INTERPINE

Forestry Innovation

Forest Condition Monitoring (FCM) Programme 2010 Report

Prepared for **NZ Forest Owners Association**

Print Date: Wednesday, 6 October 2010

Ref. No: FOA04102010

18 pages (including cover)

Interpine Forestry Ltd
P.O. Box 1209, Rotorua
Telephone. (07) 345 7573, **Facsimile.** (07) 345 7571
Email. info@interpine.co.nz
Website. www.interpine.com

1 CONTENTS

Contents

2 INTRODUCTION

Interpine Forestry Limited (Interpine) carried out the first measurement in the national Forest Condition Monitoring (FCM) Programme on behalf of the New Zealand Forest Owners Association (NZFOA). Data collection took place between the 5th May and the 30th August 2010 and was carried out at all sites measured as part of the planted forest carbon measurement survey on behalf of the Ministry for the Environment (MfE). In total 4139 *Pinus radiata* (*P. radiata*) trees were available for assessment of forest condition indicators across 190 plots established on the 4km grid network according to MfE's sampling design. Two plots were abandoned because of physical barriers to plot establishment and no trees were assessed for forest condition indicators in these plots. Forest condition monitoring plots were spread throughout New Zealand. Figure 1 provides an overview of the measurement locations in this year's survey. A total of ten data collection staff were used during the measurement phase and generally a minimum of two crews were operating in different parts of New Zealand at any one time.

