# FOREST RESEARCH REPORT



Nova Scotia Department of Natural Resources Forest Management Planning

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### Commercial Thinning Survey: 5-Year Results.

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#### Introduction

Commercial thinning has a dual role, both as a thinning and a harvesting operation. Ideally, commercial stems are removed that might have otherwise died, releasing longer lived and/or better formed trees so that the remaining trees can increase in size and value. It is a way of capturing volume before mortality occurs (Smith *et al.* 1996).

Commercial thinning is a common practice in Nova Scotia, reaching its peak in 2003-2005 (9000 ha) (Figure 1).

Commercial thinning along with other partial harvesting methods make up 9% of the total harvest for the province (NFD 2010), but it could increase substantially as a result of implementing Nova Scotia's Natural Resources Strategy (NSDNR 2011). The strategy set a target to reduce clearcutting to no more than 50% of harvests. However, more partial harvesting could result in greater losses due to blowdown, especially with softwoods. This survey provides information regarding blowdown that occurred as a result of commercial thinning and also helps identify site/soil conditions that are risk factors for blowdown.



Figure 1. Commercial thinning (ha) in Nova Scotia 1977-2010.

#### Objective

The objective of this survey is to see what the status of commercial thinning is in the province, in particular;

- Quality of job
- Balsam Woolly Adelgid Damage
- Release Response
- Blowdown
- Basal Area and Volumes Removed

#### Methods Study Site Locations and Descriptions

In 2009 and 2010, 71 commercially thinned sites were surveyed (844ha) (Figure 2). These sites were randomly selected from commercial thinning operations performed in 2004 and 2005 (5447ha). Results are therefore approximately 5 years post-thinning. The survey sampled 15% of the area that was commercially thinned during this period.



Figure 2. The locations of the 71 commercial thinning sites that were surveyed in Nova Scotia.

Figure 3 shows a summary of the sites that were surveyed. Most sites were dominated by red spruce or balsam fir. The majority of the sites were less than 10 ha in size. Stands of various ages were commercially thinned. Approximately half the stands were previously treated (PCT or planted). Half of the sites surveyed were on Crown land and half were on private land. The sites were evenly distributed by region. Land capability ranged between 4-9 m<sup>3</sup>/ha/year (NSDNR 1993).





#### Field Sampling Procedures

A sampling intensity of 1 plot/ha was used with a minimum of 5 plots and a maximum of 25 plots per stand. Plots were established in a uniform grid pattern to provide full coverage of each site. Plots were assigned one of six categories (treated, partially treated, only trails, not treated, untreatable, or clearcut). These categories are defined later in the text (see Table 2). If it was treated or partially treated, then a circular plot was established which spanned between 2 trails (Figure 4). All live, dead, and cut trees were tallied. Damages, site characteristics, soil and vegetation types (Keys et al. 2011) were recorded. One tree per plot (average tree of average release) was cored and the sample taken for further analysis. Three hundred and ninety cores were examined for release response (diameter increment) after commercial thinning using the WinDENDRO<sup>™</sup> system.<sup>2</sup>



Figure 4. Example of plot layout.

#### Results

#### Area Treated

Nine percent (9%) of the area that was commercially thinned was clearcut within 5 years of treatment (Table 1). This area is believed to be salvaged after it was commercially thinned because of blowdown, sirococcus shoot blight (Nicholls and Robbins 1984) or reasons unknown. It is difficult to determine the exact causes of clearcutting in many cases. These classifications are based on a combination of evidence at the site, age of regeneration, deterioration of stumps, experience of field staff, and information from forest industry. Five percent (5%) appears to have been partial harvests in mixed wood stands, where most of the softwood was taken leaving low quality hardwoods.

<sup>2</sup> WinDENDRO<sup>TM</sup> – Registered trademark of Regent Systems Inc.

Table 1. The proportion of area in each of the following categories (commercially thinned, partial harvest, clearcut) based on sample area of commercial thinning survey.

					%			
					Area	%		
	%	Area	#		(clear-	Area	Area	
	Area	(ha)	Sites		cut)	(total)	(ha)	# Sites
Commercially	86%	729.0	51					
thinned								
Partial Harvest	5%	37.6	6					
Clearcut	9%	77.7	14	Salvage (reason unknown)	51%	5%	39.9	10
				Salvage (sirococcus)	40%	3%	30.7	2
				Salvage (blowdown)	9%	1%	7.1	2
Total	100%	844.3	71		100%	9%	77.7	14

Table 2 shows the breakdown of the area that was reported as being commercially thinned in Table 1. Only 58% of this area was treated. Thirty-one percent of the area was either not treated, or the treatment done was marginal. For example, trails were harvested, but there was no thinning between trails or it was only thinned on the edge of trails (the centre of the leave strip left unthinned). Ten percent of the area consisted of small areas of unthinned inclusions untreatable for a variety of reasons. However, 1% of the area consisted of large contiguous untreated areas. When a large section of the stand is untreatable, that section could have been excluded from the area reported.

Table 2. The pro	oportion of	area that was treate	d.					
Troated	E 00/							
Treated	58%							
Partially	31%							
Treated/		Partially Treated <sup>1</sup>	12%					
Not Treated		Not Treated <sup>2</sup>	9%					
		Only Trails <sup>3</sup>	10%					
		Total	31%					
Untreatable <sup>4</sup>	10%	Wet Area, SMZ, Hw	v. patch, rock,					
(acceptable)		wildlife clump, nat	ural openings.					
Untreatable⁵	1%	Large section of stand untreatable						
(unacceptable)		all in one area.						
	100%							

<sup>1</sup>**Partially Treated**: only trees on edge of trails were harvested and the centre of the leave strip was not thinned. The average width of the partially treated leave strips was 26m and of this 56% was not treated (15m).

<sup>2</sup>**Not Treated**: no trails and no thinning when there was no reason for it not to be treated.

<sup>3</sup>**Only Trails**: trails are present but no thinning between trails.

<sup>4</sup> Untreatable (acceptable): Untreatable for a specific reason (i.e. wet area, SMZ, etc....)

<sup>5</sup> Untreatable (unacceptable): Large section of stand untreatable, should have been excluded from the area reported as commercially thinned.

#### Basal Area and Volume

The width of the leave strips averaged 18 m and trails averaged 5 m wide; therefore 22% of the area consists of trails (Table 3). The average amount of basal area removed in leave strips that were treated was 40%; when including trails 53% was removed. There were many areas that were not treated, if one includes these areas the basal area removed was 32% and 47% respectively excluding and including trails. The average merchantable volume of the stands that were commercially thinned was 221m<sup>3</sup>/ha before thinning. It is estimated that 111m<sup>3</sup>/ha was removed during thinning in treated areas; across all area 79m<sup>3</sup>/ha was removed. The results for individual sites are presented in Appendix 1.

Table 3. The number of stems and the amount of basal area and volume removed during													
commercial thinning.													
	Leave Strip	Trail	Stand Level (Leave Strip + Trail)										
Width	18m	5m	23m										
% of Stand	78%	22%	100%										
# Stems/ha (before CT)	1,858	-	1,858										
# Stems/ha (after CT) <sup>1</sup>	1,040	0	811										
% of Stems Removed <sup>1</sup>	44%	100%	56%										
Basal Area (before CT)	39m²/ha	-	39m²/ha										
% Basal Area Removed (treated areas) <sup>1</sup>	40%	100%	53%										
% Basal Area Removed (all areas <sup>2</sup> )	32%	100%	47%										
Merchantable Volume Before Thinning	221m <sup>3</sup> /ha	-	221m <sup>3</sup> /ha										
Merchantable Volume Removed (treated areas) <sup>1</sup>	66m <sup>3</sup> /ha	45m <sup>3</sup> /ha	111m³/ha										
Merchantable Volume Removed (all areas <sup>2</sup> )	45m <sup>3</sup> /ha	34m <sup>3</sup> /ha	79m³/ha										

<sup>1</sup> Includes only those areas that were treated.

<sup>2</sup>All areas: Includes areas that were not treated.

The average diameter at breast height (DBH) of trees that were cut was 16 cm compared to 17.7 cm for those that were left. In general, most of the sites were thinned from below meaning the smaller trees were removed.

#### Harvest Damage

On average, 6% of trees were damaged due to harvesting activities (Figure 5). The majority of the sites (67%) had very little damage ( $\leq$ 5%). However, some sites had significant harvesting damage; the worst had 43% of residual trees damaged.





Figure 5. The proportion of sites in each harvest damage category. (n= # of sites)

#### Balsam Woolly Adelgid

Balsam woolly adelgid (BWA) (*Adelges piceae*) is a major pest in Nova Scotia affecting balsam fir trees. All balsam fir commercial thinnings within mainland Nova Scotia and lower elevation Cape Breton had moderate (25-50%) to severe (+51%) infestations (Figure 6). All of these sites were at an elevation of 200 m or less. The only place in Nova Scotia where BWA was not visible in the crowns was in the Highlands of Cape Breton. Elevation appears to play a role as all these sites are at an elevation of 328 m or greater and have no visible signs of BWA (0%). It has been reported that colder winters at higher elevations reduce BWA overwintering survival, which in turn keeps BWA populations in check (NSDNR 2012).



#### Release Response

Commercially thinned trees responded to release from the treatment (Figure 7). The diameter increment started increasing the first year following treatment. Diameter growth went from 0.29 cm/year before thinning to 0.42 cm/year, four years after thinning; an increase of 45%.

Eighty-six percent (86%) of the cores were from red spruce and balsam fir. Figure 8 shows the response of these species. The larger diameter (dominant) trees and younger trees had the greatest diameter increment both before and after thinning.





However, all trees regardless of size or age responded to release. For more detailed graphs see Appendix 2 and 3. Red spruce did not respond to release as much as balsam fir. This observation may be due to the red spruce being older with less live crown (Table 4).

Table 4. The average age and the percent live crown of balsam fir and red spruce when they were commercially thinned.													
	% Live	# Sites											
	Avg. Age	Crown											
Balsam fir (Highland)	31	70%	7										
Balsam fir	36	58%	13										
Red spruce	66	46%	31										



Figure 8. The diameter increment of commercially thinned red spruce and balsam fir before and after thinning categorized by DBH class and age class. Sample sizes are shown in parentheses (n).

