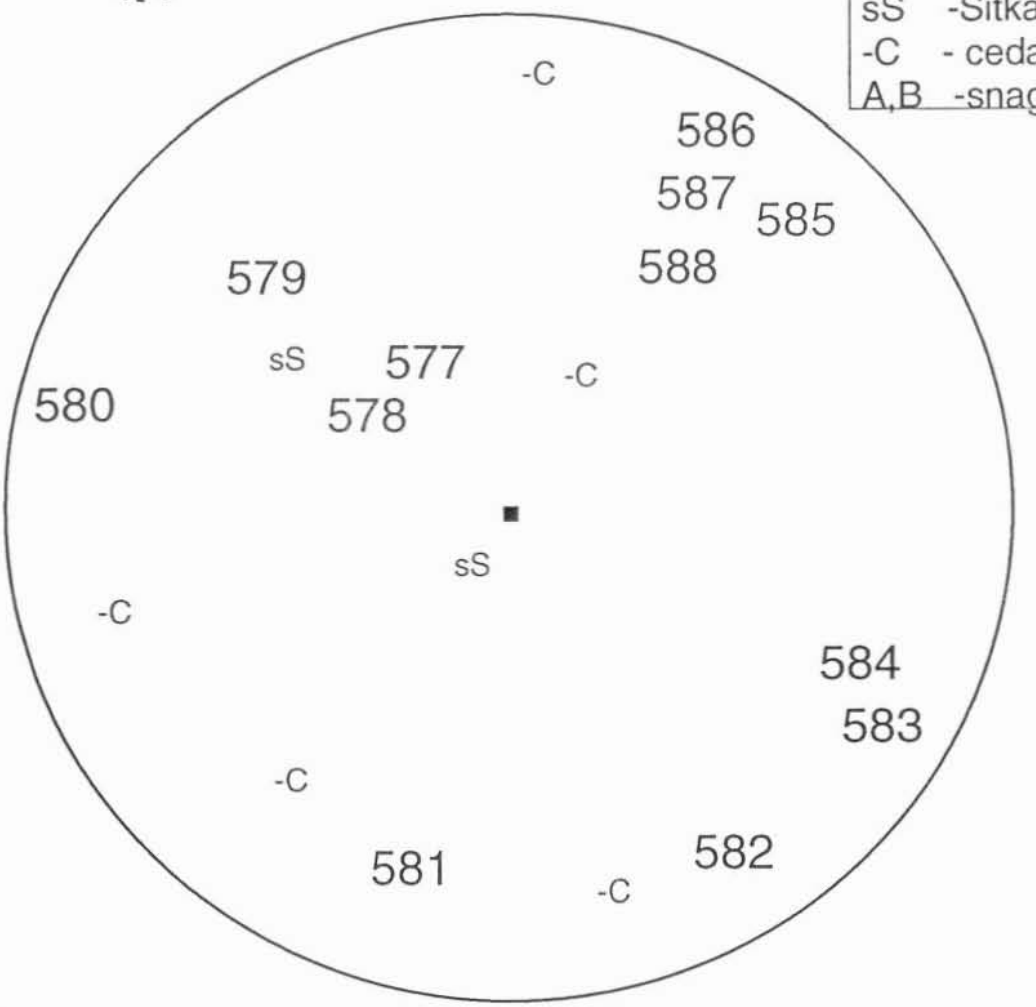
Gregory Creek - Demonstration Trail A

Plot 10

Canadian Forest Service

FOREST INSECT & DISEASE SURVEY

LEGEND
999 - tagged tree #
xx - natural regen.
oo - regen. destroyed
sS -Sitka spruce seedling
-C - cedar seedling
A,B -snags



Original tree no.	New tree no.	Species	DBH	Status
1	577	wH	60	logged
2	578	wH	17	crook, logged
3	579	wrC	9	logged
4	580	wH	13	logged
5	581	wH	13	lean,logged
6	582	wH	34	logged
7	583	wH	17	lean/sweep, logged
8	584	wH	62	lean, logged
9	585	wH	30	logged
10	586	wH	13	crook, logged
11	587	wH	14	logged
12	588	wH	12	logged