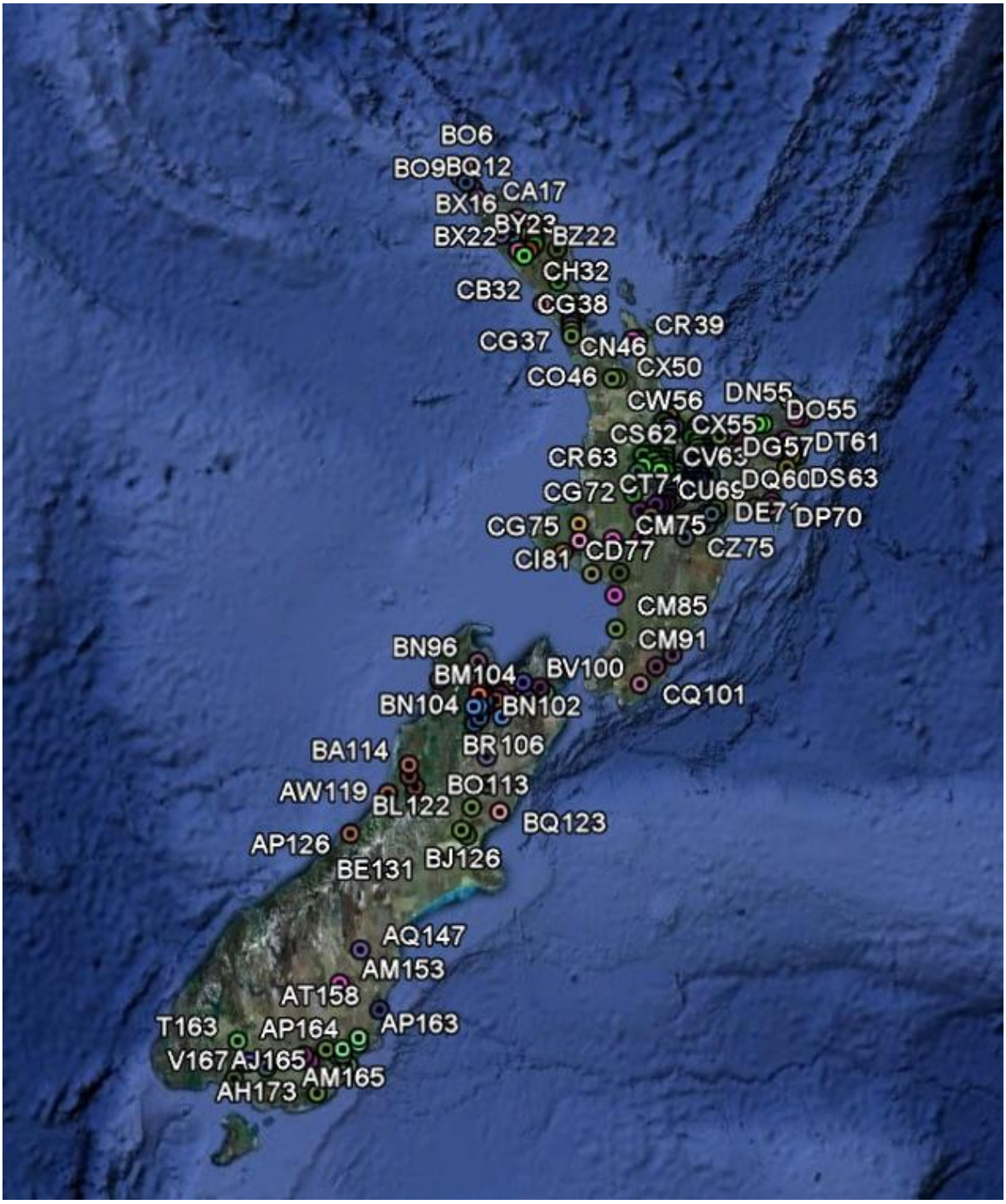

Figure 1 . The location of the measurement sites in this year's FCM survey

Forest condition was assessed as per the procedures set out in the New Zealand FCM manual[1]. The indicators used to provide a measure of forest condition are presented in Table 1.

[1] Forest Condition Monitoring (FCM) of Pinus radiata in New Zealand. Field Data Collection Procedures. Prepared by Interpine Forestry Limited on behalf of NZFOA.

Table 1 . The indicators used to assess forest condition

Indicator	Scale				
Description	***0***	***1***	***2***	***3***	***4***
Entire Crown Transparency The amount of skylight visible through the live, normally foliated portion of the tree crown.	0 – 100% transparency classes (5% classes)				
Top 50% Crown Transparency The amount of skylight visible through the live, normally foliated portion of the top half of the crown.	0 – 100% transparency classes (5% classes)				
Crown Defoliation The amount of needle loss in the assessable crown as compared to a reference tree.	0 – 100% defoliations classes (5% classes)				
Stem Visibility The amount of stem visible through the foliage and branching.		Less than 25% of stem visible	25 – 50% of stem visible	50 – 75% of stem visible	More than 75% of stem visible
Needle Retention The number of needle age classes (to nearest year) present in the lower third of the unsuppressed green crown.	1 yr old needles absent	1 yr old needles present	2 yr old needles present	3 yr old needles present	4 yr old needles present
Crow Dieback The recent dieback of branches with fine twigs in the upper and outer portions of the tree.	0 – 100% crown dieback (in 5% classes)				
Crown Depth The depth of green foliage present in the crown.		Green foliage in lower quarter of crown	Green foliage in lower-mid quarter of crown	Green foliage in upper-mid quarter of crown	Green foliage in upper quarter of crown
Dothistroma Presence of *Dothistroma septosporum* which causes needles to turn brown with red bands.	0 – 100% of total crown foliage with infection (5% classes)				
Resin Bleeding Resin evident on the outside of the tree	Not assessed	Nil or light resin bleeding	Moderate resin bleeding	Severe resin bleeding	

3 RESULTS

3.1 DATA

FCM indicators are recoded against each tree and are warehoused in the LUCAS Gateway, a SQL database built and maintained by Interpine on behalf of MfE. A wide range of other tree and plot level data is also housed in this database and is available to NZFOA with prior approval from MfE (contact nigel.searles@mfe.govt.nz). The data provided in the current release is summarised in Table 2.

Table 2 . The fields provided in the FCM data file provided to NZFOA

Field	Description
t574_SurveyID	Contains a unique identifier for the survey and site where data was collected
t574_TreeID	Contains a unique identifier for the tree measured
t574_BearingMagnetic	Magnetic bearing to the subject tree from plot centre
t574_BearingTrue	True bearing to the subject tree from the plot centre
t574_SlopeDistance	Slope distance to the subject tree from the plot centre
t574_SpeciesCode	Code identifying the species of the subject tree
t574_Status	The tree status of the subject tree (A = Alive)
t574_NeedleRetention	The needle retention class assigned to the subject tree
t574_DothistromaPct	The Dothistroma Percentage assigned to the subject tree
t574_EntireCrownTransparencyPct	The entire crown transparency score assigned to the subject tree.
t574_Top50CrownTransparencyPct	The top 50% of crown transparency score assigned to the subject tree
t574_DefoliationPct	The defoliation score assigned to the subject tree
t574_CrownDepth	The crown depth score assigned to the subject tree
t574_StemVisibility	The stem visibility score assigned to the subject tree
t574_CrownDiebackPct	The crown dieback score assigned to the subject tree
t574_ResinBleeding	The resin bleeding score assigned to the subject tree

3.2 DEFOLIATION

Defoliation was assessed on 4062 trees in the first year of measurement of the FCM Programme. Defoliation was only assessed on live *P. radiata* crop trees with a diameter at breast height (dbh) of greater than 2.5 cm or greater. The distribution of defoliation scores assigned is presented in Figure 2.