#### Amount of Blowdown

Five years after commercial thinning, 6% of the basal area had blown-down and 4% had stem breakage for a total of 10% wind damage (Table 5). An additional 6% of the area was salvaged. This could be due to blowdown, although this was not confirmed in all cases. Areas that were known to be salvaged for other reasons were excluded from Table 5.

Table 5. Wind Damage		
		Salvage
	% of	(% of
	BA	area)
Blowdown	6%	
Stem Breakage	4%	
Wind Damage	10%	6% <sup>1</sup>

<sup>1</sup>See Table 1: Salvage (reason unknown) 5% + Salvage (blowdown) 1% = 6%

Fifty-five percent of sites had basal area losses of 5% or less (Figure 9). Wind damage tended to be fairly minimal when taking into consideration the entire stand, but upon closer examination many of the sites with 5% or more basal area losses tended to have pockets of severe wind damage (Appendix 4). Twenty percent of sites (12/60 sites) had severe wind damage (25+% basal area losses) covering at





least 25% of the site (Appendix 4). If you include sites that were potentially salvaged because of blowdown this number is increased to 33% of sites (22/66 sites).

Blowdown was usually concentrated in pockets. These blowdown pockets can give the impression of large losses, because of their visual impact, but over the entire stand the level of blowdown is usually less. Keep in mind, the results only cover 5-years post-thinning; there is likely to be more blowdown in the future especially in stands that already are partially blown down.

#### Factors Affecting Blowdown

The survey did reveal some factors that make a stand more prone to blowdown. Sites with stony phase (S-phase) soils experienced some of the most severe blowdown (Figure 10, Figure 11, Appendix 4). Sphase soils have 60 % or more cobbles, stones, and/or boulders in the upper 30 cm of mineral soil such that rooting is restricted (Keys et al. 2010). Comparing similar sites, the blowdown on sites with S-phase soils was 14% versus 4% on non S-phase soils (Figure 10).

The proximity of a tree to an extraction trail also affected it's likelihood of blowing down. Nine percent of the trees bordering trails were blown down, compared to 4% in the interior of leave strips.

Soils that are imperfectly drained or shallow to bedrock are known to be prone to blowdown (Keys *et al.* 2010). The sites with these attributes did tend to have more blowdown than others (Appendix 4). However, there were too few sites surveyed with these



Figure 10 . The blowdown which occurred on sites with S-phase soils compared to non-S-phase soils on similar sites .



Figure 11. Photo of s-phase soils. Notice rock directly under roots.

characteristics to make any definitive conclusions. Height diameter ratio and exposure are other factors that have been connected to blowdown (McGrath and Ellingsen 2009, McGrath 2010), but this survey did not reveal any conclusive trends regarding these factors.

#### Summary

- **Treated:** 58% of the area submitted as being commercially thinned was treated.
- Not Treated: 31% of the area was either not treated or the treatment done was marginal (i.e. trails were harvested but there was no thinning between trails or it was only on the edge of trails).
- Untreatable: 11% of the area was untreatable.
- Harvest Damage: 6% of trees were damaged due to harvesting.
- **Balsam Woolly Adelgid (BWA):** No visible signs of BWA in the crowns of trees in the Cape Breton Highlands. All other balsam fir sites showed at least moderate levels of BWA.
- **Release Response:** Diameter increment increased by 45% (0.29 cm/year before thinning to 0.42 cm/year four years after thinning).
- Wind Damage:
  - 10% of the basal area sustained wind damage (blowdown=6%+stem breakage=4%), plus
     6% of the area was salvaged (possibly because of blowdown).
  - 55% of sites had basal area losses of 5% or less.
  - 20% of sites had severe wind damage (25+% basal area losses covering at least 25% of the site), if you include sites that were potentially salvaged because of blowdown this number is increased to 33%.
- **Blowdown on Trails:** 9% of the trees bordering extraction trails were blown down, compared to 4% in the interior of the leave strip.
- S-Phase Soils: Of the 18 sites with the worst wind damage ( >10% BA), 7 were growing on S-phase soils.
- Leave Strips and Trails: Average width of leave strips=18 m; average width of trails=5 m
- **# Stems:** 44% of stems were removed from leave strips.
- Basal Area Removal (BAR): 40% (within leave strips), including trails it is 53%.
- **Gross Merchantable Volumes:** 221 m<sup>3</sup>/ha (before CT); 111 m<sup>3</sup>/ha removed in treated areas; 79m<sup>3</sup>/ha removed including all areas.
- **Thin from Below:** On average most of the sites were thinned from below meaning the smaller trees were removed (DBH cut trees=16.0 cm; DBH trees left =17.7 cm).