Hangover Creek - Demonstration trail

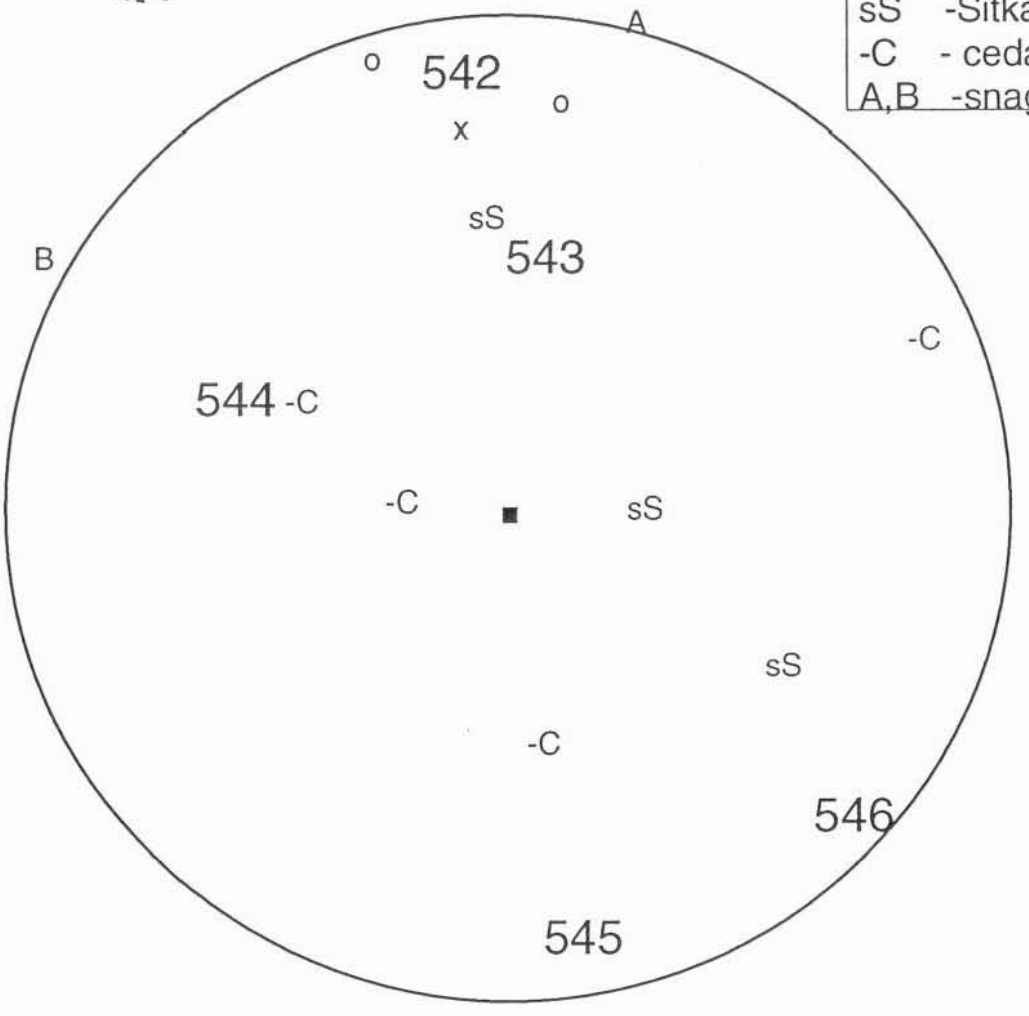
Plot 1

Canadian Forest Service

FOREST INSECT & DISEASE SURVEY

LEGEND

999 - tagged tree #
xx - natural regen.
oo - regen. destroyed
sS -Sitka spruce seedling
-C - cedar seedling
A,B -snags



Original tree no.	New tree no.	Species	DBH	Status
1	542	wH	61	
2	543	wH	14	logged
3	544	wH	27	logged
4	545	wH	69	
5	546	sS	130	f. pini, fork
A,B				snags felled
xx		wH		most destroyed, slash

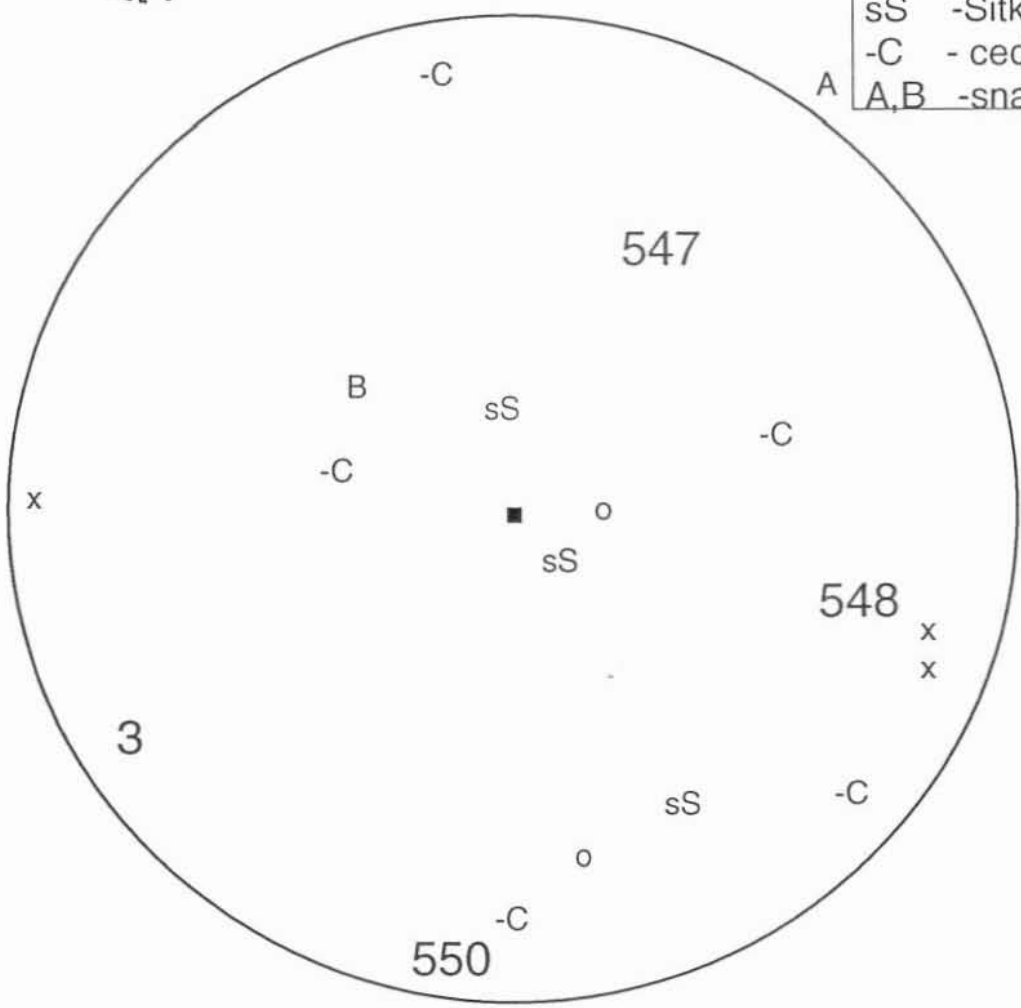
Hangover Creek - Demonstration trail

Plot 2

Canadian Forest Service

FOREST INSECT & DISEASE SURVEY

LEGEND	
999	- tagged tree #
xx	- natural regen.
oo	- regen. destroyed
sS	-Sitka spruce seedling
-C	- cedar seedling
A,B	-snags



Original tree no.	New tree no.	Species	DBH	Status
1	547	wH	56	
2	548	wH	49	sapsucker
3		wH	13	crook, felled, not found
4	550	wH	70	sapsucker
A,B				felled
xx		wH		about half lost, slash