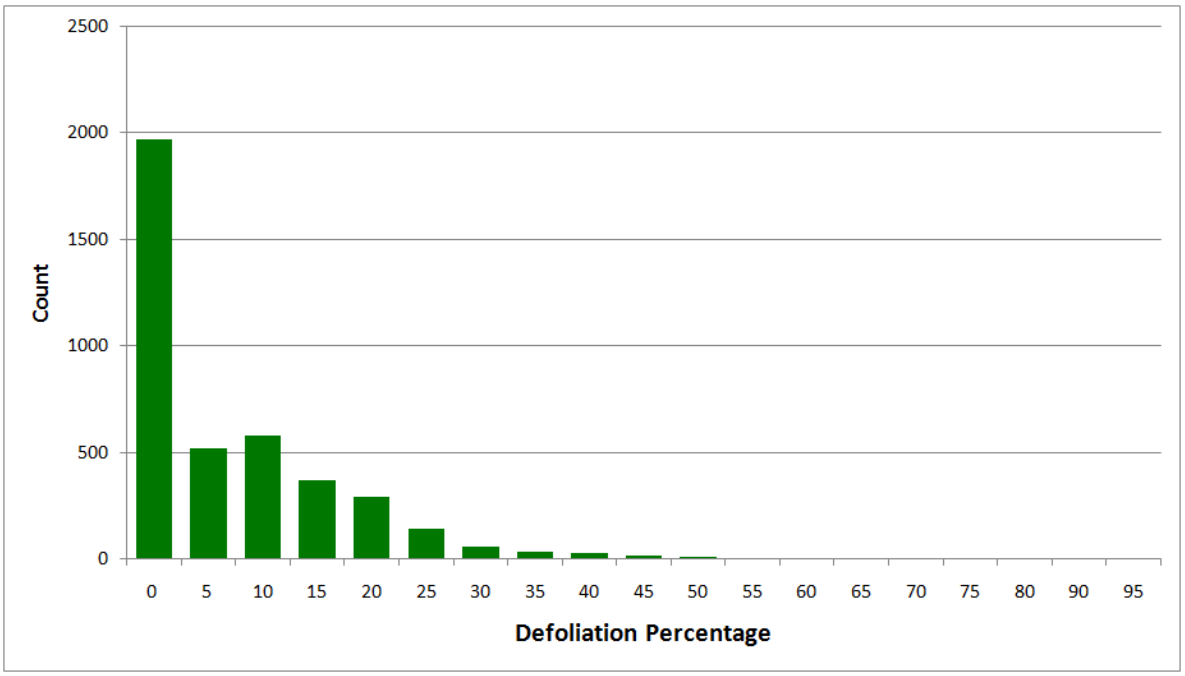

Figure 2. The distribution of defoliation scores assigned in year one of the FCM Programme

Figure 2 indicates that no defoliation or 5% defoliation class was observed in the majority (61%) of trees in the sample. A further 37% were designated as having a defoliation class of between 5 and 35. The descriptive statistics for the defoliation data collected are displayed in Table 3.

Table 3. The descriptive statistics for the defoliation data

Statistic	Value
Mean	7.66
Median	5
Mode	0
Std. Deviation	10.94
Sample Variance	119.60
Range	95

3.3 CROWN TRANSPARENCY

3.3.1 Entire crown transparency

Entire crown transparency was assessed on 4085 trees in the first year of measurement. Entire crown transparency was only assessed on live *P. radiata* trees with a dbh of 2.5 cm or greater. The distribution of entire crown transparency scores is shown in Figure 3.