#### References

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Appendix 1: Commercial	Plots	Partially Treated Plots Leave Stri	Strips and Trails	DBH & Height & Crown	# Stems Basal Area	Merchantable V	Wind Damage Damages	
thinning survey.						Treated Leave		
chining survey.						Strips Treated Areas	All Areas	
		%						
Correct la		leave			% BAR %BAR			
Ow Size	* %	% strip Leave	% of	Avg.	After treated all	Cut Cut	Cut	Dia Data ar
Stand Area Coup. Der - Year Spe- @ (#	Not % Un % %	A Part. Leave not Strip Irai	Vidth in Chost (Cut)	1 DBH DBH Avg. Live	CI Before areas areas	Before After (leave (leave Cut Cut	(leave Cut Cut Cut	BIOW- Broken %
$ID$ (ha) ty shin <sup>1</sup> (T'ed cies <sup>2</sup> $IC^3$ (T Trees) <sup>4</sup>	"%CC <sup>5</sup> ted table trails ed	d ed (m) ed (m) (m)	(m) Trails Trails (cm)	) (cm) (cm) (m) Ratio Ratio	CT strin) (m <sup>2</sup> /ha) strin) strin)	$(m^3/ha)$ $(m^3/ha)$ $(m^3/ha)$ $(m^3/ha)$ $(m^3/ha)$	$(10^{3}/ha)$ (m <sup>3</sup> /ha) (m <sup>3</sup> /ha) (m <sup>3</sup> /ha)	(% BA) (% BA) BWA <sup>6</sup> Dam
0901 2.1 GU CL 2004 bE 5 34 71	20% 40% 40%	% 20 43	4.3 18% V 10.5	5 9.8 10.0 8.1 0.81 66% 7	2 140 1 420 17 41% 15%	38 23 15 12 7 19	5 5 10	0% 0% 20% 1%
0902 2.2 CB CL 2004 TI/xs	100%	20 4.5	4.5 10/0 1 10.5	5 5.5 10.0 0.1 0.01 0070 2	2,140 1,420 17 41% 15%	56 25 15 12 7 15	5 5 10	070 070 2070 170
0902 2.2 CB CL 2004 10x3	100%	% 60% 25 72% 28 50	5.0 15% V 10.5	5 127 115 86 074 67%	2 561 1 200 27 48% 25%	81 52 20 25 12 27	14 11 25	10% 0% 27% 0%
0904 2.4 PL CL 2004 PL 5 30 89	40% 20% 409	~ 00% 33 72% 28 3.0 ~ 15 44	1.0 13% I 10.3	2 169 169 126 075 22% 1	1 4 25 7 27 22 50% 20%	170 92 76 59 40 98	22 24 47	0% 11% *NA 0%
0905 2.7 IN CL 2004 IF 9 24 21	40% 20% 40	19 51	4.4 23% N 10.8	0 154 156 108 060 78% 1	1607 1122 21 25% 27%	128 02 45 25 20 66	25 24 47	0% 1% 0% 2%
0905 2.7 IN CL 2004 bi(II) 8 20 100	20% 609	201/ 25 401/ 20 55	5.1 22% 1 10.2		2 405 1 222 25 408 228	141 07 44 27 22 60	33 30 00	270/ E0/ 4E0/ 2E0/
0900 2.8 GO CL 2004 bi 4 45 110	20% 00	~ 20% 33 40% 23 3.3	10 28% N 160	14.3 $15.3$ $10.3$ $0.73$ $01.6$ $2$	1 9 21 1 1 0 2 2 1 7 2 1 0	140 76 64 46 40 85	26 22 68	2% 1% 05% 0%
	20% 30%	12 4.5	4.5 20% N 10.5	5 14.2 13.2 10.1 0.07 52/8 1	1,821 1,193 33 47% 34%	140 70 04 40 40 85	30 32 08	576 476 5576 076
	100%				80%			
0909 3.9 PI CL 2004 IP	20% 20%							
0011 44 CP CL 2004 bi	20% 20%	22 52	E 2 10% V 1E 0	195 179 175 070 51%	1 369 052 24 27% 24%	174 124 20 22 22 65	26 26 52	29/ 29/ 769/ 09/
0911 4.4 CB CL 2004 br 6 40 181	20% 80	22 5.2	5.2 19% T 15.9		1,500 952 54 27% 24%	174 154 59 52 55 05	20 20 32	2% 5% 70% 0%
0912 4.5 PI CL 2004 DF 8 50 25	20% 40% 40	76 12 4.5	4.5 27% N 15.5	5 10.7 11.8 9.1 0.77 50% 2	2,557 1,577 28 55% 19%	95 41 52 56 25 05	15 20 55	5% 0% 92% 4%
0913 5.2 GU CL 2004 X3	60% 40%	× 170/ 20 240/ 22 40	4.C 170/ V 12.F	150 150 105 070 (0)	1 9 4 1 1 2 2 2 2 2 9 9 9 9	140 00 41 34 33 59	22 22 55	00/ 10/ 110/ 20/
0914 5.8 CB CL 2004 DF 6 31 237	833	% 17% 20 34% 23 4.0	4.0 17% Y 13.5	5 13.9 13.0 10.5 0.70 68% 1	1,804 1,133 33 35% 30%	140 99 41 34 23 58	32 23 55	
0915 6.0 PI CL 2004 FP 8 20 68	100	12 4.1	4.1 25% N 12.0		2,059 972 28 54% 50%	91 48 43 32 23 55	32 23 55	2% 0% 'NA 3%
0916 6.3 GU CL 2004 DF 6 34 98	1/% 1/% 6/	% 22 4.1	4.1 16% ¥ 16.5	5 15.9 16.1 10.5 0.65 55% 1	1,303 840 27 41% 30%	116 /2 44 3/ 18 56	25 15 40	0% 0% 89% 1%
0917 6.6 IN CL 2004 DF(H)	100%	~	5 7		2 440 4 225 25 40% 20%		20 20 40	
0918 6.8 GU CL 2004 6F 4 48 178	14% 14% 14% 57	% 23 5.7	5.7 20% ¥ 13.2	2 14.3 13.8 9.6 0.69 59% 2	2,418 1,226 36 49% 30%	141 80 61 48 28 77	28 20 48	9% /% 64% 43%
0919 7.5 CB CL 2004 DF	63% 38%	× 22% 42 52% 20 51	5.1. 1CW Y 14.7	7 14 4 14 5 9 7 9 6 9 9 9 1	1 410 025 22 20% 25%	96 55 21 26 12 40	10 11 20	00 20 00 50
0920 8.5 IN CL 2004 DF(H) 7 27 157	11% 56	% 33% 43 52% 28 5.1	5.1 10% Y 14.7		1,419 925 23 39% 25%	86 55 31 26 13 40	19 11 30	
0921 9.4 PI CL 2004 WS 9 20 168	22% 11% 67	% 1/ 4.4	4.4 21% Y 12.8	3 12.8 12.8 9.6 0.75 51% 2	2,592 1,352 33 52% 36%	119 62 57 45 25 70	30 17 47	2% 5% *NA 21%
0922 10.1 CB CL 2004 6F 7 35 190	30% 10% 60	% 1/ 4./	4.7 22% Y 15.1	1 15.0 15.0 12.2 0.81 59% 2	2,470 1,490 44 43% 34%	211 126 85 66 46 112	40 32 72	2% 2% 3/% 4%
0923 10.9 GU CL 2004 PP 8 34 42	2/% 18% 9% 45	% 16 4.9	4.9 24% N 18.7	/ 22.6 20.8 13.6 0.65 35%	992 508 34 43% 22%	198 123 75 57 48 104	26 26 52	0% 0% *NA 7%
0924 14.1 VI CL 2004 bF(H) 4 38 368	14% 575	% 29% 30 59% 22 5.2	5.2 19% Y 12.9	9 13.2 13.1 8.4 0.64 64% 2	2,544 1,454 34 45% 34%	114 67 47 38 22 60	2/ 1/ 44	11% 3% 0% 5%
0925 16.5 PI CL 2004 6F / 30 21	63% 25% 13		4./ 2/% 14.2	2 17.0 15.8 10.2 0.65 59% 1	1,543 857 30 39% 4%	130 87 43 31 36 67	4 13 17	5% 20% 69% 10%
0926 16.8 IN CL 2004 bF(H) 5 29 340	24% 6% 47	% 24% 42 75% 26 5.3	5.3 1/% Y 13.5	5 12.8 13.0 8.2 0.63 /1% 2	2,037 1,248 27 45% 22%	90 51 38 32 15 47	1/ 10 2/	0% 1% 0% 2%
0927 28.0 IN CL 2004 bF(H) 6 31 887	4% 965	% 20 5.5	5.5 22% Y 17.5	5 14.4 15.8 9.8 0.62 /2% 2	2,034 1,144 40 54% 54%	166 /1 95 /4 36 110	/1 35 106	3% 1% 0% 19%
0928 25.4 PI CL 2004 rP	100%							
0929 33.8 IN CL 2004 bF(H) 7 33 824	100	20 5.5	5.5 22% Y 14.3	3 15.2 14.8 9.5 0.64 63% 1	1,815 971 31 44% 44%	123 /1 52 41 26 67	41 26 67	2% 2% 0% 13%
0930 34.9 VI CL 2004 bF(H) 5 39 850	4% 965	% 19 5.6	5.6 23% Y 14.3	3 15.1 14.8 9.2 0.62 64% 1	1,922 1,190 33 36% 34%	128 84 44 34 29 63	33 29 62	1% 1% 3% 3%
0931 36.4 PI CL 2004 bF 8 29 200	8% 12% 32% 489	% 14 5.0	5.0 26% Y/N 15.3	3 15.0 15.1 11.0 0.73 60% 1	1,595 1,150 28 29% 16%	126 88 38 28 33 60	13 26 39	2% 1% 69% 6%
0932 40.9 PI CL 2004 bF/rS 7 31 24	20% 16% 36% 20% 8%	6 14 5.3	5.3 28% 18.8	3 18.6 18.7 12.2 0.65 38% 1	1,404 864 38 42% 8%	206 126 79 57 58 115	5 16 62 41	64% 11% 25% 8%
U933 49.1 PI CL 2004 nS 9 29 220	36% 8% 4% 52	% 12 5.2	5.2 30% Y/N 15.2	2 13.0 13.9 10.0 0.72 60% 2	2,2/1 1,428 34 45% 25%	144 /6 68 47 43 90	25 24 49	15% 5% *NA 5%
<sup>-</sup> Ownership: CL=Crown Leased								*NA= Not

<sup>1</sup>Ownership: CL=Crown Leased

<sup>2</sup>Main Species: bF=Balsam Fir, bF(H)=Balsam Fir (highlands), nS=Norway Spruce, rP=Red Pine, rS=Red Spruce, TL=Eastern Larch, wS=White Spruce, xS=Red and Black Spruce (mixed stand)

<sup>3</sup>LC: Land Capability is a measure of site productivity and is explained in the Nova Scotia Forestry Field Handbook (NSDNR 1993).

<sup>4</sup>Sample Size: Some stands have a small sample size (does not include stumps). A plot was established (trees measured) if it was treated or partially treated. Those stands that had a lot of area clearcut, not treated, untreatable, and only trails will have a small sample size.

<sup>5</sup>%CC (reason for clearcut): Partial Harvest=0908, 0913; Salvage (reason unknown)= 0902, 0910, 0917, 0919, 0932; Salvage (sirococcus)=0928