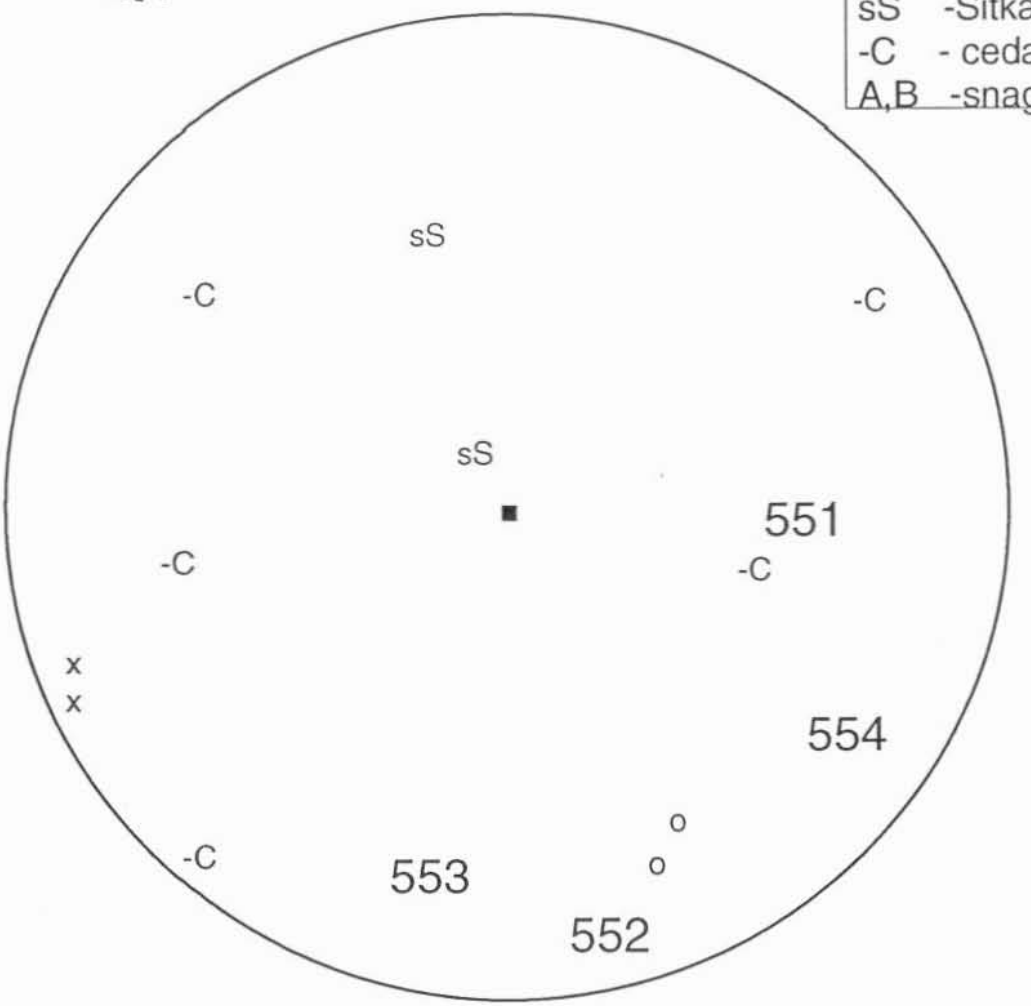
Hangover Creek - Demonstration trail

Plot 3

Canadian Forest Service

FOREST INSECT & DISEASE SURVEY

LEGEND
999 - tagged tree #
xx - natural regen.
oo - regen. destroyed
sS -Sitka spruce seedling
-C - cedar seedling
A,B -snags



Original tree no.	New tree no.	Species	DBH	Status
1	551	wH	46	
2	552	wH	37	
3	553	wH	23	brk. top
4	554	wH	34	snag, f. pinicola, felled
xx		wH		about half lost, slash

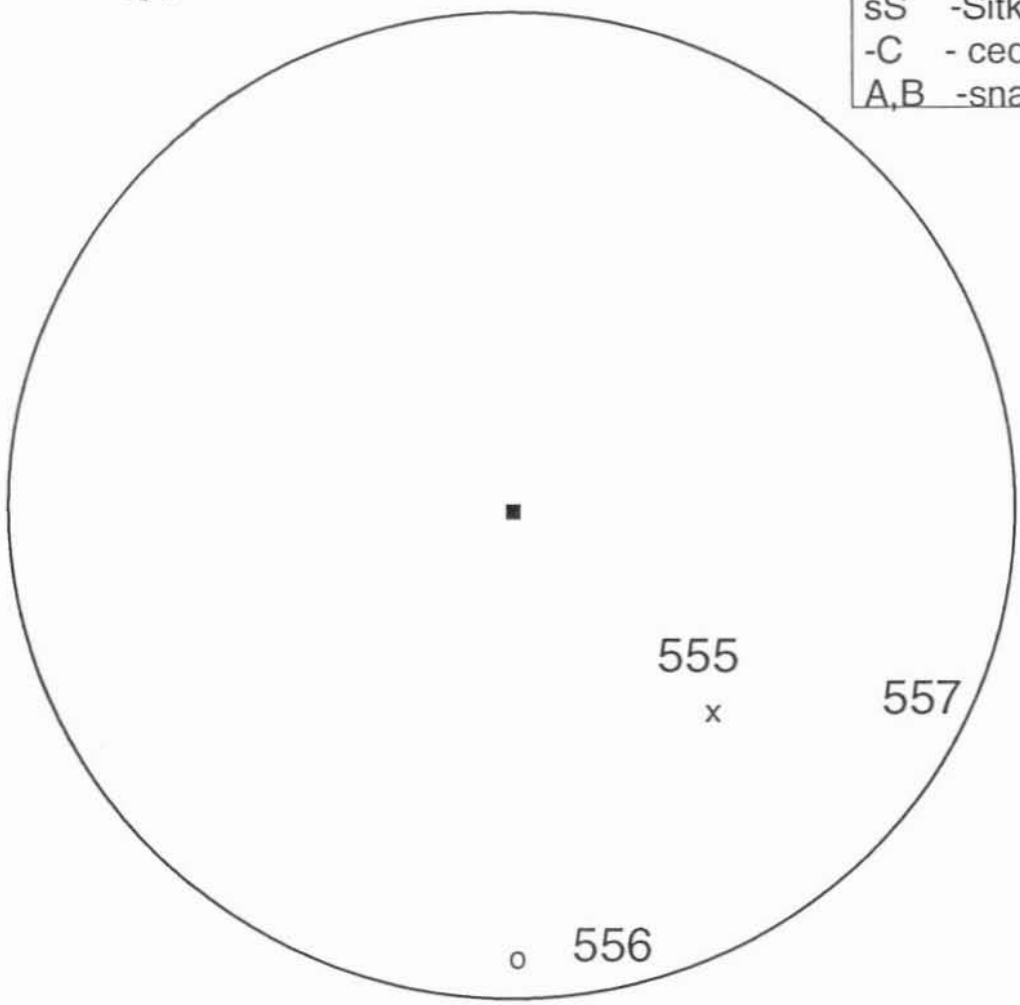
Hangover Creek - Demonstration trail

Plot 4

Canadian Forest Service

FOREST INSECT & DISEASE SURVEY

LEGEND
999 - tagged tree #
xx - natural regen.
oo - regen. destroyed
sS -Sitka spruce seedling
-C - cedar seedling
A,B -snags