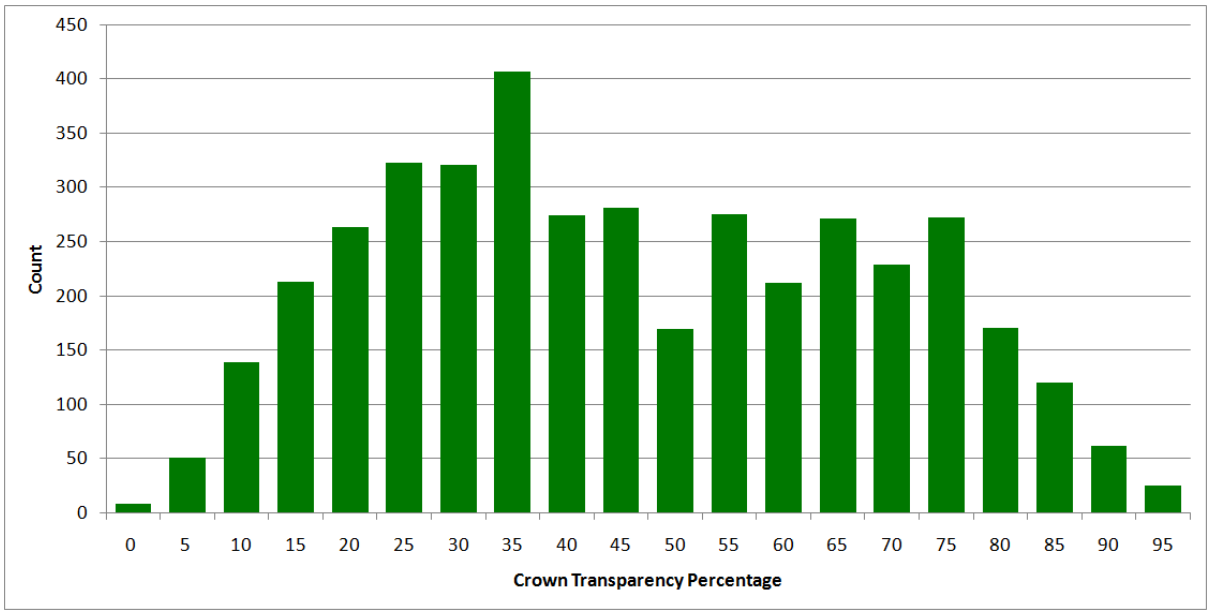

Figure 3. The distribution of entire crown transparency scores assigned in year one of the FCM Programme

Figure 3 indicates that there is a fairly even distribution of entire crown transparency scores throughout the population of trees in the survey. The 35% transparency class was the most commonly used in this year's data set. The descriptive statistics for the entire crown transparency assessment are given in Table 4.

Table 4 . The descriptive statistics for the entire crown transparency scores

Statistic	Value
Mean	45.96
Median	45
Mode	35
Std. Deviation	22.32
Sample Variance	497.86
Range	95

3.3.2 Top 50% Crown Transparency

Top 50% crown transparency was assessed on 4085 trees in this year's measurement programme. Top 50% crown transparency was only assessed on live *P. radiata* trees with a dbh of 2.5 cm or greater. The distribution of top 50% crown transparency scores is shown Figure 4.