<sup>6</sup>% BWA: Balsam Woolly Adelgid

applicable

Appendix 1(continued):	Plots	Partially Treated Plots Leave Strips and Trail	s DBH & Height & Crown # Stems Basal Area Merchantable Volume	Wind Damage
Commercial thinning survey.			Treated Leave Strips Treated Areas All Areas	
Sampl	e %	% leave % strip Leave % of	% BAR %BAR After Avg. After treated all CT Cut Cut Cut	
Ow Age Size	Not % Un % %	Part. Leave not Strip Trail Stand	DBH DBH Hei- Avg. Live CT Before areas areas Before (leave (leave (leave Cut Cut (leave Cut Cut Cut Cut Cut Cut	Blow- Broken %
Stand Area Coun- ner- Year Spe- @ (#	trea- trea- Only Treat	t- Treat- Strip treat- Width Width in Ghos	t (Cut) (Left) (all) ght h/d Crown Before (leave CT (leave (leave CT strip) strips) strip) (trail) (total) strips) (trails) (total) (CC)	down tops Harv.
ID (ha) ty ship <sup>1</sup> CT'ed cies <sup>2</sup> LC <sup>3</sup> CT Trees)	<sup>4</sup> % CC <sup>5</sup> ted table trails ed	ed (m) ed (m) (m) Trails Trail	s (cm) (cm) (cm) (m) Ratio Ratio CT strip) (m²/ha) strip) strip) (m²/ha) (m³/ha) (ma) (ma) (ma) (ma) (ma) (ma) (ma) (m	(% BA) (% BA) Dam.
1001 2.2 LU SP 2005 rS 9 51 152	20% 80%	6 23 4.3 16%	15.9     18.1     17.3     16.3     0.94     35%     2,132     1,362     50     31%     31%     328     235     93     78     52     130     63     42     104	0% 0% 1%
1002 2.3 LU SP 2004 rS 76 6	40% 20% 20% 20%	8 3.7 33%	15.2     18.4     16.7     17.6     1.05     39%     2,600     1,200     57     44%     49%     381     220     161     108     126     234     22     50     72     152	0% 4% 0%
1003 2.3 LU SP 2005 rS 7 60 65	40% 60%	6 20 4.5 19%	15.2     18.1     17.2     14.6     0.85     43%     1,565     1,038     36     26%     26%     223     168     55     45     42     87     27     25     52     89	0% 2% 0%
1004 2.3 CU SP 2005 bS 5 66 133	1009	% 16 4.8 23%	14.2     17.2     15.8     13.6     0.86     38%     2,468     1,244     48     40%     40%     281     179     101     78     64     142     78     64     142	4% 5% 8%
1005 2.6 LU SP 2004 rS 6 66 118	1009	% 17 4.3 20%	15.9 18.5 17.3 15.7 0.91 35% 2,344 1,224 55 40% 40% 356 222 135 107 72 180 107 72 180	0% 1% 1%
1006 2.6 LU SP 2005 rS 6 70 62	80%	% 20% 17 59% 14 3.8 21%	14.9     20.3     17.3     15.5     0.89     44%     2,244     940     53     42%     38%     340     207     133     105     72     176     93     70     163	1% 5% 0%
1007 2.7 QU SP 2004 rS 5 69 53	20% 80%	% *NDT	15.4 18.0 16.6 14.4 0.87 46% 1,600 662 35 51% 41% 197 100 97 97 0 97 78 0 78	7% 9% 2%
1008 2.8 YA SP 2005 rS	100%			
1009 2.9 CU SP 2004 rS 6 46 73	40% 40%	% 20% 27 65% 23 4.5 16%	13.9     15.0     14.6     12.7     0.87     54%     1,846     1,123     31     35%     17%     162     106     57     47     27     74     22     15     38	3% 0% 3%
1010 3.1 QU IM 2004 rS 7 53 28	20% 80%	6 10 5.2 35%	17.1 19.1 17.9 14.9 0.83 51% 2,110 844 53 54% 54% 340 163 177 116 118 233 92 94 187	3% 0% 11%
1011 3.2 DI SP 2004 rS 7 58 60	20% 20% 60%	6 23 5.7 20%	13.1       19.6       15.6       16.0       1.03       48%       2,522       832       48       47%       47%       298       177       120       97       58       155       58       35       93       60	0% 0% 3%
1012 4.9 QU SP 2004 rS 6 77 36	1009	% *NDT	16.9       30.0       21.5       16.2       0.75       52%       1,250       360       46       43%       44%       312       203       109       109       0       109       0       109	0% 9% 0%
1013 5.3 PI SP 2005 rP	100%			
1014 5.3 DI SP 2005 rS 5 73 44	40% 60%	6 16 3.6 19%	16.7       21.9       19.6       16.2       0.83       55%       1,434       733       43       35%       35%       290       194       96       78       54       132       47       33       79       116	0% 0% 2%
1015 5.8 DI SP 2004 rS 5 120 74	1009	% *NDT	29.6       32.0       30.8       20.1       0.65       51%       646       309       48       48%       48%       395       203       192       192       0       192       192       0       192	4% 0% 0%
1016 6.6 DI SP 2005 rS 6 64 61	14% 86%	11 3.3 24%	14.3     19.6     17.7     14.9     0.84     52%     1,776     1,072     44     25%     266     206     60     46     64     110     39     55     94	2% 2% 0%
1017 6.6 HX CR 2005 rS 4 68 89	14% 14% 14% 43%	% 14% 50 80% 37 4.3 11% Y	13.2       18.1       15.8       13.7       0.87       38%       2,446       1,196       48       36%       19%       278       195       84       75       29       104       34       20       54	22% 2% 15%
1018 6.9 QU IM 2004 rS 7 51 63	14% 14% 71%	13 5.0 27%	20.1       21.7       21.0       15.2       0.72       49%       1,204       716       42       36%       30%       260       162       98       72       70       142       51       50       101       37	1% 0% 10%
1019 7.6 QU SP 2005 wP 6 55 80	25% 13% 63%	% 15 6.4 30% N	20.0 19.6 19.7 15.7 0.80 46% 1,061 745 32 31% 26% 208 146 62 44 62 106 27 47 74	0% 3% 3%
1020 7.7 QU IM 2005 rS 6 47 83	13% 13% 13% 38%	% 25% 17 48% 16 4.8 23% N	17.2 16.3 16.6 12.6 0.76 47% 1,761 1,238 38 31% 18% 209 141 68 52 48 100 27 36 62	2% 0% 2%
1021 8.2 DI SP 2004 rS 6 55 74	25% 75%	6 15 5.2 26%	12.6 18.6 16.1 13.5 0.83 59% 1,985 1,072 41 28% 28% 226 176 50 37 59 96 28 45 72	0% 0% 0%
1022 8.5 PI SP 2004 rS	100%			
1023 10.2 DI IM 2005 rS 7 71 94	10% 90%	12 4.4 27%	12.3 20.3 16.9 14.8 0.88 52% 1,817 933 41 25% 26% 240 197 43 31 65 97 28 59 87	2% 7% 1%
1024 11.2 SH SP 2005 wP 5 64 26	36% 18% 46%	% *NDT	31.1 21.6 26.4 17.7 0.67 42% 980 520 54 65% 80% 393 118 275 275 0 275 126 0 126 141	9% 17% 0%
1025 11.7 YA SP 2004 rS 8 50 96	25% 75%	6 13 5.7 31%	15.0 20.8 17.4 13.7 0.79 52% 2,031 753 48 46% 47% 284 164 120 83 88 171 62 66 128	2% 1% 2%
1026 11.9 QU SP 2005 wP 7 52 169	17% 83%	<sup>6</sup> 13 4.0 24%	14.1 17.3 15.9 14.8 0.93 43% 2,123 1,158 42 35% 36% 242 164 79 60 58 118 50 48 98	0% 4% 0%
1027 11.9 CO CR 2005 rS 4 114 89	8% 25% 50%	% 17% 17 42% 17 4.9 23%	14.3 20.4 18.4 16.1 0.87 31% 1,645 1,039 44 22% 15% 299 244 54 42 68 110 25 62 87	19% 8% 15%
1028 12.6 QU IM 2004 rS 7 56 55	1009	% *NDT	19.7 24.0 21.4 17.4 0.81 49% 1,115 423 40 51% 52% 283 146 137 137 0 137 137 0 137	0% 0% 7%
1029 13.4 HX CR 2004 rS 5 70 157	23% 69%	% 8% 28 46% 26 4.5 15% Y	15.1 19.3 17.2 13.8 0.80 45% 1,962 928 46 40% 39% 275 173 102 87 41 128 64 31 95	10% 2% 3%
1030 15.5 QU IM 2004 rS 7 59 204	13% 63%	% 25% 20 50% 18 5.9 25% N	18.9       20.2       19.8       15.1       0.76       55%       1,220       873       38       26%       19%       246       184       62       47       60       107       35       59       94	8% 5% 5%
1031 15.7 AP IM 2005 rS 7 59 229	20% 7% 53%	% 20% 27 67% 18 5.7 24% N	20.9       19.3       19.7       15.3       0.78       40%       1,643       1,230       50       27%       21%       330       234       96       73       79       152       44       59       103	6% 9% 10%
1032 18.4 HN IM 2005 rS 8 58 132	33% 17% 6% 33%	% 11% 19 42% 15 5.3 26% N	16.5     20.1     18.7     15.8     0.84     44%     1,746     1,043     48     30%     26%     319     227     93     68     83     152     27     40     67     105	24% 7% 7%
1033 19.8 AP IM 2005 rS 4 51 51	5% 10% 24% 5%	57% 20 59% 21 5.6 21% N	19.4       17.4       18.3       15.0       0.82       39%       2,132       1,169       56       49%       16%       359       174       185       146       75       221       41       67       108	2% 5% 4%
1034 21.4 AP IM 2005 rS 5 68 101	5% 19% 38% 24%	% 14% 16 62% 13 5.8 31% N	18.5       18.4       18.4       13.1       0.71       52%       1,474       1,087       39       26%       10%       226       166       60       42       71       112       12       52       65	2% 2% 4%
1035 23.4 HX CR 2005 rS 5 90 262	4% 4% 78%	% 13% 15 60% 14 4.5 24% N	15.8       20.1       18.2       15.1       0.83       45%       1,694       917       44       34%       30%       284       195       89       67       68       136       56       62       118	18% 7% 5%
1036 38.7 HX CR 2005 rS 5 66 526	4% 76%	% 20% 24 63% 20 4.5 19% Y	13.1       15.9       14.6       13.4       0.92       35%       3,178       1,720       53       36%       32%       294       198       96       78       55       133       65       51       116	11% 2% 16%
1037 43.6 AP IM 2004 rS 5 69 131	17% 8% 13% 42%	% 21% 21 55% 15 5.6 27% N	19.6 19.0 19.2 13.2 0.69 52% 1,323 875 38 35% 20% 223 144 79 58 60 118 30 43 72	5% 2% 11%
1038 45.8 QU IM 2005 rS 5 64 179	12% 24% 20%	% 44% 17 45% 19 5.5 22% N	16.7 17.0 16.9 14.8 0.87 34% 2,194 1,487 49 31% 16% 304 208 96 74 68 142 32 62 94	5% 5% 5%
71 844.3		26 56% 18 5 22%	16.0 17.7 16.8 13.0 0.77 51% 1,858 1,040 39 40% 32% 221 139 82 66 45 111 45 34 79	6% 4% 6%

<sup>1</sup>Ownership: CL=Crown Leased, CR=Crown, IM=Industrial, SP=Small Private

\*NDT: No discernable trails

<sup>2</sup>Main Species: bS=Black Spruce, rP=Red Pine, rS=Red Spruce, wP=White Pine

<sup>3</sup>LC: Land Capability is a measure of site productivity and is explained in the Nova Scotia Forestry Field Handbook (NSDNR 1993).

<sup>4</sup>Sample Size: Some stands have a small sample size (does not include stumps). A plot was established (trees measured) if it was treated or partially treated. Those stands that had a lot of area clearcut, not treated, untreatable, and only trails will have a small sample size.

<sup>5</sup>%CC (reason for clearcut): Partial Harvest=1002, 1007, 1024, 1028; Salvage (reason unknown)= 1003, 1008, 1011, 1014, 1022; Salvage (sirococcus)=1013; Salvage (blow-down)=1018, 1032

## **Red Spruce**



Appendix 2. The diameter increment of commercially thinned red spruce before and after thinning categorized by DBH class and age class. Sample sizes are shown in parentheses (n).



Appendix 2 continued. The diameter increment of commercially thinned red spruce before and after thinning categorized by DBH class and age class. Sample sizes are shown in parentheses (n).

## Balsam Fir



Appendix 3. The diameter increment of commercially thinned balsam fir before and after thinning categorized by DBH class and age class. Sample sizes are shown in parentheses (n).