Original tree no.	New tree no.	Species	DBH	Status
1	555	wH	19	
2	556	sS	87	dead branches
3	557	wH	39	
xx		wH		1 of 2 missing

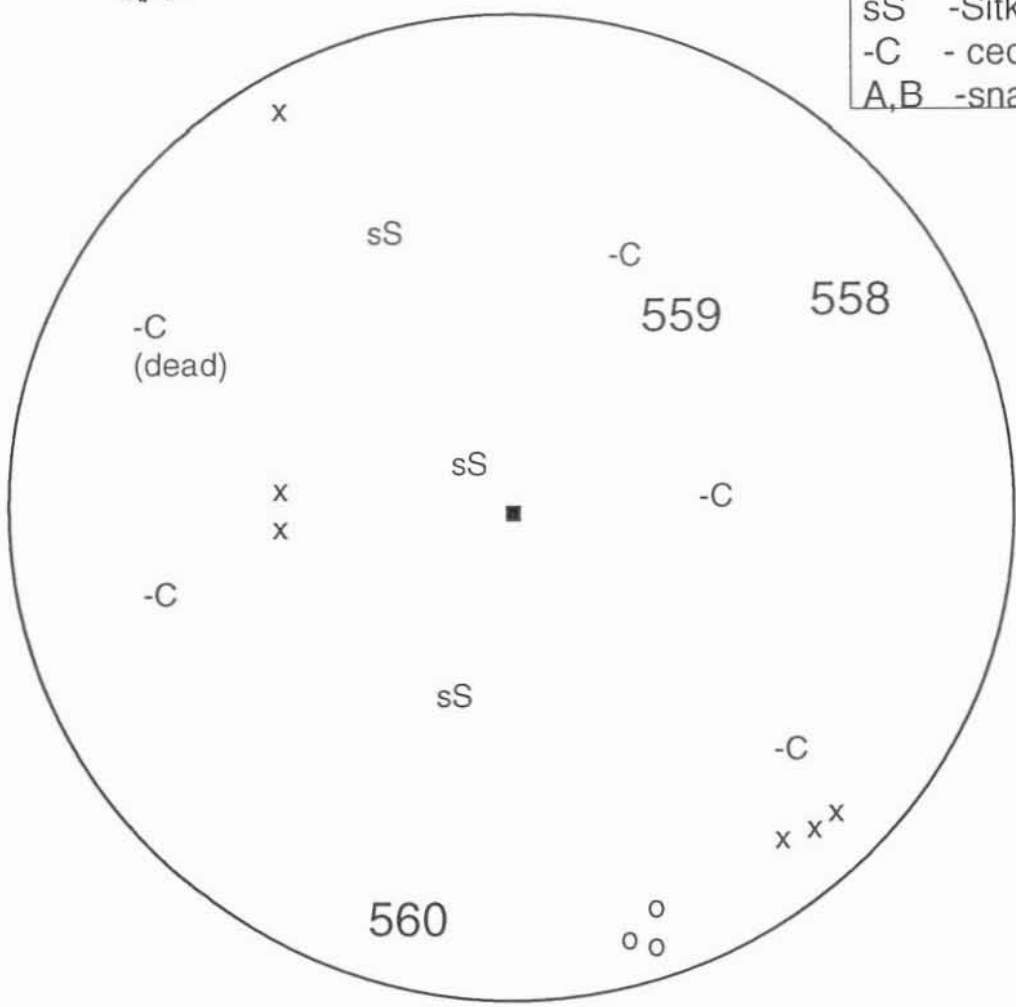
Hangover Creek - Demonstration trail

Plot 5

Canadian Forest Service

FOREST INSECT & DISEASE SURVEY

LEGEND
999 - tagged tree #
xx - natural regen.
oo - regen. destroyed
sS -Sitka spruce seedling
-C - cedar seedling
A,B -snags



N

Original tree no.	New tree no.	Species	DBH	Status
1	558	wH	16	crook
2	559	wH	21	fork/sweep
3	560	wH	35	
xx		wH		some under slash