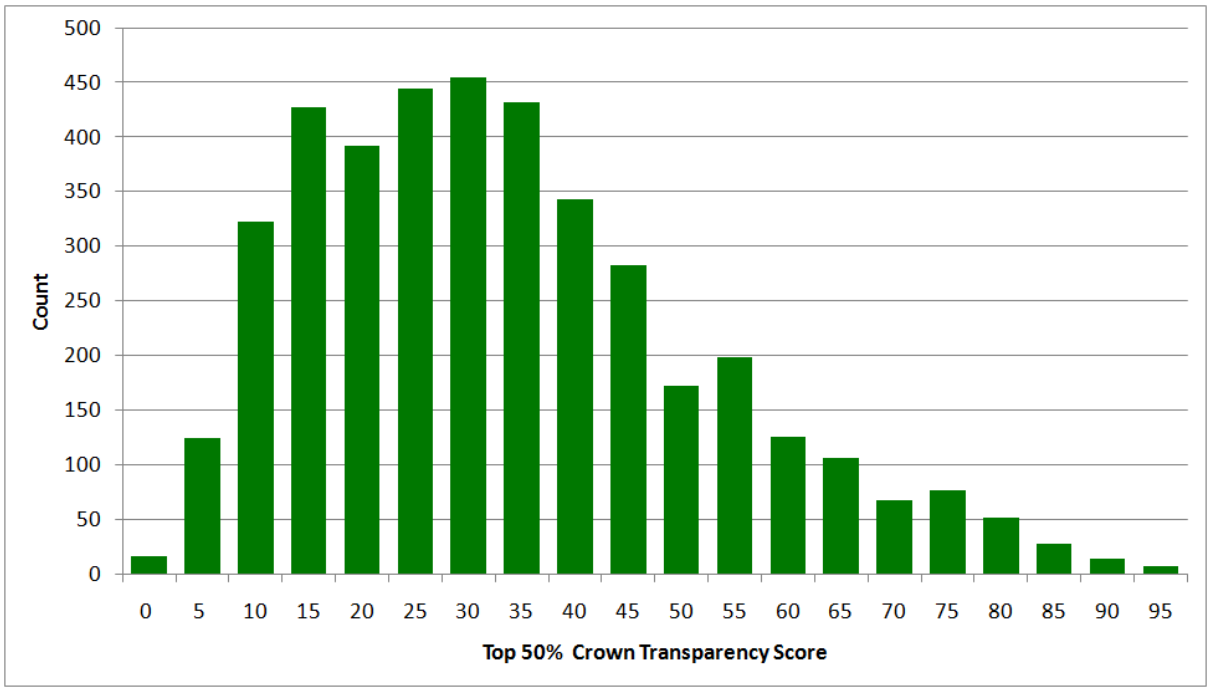

Figure 4. The distribution of Top 50% Crown Transparency Scores

94% of top 50% crown transparency scores were between 5 and 65% with 30% the most common classification. The descriptive statistics for the top 50% crown transparency are in Table 5.

Table 5. The Descriptive statistics for the top 50% crown transparency scores

Statistic	Value
Mean	33.61
Median	30
Mode	30
Std. Deviation	18.63
Sample Variance	347.12
Range	95

3.4 STEM VISIBILITY

4088 live *P. radiata* trees were assessed for stem visibility; only trees with a dbh greater than 2.5 cm were assessed for stem visibility. The distribution of the stem visibility codes is shown in Figure 5.