-			-	~							~										
Λ.	anondiv	Λ.	Cummon	1 of 1	hain	damag	s hi	r cita	and	rick	tactore	Icortor	lin.	ordor	<u>-+</u>	mont	+~	loact	wind	damag	701
м	JUEHUIX	4.	Summary	voiv	viriu	uamage	- 01	sile	anu	LISK	Tactors	isonet		oruer	OL.	HIUST	ιO	ieast	winu	uamae	201
							/														

b       b								Pocke	ts of se	vere												
LineLi					Wind Da	mage		wind	d dama	ge		Soi	ls <sup>1</sup>			Site Characteristics						
b       i			Sample					(%	of stan	d)								Dee				
bin       bin <td></td> <td>_</td> <td>Size</td> <td>Blow-</td> <td>Stem</td> <td>Wind</td> <td>Area</td> <td></td> <td></td> <td></td> <td>Soil Types</td> <td>S-</td> <td></td> <td>G-</td> <td>Root-</td> <td></td> <td></td> <td>Slope</td> <td>Eleva</td> <td>Pre-</td> <td>Avg.</td> <td></td>		_	Size	Blow-	Stem	Wind	Area				Soil Types	S-		G-	Root-			Slope	Eleva	Pre-	Avg.	
10       10       10       000       1000       000       000       1000 <td>Stand</td> <td>Spe-</td> <td>(#</td> <td>down</td> <td>Breakage</td> <td>Damage</td> <td>Sal-</td> <td>25-49%</td> <td>50+%</td> <td>25+%</td> <td>(listed in order</td> <td>Phase</td> <td>Limita-</td> <td>Phase</td> <td>ing</td> <td>F</td> <td>Cut</td> <td>Slope</td> <td>tion</td> <td>vious</td> <td></td> <td>0/ 0 4 0</td>	Stand	Spe-	(#	down	Breakage	Damage	Sal-	25-49%	50+%	25+%	(listed in order	Phase	Limita-	Phase	ing	F	Cut	Slope	tion	vious		0/ 0 4 0
Disp       Disp <thdisp< th="">       Disp       Disp       <thd< td=""><td></td><td>cres</td><td>trees)</td><td>(% BA)</td><td>(%BA)</td><td>(%BA)</td><td>vage</td><td>OT BA</td><td>OT BA</td><td>OT BA</td><td>of frequency)</td><td>SOILS</td><td>tions</td><td>Solis</td><td>Depth</td><td>Exp.</td><td>Edge</td><td>P05.</td><td>(m)</td><td>ireat.</td><td>Ratio</td><td>% BAR</td></thd<></thdisp<>		cres	trees)	(% BA)	(%BA)	(%BA)	vage	OT BA	OT BA	OT BA	of frequency)	SOILS	tions	Solis	Depth	Exp.	Edge	P05.	(m)	ireat.	Ratio	% BAR
b)	0932	bF/rS	24	64%	11%	/5%	20%		50%	50%	513,2		Imperfect		26	M	Y	F	200	PCI	0.70	42%
1212       6       12       13       24       33       12       243       33       14       240       33       14       14       14       14       14       14       14       14       14       14       14       14       14       15       13       14       14       15       14       14       15       14       14       15       14       14       15       14       15	0906	bF	110	27%	5%	32%	224	50%		50%	ST3, 2-S	S	Imperfect		32	M	.,	L	131	РСТ	0.79	40%
121/       0      0       0       0	1032	rS	132	24%	7%	31%	33%	11%	22%	33%	ST2,2-G,15-G,3-G		Shallow	G	*40	ME/E	Y	M-H	127		0.84	30%
1242       107       258       108       70       258       108       70       107       108       107       108       107       108       107       108       107       108       107       108       107       108       107       108       108       107       108       108       108       107       108       108       108       108       107       108       108       108       107       108	1027	rS	89	19%	8%	26%		<b>2</b> 2 2 4	25%	25%	ST2,3				40	M		M	41		0.87	22%
1313   5.   2.0.   158   2.9.   <	1024	WP	26	9%	1/%	26%		20%	20%	40%	S12,3,2-G			G	30	M/MS		M	44		0.67	65%
bbs       bbs <td>1035</td> <td>rS</td> <td>262</td> <td>18%</td> <td>7%</td> <td>25%</td> <td></td> <td>33%</td> <td>14%</td> <td>47%</td> <td>ST2, 2-S</td> <td>S</td> <td></td> <td></td> <td>35</td> <td>ME/M</td> <td>Y</td> <td>M</td> <td>182</td> <td>РСТ</td> <td>0.83</td> <td>34%</td>	1035	rS	262	18%	7%	25%		33%	14%	47%	ST2, 2-S	S			35	ME/M	Y	M	182	РСТ	0.83	34%
1111   5   38   2.94 <td< td=""><td>0925</td><td>bF</td><td>21</td><td>5%</td><td>20%</td><td>24%</td><td></td><td></td><td>50%</td><td>50%</td><td>ST9</td><td></td><td>Imperfect</td><td></td><td>26</td><td>M</td><td></td><td>M/U</td><td>194</td><td></td><td>0.65</td><td>39%</td></td<>	0925	bF	21	5%	20%	24%			50%	50%	ST9		Imperfect		26	M		M/U	194		0.65	39%
0333   05   20   15%   5%   15%   9%   15%   23%   174   1	1017	rS	89	22%	2%	24%		20%	20%	40%	ST2-L, 2-S	S			23	ME		U	157	РСТ	0.87	36%
0909   0909   0909   0909   0909   070   5   30   M   P   39   P. 10   0   0   0      0318   65   178   9%   15%   15%   15%   5   5   1   M   1   1   0   2   M   0   1   0 <td>0933</td> <td>nS</td> <td>220</td> <td>15%</td> <td>5%</td> <td>21%</td> <td></td> <td>8%</td> <td>15%</td> <td>23%</td> <td>ST2</td> <td></td> <td></td> <td></td> <td>50</td> <td>М</td> <td></td> <td>L/F</td> <td>183</td> <td>Plant.</td> <td>0.72</td> <td>45%</td>	0933	nS	220	15%	5%	21%		8%	15%	23%	ST2				50	М		L/F	183	Plant.	0.72	45%
1007       85       33       75       95       155       507       572       5       3       M       F       73       0.07       31.8         1031       65       226       66       95       11.5       28       155       155       5       5       1       M       10.1 </td <td>0903</td> <td>bF</td> <td>89</td> <td>10%</td> <td>9%</td> <td>19%</td> <td></td> <td>20%</td> <td></td> <td>20%</td> <td>ST2-L, 3-L</td> <td></td> <td></td> <td></td> <td>32</td> <td>M</td> <td></td> <td>F</td> <td>159</td> <td>РСТ</td> <td>0.74</td> <td>48%</td>	0903	bF	89	10%	9%	19%		20%		20%	ST2-L, 3-L				32	M		F	159	РСТ	0.74	48%
0218       07       19       94       74       154       75       5       5       32       M       P       154       PC       0.00       27         1036       65       526       11%       2%       15%       15%       15%       15%       5        15       M       V       L       151       VC       028       2         1030       65       204       15%       55       15%       5        25       L       M       L       158       PC       028       45       10.0       45       35       10.0	1007	rS	53	7%	9%	16%		50%		50%	ST2				42	MS		L	73		0.87	51%
1331       6''       29'       6''       9''       19''       19''       19''       19''       19''       19''       19''       10'''       10'''       10''' <th< td=""><td>0918</td><td>bF</td><td>178</td><td>9%</td><td>7%</td><td>15%</td><td></td><td></td><td></td><td></td><td>ST2-S</td><td>S</td><td></td><td></td><td>32</td><td>М</td><td></td><td>F</td><td>154</td><td>РСТ</td><td>0.69</td><td>49%</td></th<>	0918	bF	178	9%	7%	15%					ST2-S	S			32	М		F	154	РСТ	0.69	49%
1308       65       55       55       35       MM       V       L       15       CP       0.02       36.         1303       65       55       130       65       55       130       135       135       135       135       136       137       137       137       75	1031	rS	229	6%	9%	15%		33%		33%	ST2-G,2,3-G,3			G		ME		U/M	196		0.78	27%
0224   05*   36*   36*   36*   36*   36*   36*   36*   36*   36*   76* </td <td>1036</td> <td>rS</td> <td>526</td> <td>11%</td> <td>2%</td> <td>14%</td> <td></td> <td>12%</td> <td>16%</td> <td>28%</td> <td>ST2-L,3-L, 2-S</td> <td>S</td> <td></td> <td></td> <td>35</td> <td>M/ME</td> <td>Y</td> <td>L</td> <td>151</td> <td>РСТ</td> <td>0.92</td> <td>36%</td>	1036	rS	526	11%	2%	14%		12%	16%	28%	ST2-L,3-L, 2-S	S			35	M/ME	Y	L	151	РСТ	0.92	36%
1030   105   204   88   58   10   2.8   10   7   10   7.0   2.8   10.0	0924	bF	368	11%	3%	13%		8%	8%	16%	ST2-S	S			25	E		H/U	437	РСТ	0.64	45%
1029   is   157   10%   17% </td <td>1030</td> <td>rS</td> <td>204</td> <td>8%</td> <td>5%</td> <td>13%</td> <td></td> <td></td> <td>7%</td> <td>7%</td> <td>ST2-L,2L-S</td> <td>S</td> <td></td> <td></td> <td>26</td> <td>М</td> <td></td> <td>F</td> <td>106</td> <td>РСТ</td> <td>0.76</td> <td>26%</td>	1030	rS	204	8%	5%	13%			7%	7%	ST2-L,2L-S	S			26	М		F	106	РСТ	0.76	26%
1004   67   21   67   54   54   64   161	1029	rS	157	10%	2%	12%		17%		17%	ST2,3,4				22	ME/M	Y	M/U	180	РСТ	0.80	40%
1018   rs   1.79   5.8   5.8   5.9   9.8   9.8   9.8   9.8   206   7.2   7.8   7.8   0.0	0904	rP	21	0%	11%	11%					ST2-L				30	M/MS		F	161	Plant.	0.75	50%
1012   rb   3.6   0.8   9.8   0.8   2.08   7.2   5.7   3.0   0.8.6   0.8.6   0.8.6   0.9.7     1023   r.5   9.4   2.8   7.8   9.8   2.8   102   1.0 <t< td=""><td>1038</td><td>rS</td><td>179</td><td>5%</td><td>5%</td><td>10%</td><td></td><td>19%</td><td></td><td>19%</td><td>ST2</td><td></td><td></td><td></td><td>30</td><td>MS</td><td></td><td>L</td><td>106</td><td></td><td>0.87</td><td>31%</td></t<>	1038	rS	179	5%	5%	10%		19%		19%	ST2				30	MS		L	106		0.87	31%
1004       105       133       4%       5%       9%       107	1012	rS	36	0%	9%	9%		20%		20%	ST2				42	М		U	78		0.75	43%
1022   rs	1004	bS	133	4%	5%	9%					ST2				30	MS		М	103		0.86	40%
1970       197       157       157       158       158       158       157       258       172       258       172       258       172       258       172       258       172       178 <td>1023</td> <td>rS</td> <td>94</td> <td>2%</td> <td>7%</td> <td>9%</td> <td></td> <td>10%</td> <td>10%</td> <td>20%</td> <td>ST2</td> <td></td> <td></td> <td></td> <td>48</td> <td>MS</td> <td></td> <td>L/M</td> <td>109</td> <td></td> <td>0.88</td> <td>25%</td>	1023	rS	94	2%	7%	9%		10%	10%	20%	ST2				48	MS		L/M	109		0.88	25%
1037   rs   131   95   134   95   75   28   97   66   66   72,2,3,3   6   20   M   U   237   0,03   35     1033   rs   168   28   58   78   17   178   87   37.3   38   M   U   237   0.05   32.4     1006   rs   6.2   18   58   78   17   178   174   178   174   178   174   178   174   178   174   178   174   178   174   178   174   178   174   178   174   178   174   178   173,3   58   174   188   174   188   174   184   174   187   174   184   174   187   174   187   174   187   174   187   174   187   174   187   174   184   174   184	0907	bF	57	3%	4%	8%		25%		25%	ST2-L				38	MS		F/L	200		0.67	47%
1023       rs       51       25%       75%	1037	rS	131	5%	2%	7%		6%		6%	ST2, 2-G,3,3-G			G	20	М		U	237	РСТ	0.69	35%
921     ws     158     2%     5%     7%     17%     17%     17%     574     38     M     F,1     19     0,3     32       1006     181     2%     5%     5%     5%     574     32     0,0     12     12     2%     3%     5%     572     573     570     40     14%     0%     4%     4%     572,31.5     Snallow     40     M     F     6     2     0.65     4%       1026     169     169     2%     4%     4%     9%     572,32,63-63,40     6     43     M/ME     1     15     0.10     4%       0227     167     07     2%     4%     4%     572,42-63-63,40     6     43     M/ME     1     15     0.10     4%       0227     167     387     3%     4%     4%     572,42-36     2     28     M/ME     1     15     0.01     43     10.0     44     10.0     44     10.0     44     10.0     10.0     10.0     10.0     10.0     10.0     10.0	1033	rS	51	2%	5%	7%		8%	8%	16%	ST2-G,3-G			G	39	M/ME		U	229		0.82	49%