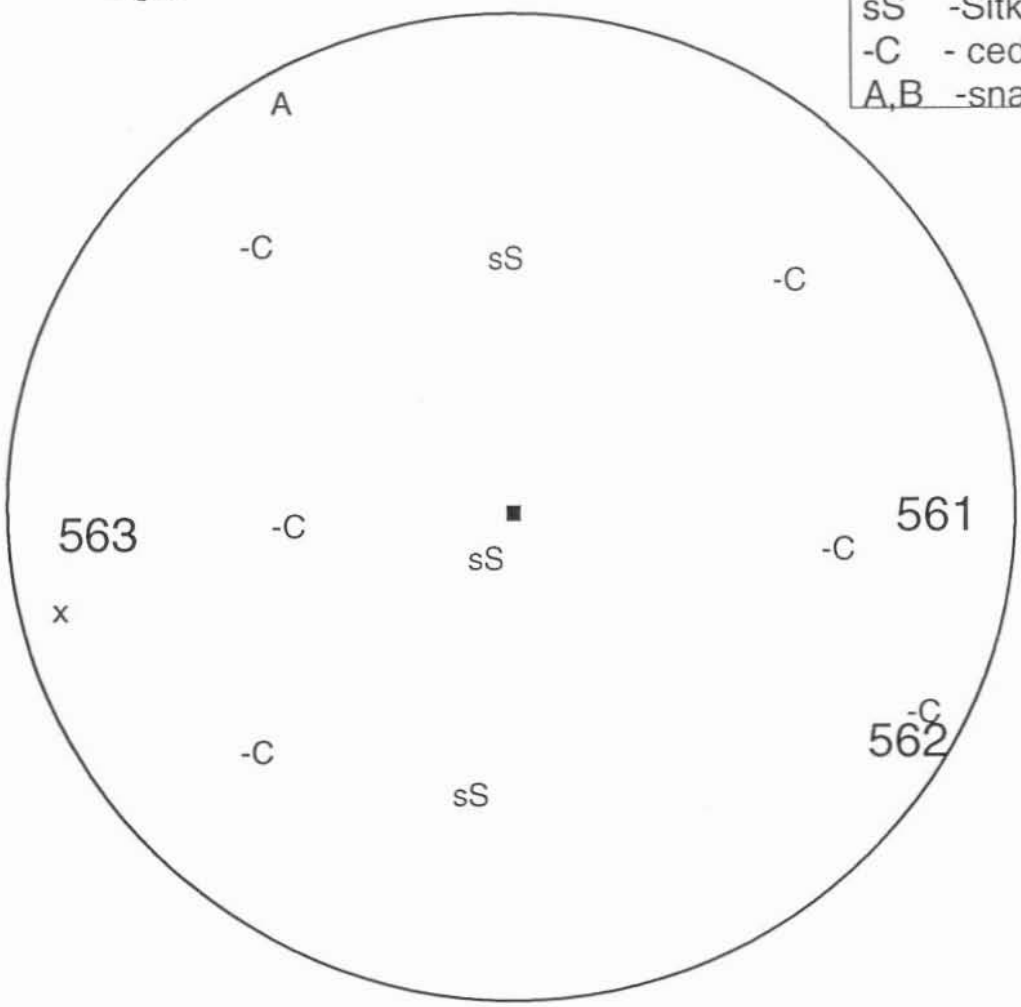
Hangover Creek - Demonstration trail

Plot 6

Canadian Forest Service

FOREST INSECT & DISEASE SURVEY

LEGEND
999 - tagged tree #
xx - natural regen.
oo - regen. destroyed
sS -Sitka spruce seedling
-C - cedar seedling
A,B -snags



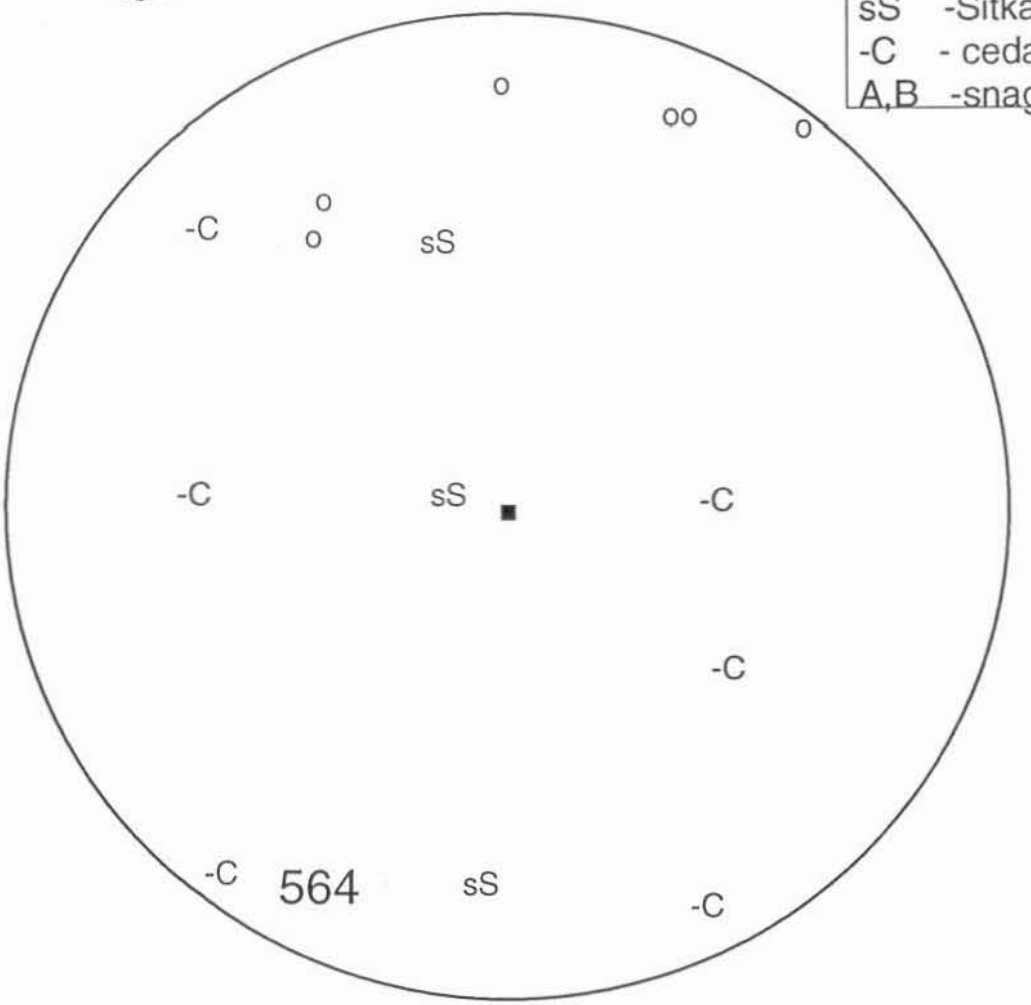
Original tree no.	New tree no.	Species	DBH	Status
1	561	wH	59	crook/scar, logged
2	562	wH	65	sweep, logged
3	563	wH	34	brk. top, logged
xx		wH		

Hangover Creek - Demonstration trail
Plot 7 (already logged at establishment)

Canadian Forest Service

FOREST INSECT & DISEASE SURVEY

LEGEND
999 - tagged tree #
xx - natural regen.
oo - regen. destroyed
sS -Sitka spruce seedling
-C - cedar seedling
A,B -snags



Original tree no.	New tree no.	Species	DBH	Status
1	564	wH	17	stump, heavy slash
xx		wH		destroyed

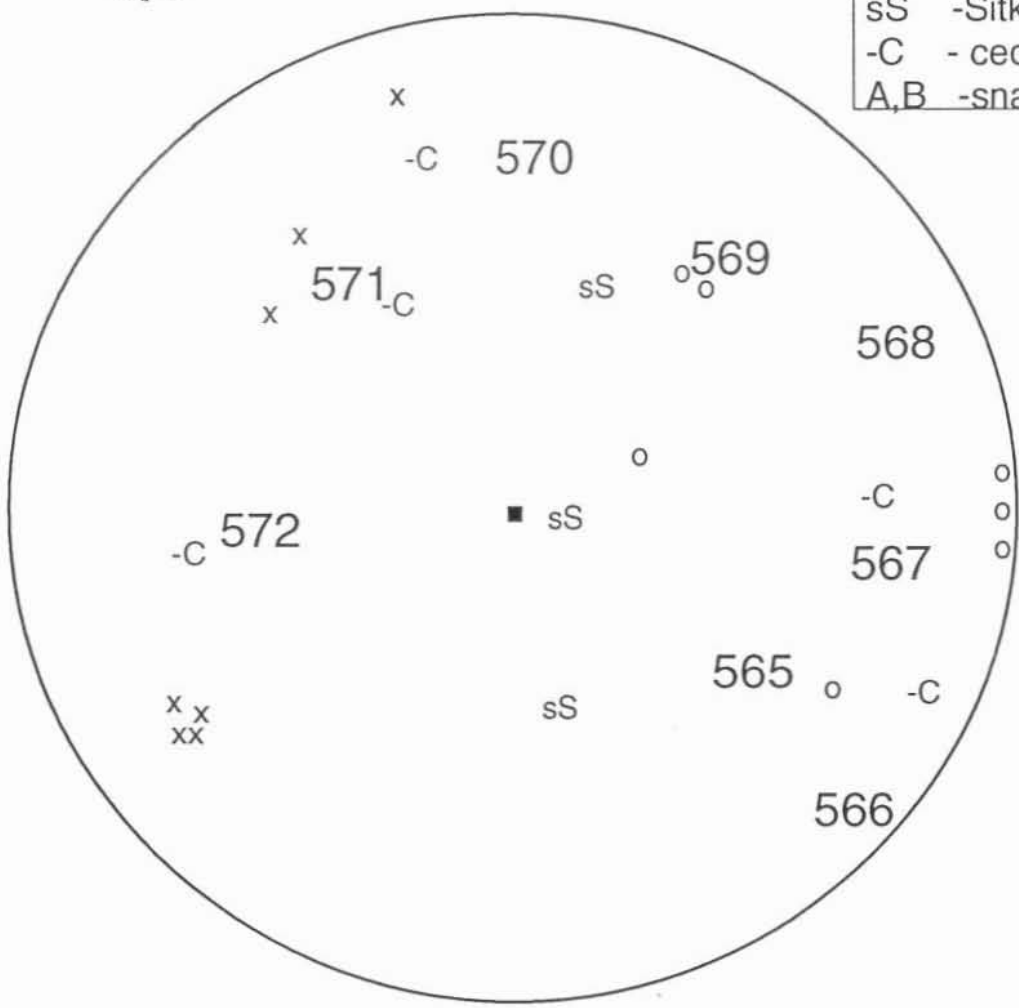
Hangover Creek - Demonstration trail

Plot 8

Canadian Forest Service

FOREST INSECT & DISEASE SURVEY

LEGEND
999 - tagged tree #
xx - natural regen.
oo - regen. destroyed
sS -Sitka spruce seedling
-C - cedar seedling
A,B -snags



Original tree no.	New tree no.	Species	DBH	Status
1	565	sS	73	logged
2	566	wH	23	crook, logged
3	567	wH	33	logged
4	568	sS	63	logged
5	569	wH	47	brk. top, logged
6	570	sS	84	
7	571	sS	85	
8	572	wH	58	sweep
xx		wH		about half lost, slash

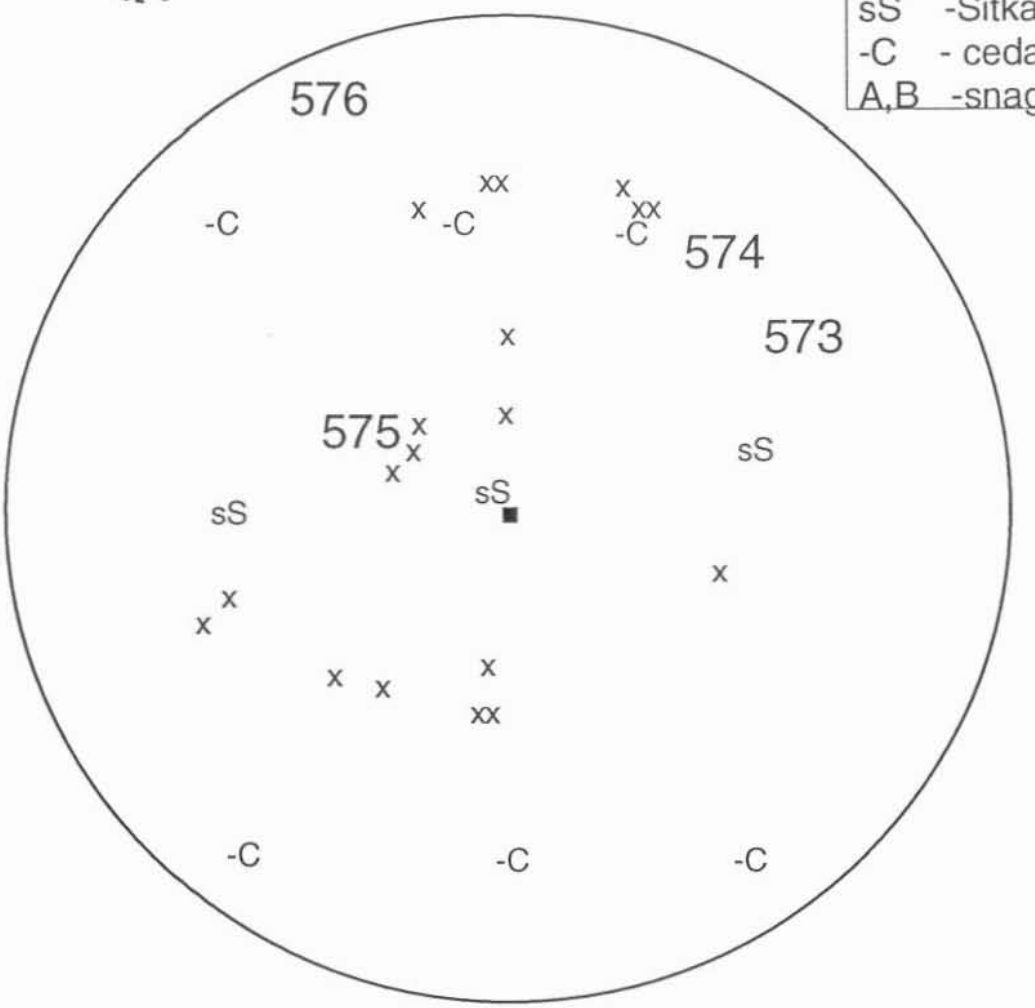
Hangover Creek - Demonstration trail

Plot 9

Canadian Forest Service

FOREST INSECT & DISEASE SURVEY

LEGEND
999 - tagged tree #
xx - natural regen.
oo - regen. destroyed
sS -Sitka spruce seedling
-C - cedar seedling
A,B -snags