1006   rs   6.2   1.9%   5%   6%   572,3;5   5hallow   27   6   30   M/ME   10   28   77     1034   rS   101   2%   2%   4%   4%   572,3;5   Shallow   64   31   M/ME   10   28   78   103   78   101   2%   4%   4%   9%   572,3;5   Shallow   38   MS   1   28   78   103   35%     1026   16%   190   2%   4%   4%   9%   572   15   38   MS   1   10   15   10   15   10   10   4%   4%   572   10   28   10   10   4%   10 <t< td=""><td>0921</td><td>wS</td><td>168</td><td>2%</td><td>5%</td><td>7%</td><td></td><td>17%</td><td></td><td>17%</td><td>ST8</td><td></td><td></td><td></td><td>38</td><td>М</td><td></td><td>F/L</td><td>199</td><td></td><td>0.75</td><td>52%</td></t<>	0921	wS	168	2%	5%	7%		17%		17%	ST8				38	М		F/L	199		0.75	52%
9911   i>F   181   2%   3%   5%   578   :   27   E   Y   F   32   .   070   2%     1015   r'S   74   4%   0%   4%   .   572,3,15   Shallow   40   M   I   V   I   2   V   102   .   2%   4%   .   572,3,15   Shallow   40   M   V   U   28   V   U   28   V   U   28   V   U   10   2%   3%   3%   3%   3%   3%   3%   3%   1%   2%   2%   3%   3%   1%   10   4%   10   10   4%   10   10   10   10   4%   10   10   4%   10   10   4%   10   10   4%   10   10   4%   10   10   4%   10   10   4%   10 <td>1006</td> <td>rS</td> <td>62</td> <td>1%</td> <td>5%</td> <td>6%</td> <td></td> <td></td> <td></td> <td></td> <td>ST2-L,3-G</td> <td></td> <td></td> <td>G</td> <td>30</td> <td>ME</td> <td></td> <td>U</td> <td>143</td> <td>РСТ</td> <td>0.89</td> <td>42%</td>	1006	rS	62	1%	5%	6%					ST2-L,3-G			G	30	ME		U	143	РСТ	0.89	42%
1015     rS     74     4%     0%     4%     4%     572,3,2,6,3-6,4     6     6     43     M/M     Q     98 </td <td>0911</td> <td>bF</td> <td>181</td> <td>2%</td> <td>3%</td> <td>5%</td> <td></td> <td></td> <td></td> <td></td> <td>ST8</td> <td></td> <td></td> <td></td> <td>27</td> <td>E</td> <td>Υ</td> <td>F</td> <td>32</td> <td></td> <td>0.70</td> <td>27%</td>	0911	bF	181	2%	3%	5%					ST8				27	E	Υ	F	32		0.70	27%
1014     r.S     101     2%     2%     4%     9%     9%     572,3,2,6,3,-6,4     G     43     M/M<     0     2.88     PCT     0.73     35%       1022     0F     169     0%     4%     4%     9%     572     572     30     6     7     6     7     7     7     100     4%       0022     0F     887     3%     1%     4%     571     28     M/M     7     1.0     4%       0927     0F     887     3%     1%     4%     571     27.3     28     1.0     1.0     4%     28     1.0     1.0     4%     28       0929     0F     824     2%     2%     4%     4%     572     23     4     MS     7     3.8     0%     38     0%     38     0%     38     0%     1.0     7     3.8     0%     38     0%     38     0%     38     0%     1.0     7     3.8     0%     1.0     1.0     1.0     1.0     1.0     1.0     1.0 <t< td=""><td>1015</td><td>rS</td><td>74</td><td>4%</td><td>0%</td><td>4%</td><td></td><td></td><td></td><td></td><td>ST2,3,15</td><td></td><td>Shallow</td><td></td><td>*40</td><td>м</td><td></td><td>F</td><td>62</td><td></td><td>0.65</td><td>48%</td></t<>	1015	rS	74	4%	0%	4%					ST2,3,15		Shallow		*40	м		F	62		0.65	48%
1026     wP     169     0%     4%     4%     9%     ST2     38     MS     Y     L     97     0.33     35%       0922     bF     190     2%     2%     4%     4%     572     30     L     V     L     100     4%       0927     bF     887     3%     1%     4%     571     28     M/M     V     L     10.0     4%       0929     bF     824     2%     2%     4%     4%     ST2     27     24     K     10.0     4%       0911     bF     23     3%     0%     3%     4%     572.4     21     16     1.0	1034	rS	101	2%	2%	4%					ST2,3,2-G,3-G,4			G	43	M/ME		U	238	РСТ	0.71	26%
992   bf   190   2%   2%   4%   572   30   E   F   81   0.01   4%     907   bF   887   3%   1%   4%   571   28   M/ME   1/U   1/U   1/U   1/U   4/V   4/V </td <td>1026</td> <td>wP</td> <td>169</td> <td>0%</td> <td>4%</td> <td>4%</td> <td></td> <td></td> <td>9%</td> <td>9%</td> <td>ST2</td> <td></td> <td></td> <td></td> <td>38</td> <td>MS</td> <td>Y</td> <td>L</td> <td>97</td> <td></td> <td>0.93</td> <td>35%</td>	1026	wP	169	0%	4%	4%			9%	9%	ST2				38	MS	Y	L	97		0.93	35%
1002     rS     6     0%     4%     4%       0927     bF     887     3%     1%     4%     572,3     23     E     H/U     417     PCT     0.62     548       0927     bF     824     2%     2%     4%     4%     572,3     23     E     H/U     45     PCT     0.62     548       0912     bF     220     2%     1%     3%     572-L     23     E     H/U     45     PCT     0.63     2%       0912     bF     23     3%     0%     3%     ST2-L     23     M     F     16     0.77     538       1010     rS     28     3%     0%     3%     ST2-L     21     M     F     10     0.77     538       1010     rS     28     3%     0%     3%     ST2     11     M     V     U     10     10.7     0.8     543       1010     rS     850     1%     1%     2%     ST2-L3-L     24     M     M     10.6     55.6 <td>0922</td> <td>bF</td> <td>190</td> <td>2%</td> <td>2%</td> <td>4%</td> <td></td> <td></td> <td></td> <td></td> <td>ST2</td> <td></td> <td></td> <td></td> <td>30</td> <td>E</td> <td></td> <td>F</td> <td>81</td> <td></td> <td>0.81</td> <td>43%</td>	0922	bF	190	2%	2%	4%					ST2				30	E		F	81		0.81	43%
927   bF   887   3%   1%   4%   572,3   23   E   H/U   417   PCT   0.62   5%     929   bF   824   2%   2%   4%   4%   572   23   47   MS   L   L   10   0.3   2%     991   bF   200   2%   1%   3%   572   23   E   H/U   48   PCT   0.73   2%     991   bF   233   3%   0%   3%   572-L   23   M   F   18   F   0.73   2%     1009   r5   73   3%   0%   3%   571   21   M   F   38   PCT   0.87   3%     1019   r5   86   2%   1%   3%   572-L   24   40   M   F   0   7   0.8   3%     1019   r5   86   2%   1%   3%   572-L   24   24   E   U   0   0.7   0.7   0.8     1025   r5   96   2%   1%   3%   572-L   24   40   M   U   V   0.6   5.5     1025 <td< td=""><td>1002</td><td>rS</td><td>6</td><td>0%</td><td>4%</td><td>4%</td><td></td><td></td><td></td><td></td><td>ST1</td><td></td><td></td><td></td><td>28</td><td>M/ME</td><td>Y</td><td>L</td><td>115</td><td>РСТ</td><td>1.00</td><td>44%</td></td<>	1002	rS	6	0%	4%	4%					ST1				28	M/ME	Y	L	115	РСТ	1.00	44%
1016   rs   6.1   2%   2%   4%   4%   4%   572   23   6   H/U   45   7CT   0.64   4%     0912   bF   23   2%   2%   4%   4%   572   23   6   H/U   45   7CT   0.64   4%     0912   bF   23   3%   0%   3%   572-L   23   M   F   10   10   7C   53%     1009   rS   73   3%   0%   3%   572-L   21   M   F   38   PCT   0.73   3%     1010   rS   28   3%   0%   3%    ST2-L   21   M   F   38   PCT   0.83   5%     1010   rS   28   3%   0%   3%   ST2-L   24   E   U   10   10   0.83   3%     1020   rS   850   1%   1%   3%   ST2-L   24   E   U   40   M   U   17   1.63   5.65     1020   rS   83   2%   0%   2%   ST2-L   ST2   35   M   U   17   0.65   5%	0927	bF	887	3%	1%	4%					ST2,3				23	E		H/U	417	РСТ	0.62	54%
0929     bF     824     2%     2%     4%     4%     5T2     23     E     H/U     445     PCT     0.73     2%       0911     bF     200     2%     1%     3%     5T2-L     44     MS     L     129     PCT     0.73     2%       0912     bF     23     3%     0%     3%     5T2-L     23     M     F     16     0.77     3%       1009     rS     28     3%     0%     3%     ST2-L     21     M     F     18     PCT     0.87     35%       1010     rS     28     3%     0%     3%     ST2     31     M     Y     U     0.77     0.8     36%       1019     wP     80     0%     3%     3%     ST2-L     24     M     M     4.8     707     0.63     36%       1025     rS     68     2%     0%     2%     ST2-L     35     M     HU     1.60     70     6.8     36%       1020     rS     83     2%	1016	rS	61	2%	2%	4%					ST2				47	MS		L	120		0.84	25%
0931     bF     200     2%     1%     3%     5T2-L     44     MS     L     1.2     PCT     0.73     29%       0912     bF     23     3%     0%     3%     5T2-L     23     M     F     1.62     0.77     53%       1009     rS     73     3%     0%     3%     5T2-L     23     M     F     38     PCT     0.87     35%       1019     wF     80     0%     3%     3%     5T2     M     W     U     107     0.83     55%       1019     wF     850     1%     1%     3%     ST2     M     W     U     469     PCT     0.63     36%       1020     rS     83     2%     0%     2%     572-L     40     MS     F     0.65     54%       1020     rS     83     2%     0%     2%     2%     40%     ST2-L     38     E     H     0.4     PCT     0.65     54%       1020     rS     118     0%     1%     1%	0929	bF	824	2%	2%	4%		4%		4%	ST2				23	E		H/U	445	РСТ	0.64	44%
0912     bF     23     3%     0%     3%     572-L     23     M     F     166     0.77     53%       1009     rS     73     3%     0%     3%     571     21     M     F     38     PCT     0.87     35%       1010     rS     28     3%     0%     3%     572     31     M     Y     0     0.87     35%       1019     wP     80     0%     3%     3%     572     24     E     0     469     PCT     0.62     36%       1025     rS     96     2%     1%     2%     572-L     40     M     H     0     67     PCT     0.62     36%       1025     rS     96     2%     0%     2%     572-L     35     34     MS     F     06     PCT     0.62     36%       1020     rS     38     2%     2%     2%     572-L     38     E     H     39     PCT     0.63     36%       1030     rS     18     0%     1%	0931	bF	200	2%	1%	3%					ST2-L				44	MS		L	129	РСТ	0.73	29%
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	0912	bF	23	3%	0%	3%					ST2-L				23	м		F	166		0.77	53%
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	1009	rS	73	3%	0%	3%					ST1				21	м		F	38	РСТ	0.87	35%
1019     W     80     0%     3%     3%     5T2     M     L     10     400     3%       0930     bF     850     1%     1%     3%     ST2     Z4     E     U     469     PCT     0.63     3%       0930     bF     850     1%     1%     3%     ST2     Z4     E     U     469     PCT     0.63     3%       1025     rS     96     2%     0%     2%     ST2-L     40     M     M     67     PCT     0.63     46%       0915     rP     68     2%     0%     2%     ST2-L     40     M     M     67     PCT     0.63     45%       1003     rS     65     0%     2%     2%     0%     ST2     M     M     M     6.5     54%       1003     rS     65     0%     2%     2%     40%     ST2     M     M     4.6     ST2       1003     rS     118     0%     1%     1%     ST2     ST2     M     M	1010	rS	28	3%	0%	3%					ST2				31	м	Y	U	107	-	0.83	54%
0930bF8501%1%3%ST2-L24EU469PCT0.6236%1025rS962%1%2%ST2-L3-L40MM67PCT0.6236%0915rP682%0%2%ST2-L3-L40MM67PCT0.6236%1020rS832%0%2%ST2-L3-L40MM67PCT0.6236%1020rS832%0%2%ST2-L3-L35MH/U175Plant.0.6554%1020rS832%0%2%ST2-L3S34MSF96PCT0.6039%1003rS650%2%2%40%ST2-L38EH394PCT0.6039%1003rS1800%1%1%ST231MH14%0.8526%1005rS1180%1%1%ST2S23MYU940.6345%1018rS631%0%1%1%ST2S23MYU940.7235%1028rS550%0%0%0%ST2S23MYU940.8151%0914bF930%0%0%ST2S <td>1019</td> <td>wP</td> <td>80</td> <td>0%</td> <td>3%</td> <td>3%</td> <td></td> <td></td> <td></td> <td></td> <td>ST2</td> <td></td> <td></td> <td></td> <td></td> <td>MS</td> <td></td> <td>L</td> <td>94</td> <td></td> <td>0.80</td> <td>31%</td>	1019	wP	80	0%	3%	3%					ST2					MS		L	94		0.80	31%
1025r5962%1%2%572-L3-L40MM67PCT0.7946%0915rP682%0%2%ST2-L3-L35MH/U175Plant.0.6554%1020rS832%0%2%ST235MH/U175Plant.0.6554%1020rS832%0%2%ST2S34MSF96PCT0.7631%0920bF1570%2%2%MST2-L38EH394PCT0.6039%1003rS650%2%2%40%ST230MEM4PCT0.6039%1003rS180%1%1%ST230MEM44PCT0.6339%1003rS1600%1%1%ST231MM44PCT0.6345%0905bF1600%1%14%ST235SL328PCT0.6935%1018rS631%0%0%0%ST228MU940.7236%0914bF2370%1%1%14%ST2S23MYM940.7235%1028rS550%0%0%ST228M	0930	bF	850	1%	1%	3%					ST2-L				24	E		U	469	РСТ	0.62	36%
O915rP682%0%2%ST235MH/U175Plant.0.6554%0920bF1570%2%2%ST238EH394PCT0.6039%1003rS650%2%2%37238EH394PCT0.6039%1003rS650%2%2%40%ST238EH394PCT0.6039%1005rS1180%1%1%ST2MSYL980.8526%1005rS1180%1%1%ST230MEM500.6135%1018rS631%0%1%14%ST235SL328PCT0.6935%1018rS631%0%1%14%ST235SL328PCT0.6935%1018rS631%0%0%0%ST223MYM940.7236%1028rS550%0%0%0%ST228MU940.7236%1028rS550%0%0%0%ST228MU940.6541%0914bF980%0%0%ST228MU940.7236% <td>1025</td> <td>rS</td> <td>96</td> <td>2%</td> <td>1%</td> <td>2%</td> <td></td> <td></td> <td></td> <td></td> <td>ST2-L,3-L</td> <td></td> <td></td> <td></td> <td>40</td> <td>м</td> <td></td> <td>М</td> <td>67</td> <td>РСТ</td> <td>0.79</td> <td>46%</td>	1025	rS	96	2%	1%	2%					ST2-L,3-L				40	м		М	67	РСТ	0.79	46%
1020rS832%0%2%ST2S34MSF96PCT0.7631%0920bF1570%2%2%ST2.L38EH394PCT0.6039%1003rS650%2%2%40%ST2.L38EH394PCT0.6039%1005rS1180%1%1%ST2.L30MEM500.9140%0926bF3400%1%1%ST231K500.9140%0926bF1600%1%1%ST235SL328PCT0.6345%0905bF1600%1%1%ST235SL328PCT0.6935%1018rS631%0%1%14%ST235SL328PCT0.6935%1018rS631%0%0%0%ST2S32MYL104PCT0.7035%1018rS550%0%0%ST2S23MYL104PCT0.7035%1028rS550%0%0%ST2S23MYL104PCT0.7035%1028rS550%0%0%ST2S <td< td=""><td>0915</td><td>rP</td><td>68</td><td>2%</td><td>0%</td><td>2%</td><td></td><td></td><td></td><td></td><td>ST2</td><td></td><td></td><td></td><td>35</td><td>м</td><td></td><td>H/U</td><td>175</td><td>Plant.</td><td>0.65</td><td>54%</td></td<>	0915	rP	68	2%	0%	2%					ST2				35	м		H/U	175	Plant.	0.65	54%
0920     bF     157     0%     2%     2%     ST2-L     38     E     H     394     PCT     0.60     39%       1003     rS     65     0%     2%     2%     40%     ST2-L     38     E     H     394     PCT     0.60     39%       1005     rS     118     0%     1%     1%     ST2-L     MS     Y     L     98     0.85     26%       1005     rS     118     0%     1%     1%     ST2     41     E     M     444     PCT     0.69     35%       0914     bF     237     0%     1%     14%     ST2-S,Z     S     23     M     Y     M     94     0.72     36%       0914     bF     237     0%     1%     14%     ST2-S,Z     S     23     M     Y     M     94     0.72     36%       0914     bF     237     0%     0%     0%     ST2-L     28     M     U     94     0.81     51%       0923     rP     71	1020	rS	83	2%	0%	2%					ST2. 2-S	S			34	MS		F., 5	96	РСТ	0.76	31%
1003     rS     65     0%     2%     2%     40%       1003     rS     65     0%     2%     2%     40%       1005     rS     118     0%     1%     1%     572     30     ME     M     50     0.00     53%       1005     rS     118     0%     1%     1%     572     41     E     M     444     PCT     0.63     45%       0905     bF     160     0%     1%     1%     572     35     S     L     328     PCT     0.69     35%       1018     rS     63     1%     0%     1%     14%     ST2     35     S     L     328     PCT     0.69     35%       1018     rS     63     1%     0%     1%     14%     ST2     32     MS     Y     L     104     PCT     0.70     35%       1028     rS     55     0%     0%     0%     ST2     28     M     U     94     0.81     51%       0901     bF <td< td=""><td>0920</td><td>hF</td><td>157</td><td>0%</td><td>2%</td><td>2%</td><td></td><td></td><td></td><td></td><td>ST2-L</td><td>-</td><td></td><td></td><td>38</td><td>E</td><td></td><td>H</td><td>394</td><td>РСТ</td><td>0.60</td><td>39%</td></td<>	0920	hF	157	0%	2%	2%					ST2-L	-			38	E		H	394	РСТ	0.60	39%
110012131313131314<	1003	rS	65	0%	2%	2%	40%				ST2				55	MS	Y	 L	98		0.85	26%
1000     1.0	1005	rS	118	0%	1%	1%	.070				ST1.14-U				30	MF	•	- M	50		0.91	40%
0905     bF     160     0%     1%     1%     572     35     S     L     328     PCT     0.69     35%       1018     rS     63     1%     0%     1%     14%     572     S     23     M     Y     M     944     PCT     0.69     35%       1018     rS     63     1%     0%     1%     14%     572-S,2     S     23     M     Y     M     944     0.72     36%       0914     bF     237     0%     1%     1%     572-S,2     S     23     M     Y     M     944     0.72     36%       1028     rS     55     0%     0%     0%     572     28     M     U     94     0.81     51%       0901     bF     71     0%     0%     0%     572-L     25     MS     L     125     0.81     41%       0916     bF     98     0%     0%     0%     575     46     M     L     135     0.65     43%       1001 <td< td=""><td>0926</td><td>hF</td><td>340</td><td>0%</td><td>1%</td><td>1%</td><td></td><td></td><td></td><td></td><td>ST2</td><td></td><td></td><td></td><td>Δ1</td><td>F</td><td></td><td>M</td><td><u>4</u>41</td><td>РСТ</td><td>0.63</td><td>45%</td></td<>	0926	hF	340	0%	1%	1%					ST2				Δ1	F		M	<u>4</u> 41	РСТ	0.63	45%
1018     rS     63     1%     1%     1%     1%     1%     57     10     57     10     52     FCT     0.69     35%       1018     rS     63     1%     0%     1%     14%     572     S     23     M     Y     M     94     0.72     36%       0914     bF     237     0%     1%     1%     572     S     23     M     Y     M     94     0.72     36%       1028     rS     55     0%     0%     0%     0%     572     28     M     U     94     0.81     51%       0901     bF     71     0%     0%     0%     572     25     MS     L     125     0.81     41%       0916     bF     98     0%     0%     0%     573     Imperfect     34     M     L     135     0.65     41%       0923     rP     42     0%     0%     0%     571     T     MS     L     24     0.94     31%       1001     rS <td>0005</td> <td>hF</td> <td>160</td> <td>0% 0%</td> <td>1%</td> <td>1%</td> <td></td> <td></td> <td></td> <td></td> <td>ST2</td> <td></td> <td></td> <td></td> <td>32</td> <td>s</td> <td></td> <td></td> <td>279</td> <td>PCT</td> <td>0.60</td> <td>35%</td>	0005	hF	160	0% 0%	1%	1%					ST2				32	s			279	PCT	0.60	35%
1010     170     070     170     1470 <t< td=""><td>1010</td><td>vr r¢</td><td>50 100</td><td>10/0</td><td>1 /0</td><td>1 %</td><td>1/10/</td><td></td><td></td><td></td><td>ST2_S 2</td><td>c</td><td></td><td></td><td>33 72</td><td>м</td><td>v</td><td>L M</td><td>520 04</td><td>FUI</td><td>0.03</td><td>360/</td></t<>	1010	vr r¢	50 100	10/0	1 /0	1 %	1/10/				ST2_S 2	c			33 72	м	v	L M	520 04	FUI	0.03	360/
1028   rS   55   0%   0%   0%   0%   572   28   M   U   94   0.81   51%     1028   rS   55   0%   0%   0%   0%   572   28   M   U   94   0.81   51%     0901   bF   71   0%   0%   0%   0%   572   25   MS   L   125   0.81   41%     0916   bF   98   0%   0%   0%   0%   575   46   M   L   135   0.65   41%     0923   rP   42   0%   0%   0%   0%   571   MS   L   145   Plant   0.65   43%     1001   rS   152   0%   0%   0%   20%   ST1   MS   L   24   0.94   31%     1011   rS   60   0%   0%   20%   ST2-L,3-L   41   M   M   114   1.03   47%     1021   rS   74   0%   0%   0%   572,2-L   35   ME   U   149   PCT   0.83   28%	1019	13	00 707	1%	U 70 1 0/	1 0/	14%				512-3,2	3			∠3 วา	MC	r v	1V1 1	94 104	DCT	0.72	30% 3E0/
1020     13     33     0%     0%     0%     0%     0%     0%     0%     0%     0%     0%     125     0%     0%     94     0.81     51%       0901     bF     71     0%     0%     0%     0%     572-L     25     MS     L     125     0.81     41%       0916     bF     98     0%     0%     0%     0%     575     46     M     L     135     0.65     41%       0923     rP     42     0%     0%     0%     0%     571     MS     L     145     Plant.     0.65     43%       1001     rS     152     0%     0%     0%     20%     ST1     MS     L     24     0.94     31%       1011     rS     60     0%     0%     0%     40%     ST2-L,3-L     41     M     M     114     1.03     47%       1014     rS     74     0%     0%     0%     ST2,2-L     35     ME     U     149     PCT     0.83     28% <td>1020</td> <td>л Г</td> <td>23/</td> <td>0%</td> <td>170</td> <td>170</td> <td></td> <td></td> <td></td> <td></td> <td>512</td> <td></td> <td></td> <td></td> <td>5∠ 20</td> <td></td> <td>T</td> <td>L.</td> <td>104</td> <td>ru</td> <td>0.70</td> <td>33% E10/</td>	1020	л Г	23/	0%	170	170					512				5∠ 20		T	L.	104	ru	0.70	33% E10/
0501     07     <	1028	13 65	55 71	0%	0%	0%					512				28 25			U	94 1 2 5		0.81	J1%
0910     07%	0901	0F	/1	0%	0%	0%									25			L.	125		0.81	41%
0525     1r     42     07%     07	0033	UF rD	98	0%	0%	0%					515		Importer		40			L E	132	Dlart	0.05	41% 420/
1001   15   152   0%   0%   0%   0%   101     1011   rS   60   0%   0%   0%   20%     1014   rS   44   0%   0%   0%   40%     1021   rS   74   0%   0%   0%   511	1001	41	42	0%	0%	0%					513 CT1		imperfect		34			г	145	Plant.	0.05	43%
1011     rs     60     0%     0%     0%     20%     512-L,3-L     41     M     M     114     1.03     47%       1014     rS     44     0%     0%     0%     40%     572     42     M/MS     Y     L     86     0.83     35%       1021     rS     74     0%     0%     0%     572,3,2-L     35     ME     U     149     PCT     0.83     28%	1001	rs "c	152	0%	0%	0%	2004				511					IVIS		L	24		0.94	51%
1014   rs   44   0%   0%   0%   40%     1021   rS   74   0%   0%   0%   512   42   M/MS   Y   L   86   0.83   35%     1021   rS   74   0%   0%   0%   512   35   ME   U   149   PCT   0.83   28%	1011	rS	60	0%	0%	0%	20%				512-L,3-L				41			IVI	114		1.03	4/%
1021 rs /4 U% U% U% S12,3,2-L 35 ME U 149 PCT 0.83 28%	1014	rs	44	0%	0%	0%	40%				512				42		Y	L	86	DCT	0.83	35%
60 6% 4% 10% *with challow costs	1021	٢S	/4	0% /	0%	U%		l			312,3,2-L				35 *\\\i+h	IVIE shallo		U otc	149	PUI	0.83	28%