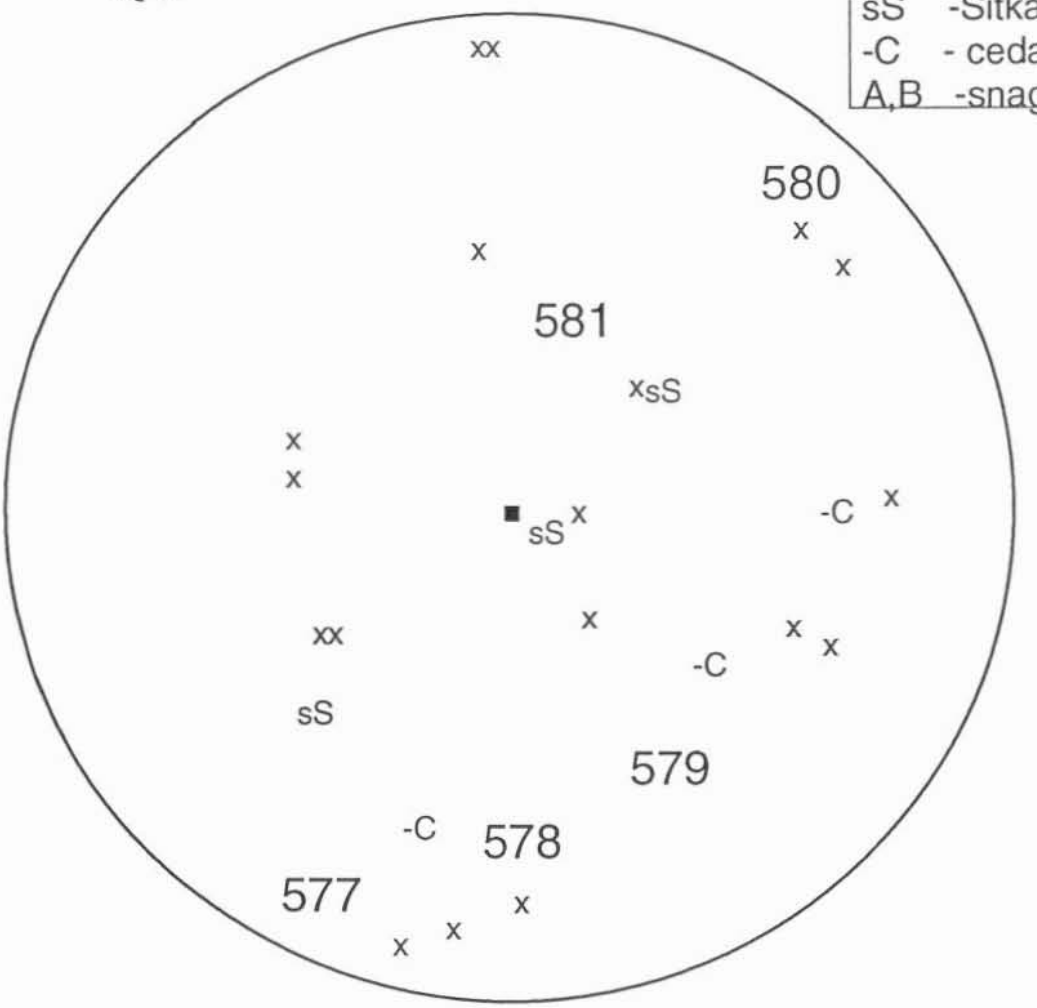
Original tree no.	New tree no.	Species	DBH	Status
1	573	wH	43	dead top, logged
2	574	wH	38	brk. top, logged
3	575	wH	77	logged
4	576	wH	42	frost crack,logged
xx		wH		most intact, drought stressed

Hangover Creek - Demonstration trail
Plot 10

Canadian Forest Service

FOREST INSECT & DISEASE SURVEY

LEGEND
999 - tagged tree #
xx - natural regen.
oo - regen. destroyed
sS -Sitka spruce seedling
-C - cedar seedling
A,B -snags



Original tree no.	New tree no.	Species	DBH	Status
1	577	wH	45	crook
2	578	wH	43	
3	579	wH	50	
4	580	sS	75	
5	581	wH	11	
xx		wH		

Appendix C

Spruce aphid
Elatobium abietinum

Spruce aphid populations declined dramatically in 1993 and defoliation was generally limited to localized pockets of light attack on older foliage.

In 1992, only ground surveys were done and area of defoliation was estimated at 3145 ha. Aerial surveys in 1993 identified 13 additional pockets totalling 305 ha severely defoliated in 1992. These additional pockets of defoliation bring the total area defoliated in 1992 to 3450 ha over 26 infestations. Based on anecdotal information, numerous other areas were infested in 1992, but defoliation was not sufficient to leave visible evidence in 1993.

The additional areas of severe defoliation were noted on the south end of Lina Island, and on Moresby Island near Cumshewa; on Louise Island at Skedans Bay and west of Breaker Bay. One area was mapped on the east side of Talumkwan Island, two on the east edge of Tangil Peninsula and two on east facing slopes of Lyell Island.

At the Heather Lake study plot, in a young mixed stand with spruce representing about 25% of crop trees, overall attack severity in 1993 was very light. This was a significant reduction from the moderate to severe defoliation recorded over each of the previous two years. In 95% of trees, 25-80% of older foliage was missing due to successive years of attack, with greater then 80% defoliation on only 5% of trees. Overall, 56% of foliage was affected as compared to 57% in 1992. Despite the minimal 1993 attack, branch tip length averaged only 8.6 cm compared to 8.9 cm in 1992, suggesting an additive effect on growth reduction from repeated years of defoliation. More than one year of pest free growth is probably required before substantial recovery occurs.