Appendix 4 continued. Summary of wind damage by site and risk factors (sites that were salvaged after they were commercially thinned).

					Pockets of severe																
	Wind Damage				wind damage			Soils <sup>1</sup>					Site Characteristics								
		Sample					(% of stand)														
		Size	Blow-	Stem	Wind	Area				Soil Types	S-		G-	Root-				Eleva	-	Avg.	
Stand	Spe-	(#	down	Breakage	Damage	Sal-	25-49%	50+%	25+%	(listed in order	Phase	Limita-	Phase	ing		Cut	Slope	tion	Previous	h/d	
ID	cies	trees)	(% BA)	(%BA)	(%BA)	vage	of BA	of BA	of BA	of frequency)	Soils	tions	Soils	Depth	Exp. <sup>2</sup>	Edge	Pos. <sup>3</sup>	(m)	Treat.4	Ratio⁵	% BAR
0902	TL/xS					100%				ST2-L				25	Е		F	68			
0910	bF					80%									ME		U	170			
0917	bF					100%				ST2-L				21	Е	Y	U	246			
0919	bF					63%				ST2, 3				32	Е	Y	L/F	36			
1008	rS					100%				ST2				30	м		U	30			
1022	rS					100%				ST5				16	м		М	200			

<sup>1</sup> for soils information refer to Keys *et al.* 2010

<sup>2</sup> Exposure: S=Sheltered, MS=Moderately Sheltered, M=Moderate, ME=Moderately Exposed, E=Exposed

 $^3 {\sf Slope}$  Position: F=Flat, L=Lower, M=Middle, U=Upper, H=Hilltop

<sup>4</sup>Previous Treatment: PCT=Pre-Commercial Thinning, Plant=Plantation

<sup>5</sup>h/d Ratio= Height/diameter Ratio