Twenty trees assessed for levels of defoliation at each of two sites in semi-mature spruce stands in 1992 were re-assessed in 1993. At Chinukundl Creek, little new attack occurred and no mortality or branch dieback was found. Recovery was minor, with most trees still moderately to severely defoliated from the 1992 attack. Only three trees showed no evidence of aphid damage or activity.

At Gray Bay, 13 of 20 trees were severely defoliated in 1992 and 5 trees moderately defoliated. Very little 1993 attack was found, but little recovery was noted. One defoliated intermediate Sitka spruce was killed, probably by the severe aphid attack followed by secondary attack of *Dryocoetes affaber*. Severely defoliated trees at both these sites may continue to be susceptible to attack by secondary invaders. Monitoring will continue.

Western blackheaded budworm
Acleris gloverana

Western blackheaded budworm populations remained at endemic levels in 1993. No larvae were collected in 14 standard fids larval samples throughout accessible areas of Graham and Moresby islands. There was also no evidence of defoliator activity during an overview aerial survey of part of the district. This continues the low level of budworm population found since its collapse in 1987.

In continued assessment of long term effects of the western blackheaded budworm/hemlock sawfly infestation of 1985-1988 in young stands, two plots (#7 and #8) were sampled near South Bay on Moresby Island. These plots were part of a large system of plots established by BCFS in 1987 throughout the infested areas. Each consisted of a large number of trees tagged and tallied with defoliation estimates documented on the majority of the trees. Cores were taken from 10 trees at each site, primarily from larger diameter trees with defoliation estimates included. Overall defoliation of trees sampled in 1987 was moderate to severe. Based on aerial survey maps, defoliation also occurred in this area in 1986 (moderate) and 1988 (light).

No mortality or top-kill was noted at either plot location although stands were too dense to see the upper crowns of many of the trees. An assessment of incremental growth from the cores show a dramatic reduction in radial increment in 1988, the year following the most severe defoliation. Radial increment averaged 0.66 mm in 1988 which was only 21% of the growth average in 1984 (3.03 mm), the year before the start of the outbreak (see figure 6). Recovery began in 1989, and by 1992 radial increment averaged 2.38 mm. This was not up to pre-outbreak levels, but was 3.6 times greater then during the height of the attack.

This stand was defoliated for three years and loss of increment, clearly reflected the pattern and intensity of the outbreak. As in the assessment in the previous two years at Tarundl Creek and Aliford Bay, it appears that while losses were significant, these young vigorous stands seemed to sustain less damage then older semi-mature to overmature stands and they recover fairly quickly. The previous two stands assessed were subsequently spaced with the result that post outbreak growth rates were higher than pre-outbreak growth rates. This did not occur at the South Bay site, likely because only this stand had not yet been spaced.

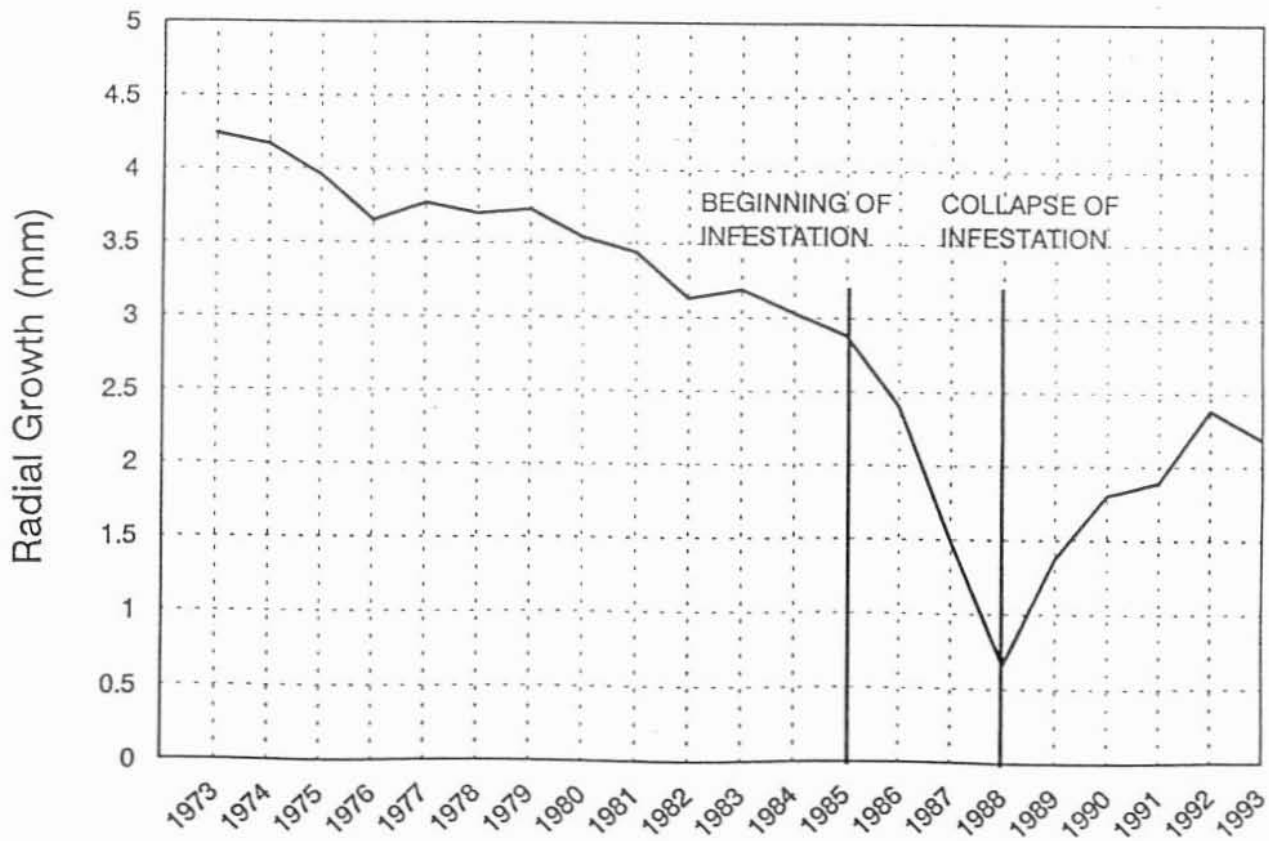


Figure 6. Radial increment of western hemlock in the South Bay area plots defoliated by