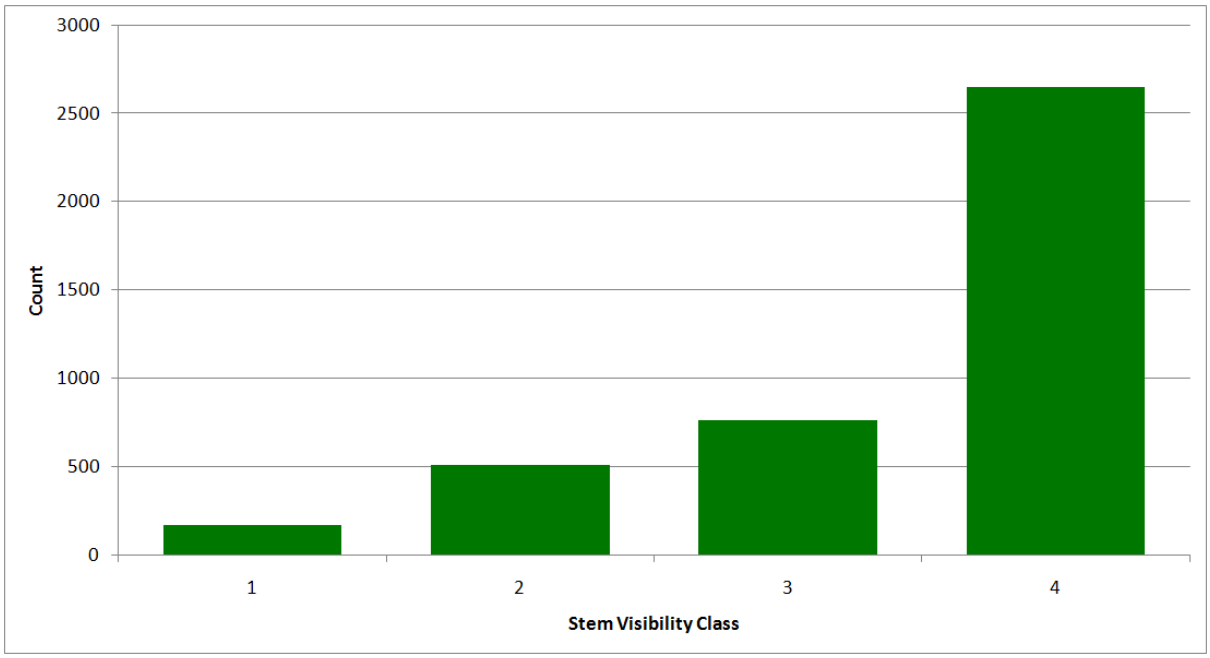

Figure 5. The distribution of stem visibility codes collected

The majority (2645) of trees were given the stem visibility code 4 (75% - 100% of stem visible through the unpruned crown). Further analysis is needed to eliminate the effect of tree age on these results. The descriptive statistics for the stem visibility data are shown in Table 6.

Table 6 . The descriptive statistics for the stem visibility data

Statistic	Value
Mean	3.44
Median	4
Mode	4
Std. Deviation	0.86
Sample Variance	0.75
Range	3

3.5 NEEDLE RETENTION

Needle retention was recorded for 4094 live *P.radiata* trees all of which had a dbh of 2.5 cm or greater. The distribution of the needle class scores obtained is shown in Figure 6 and the percentage of each code is shown in Figure 7 .

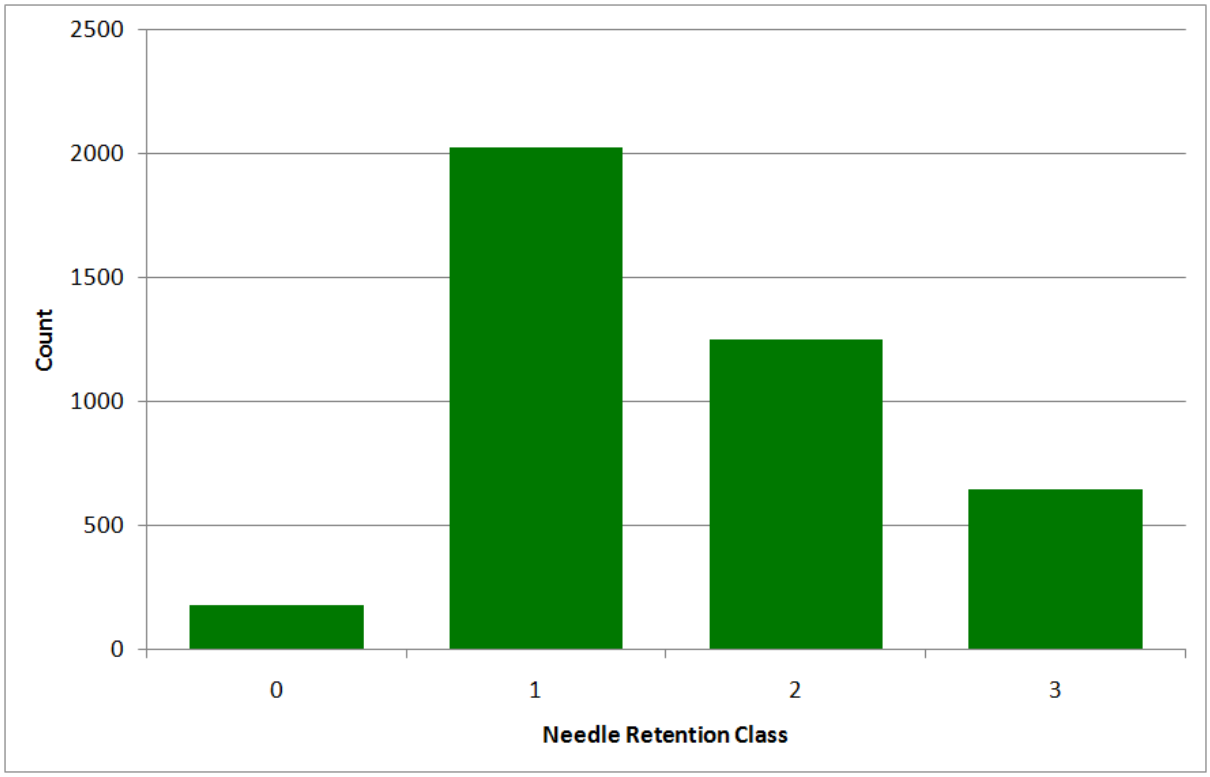

Figure 6 . The distributiuon of needle retention scores obtained

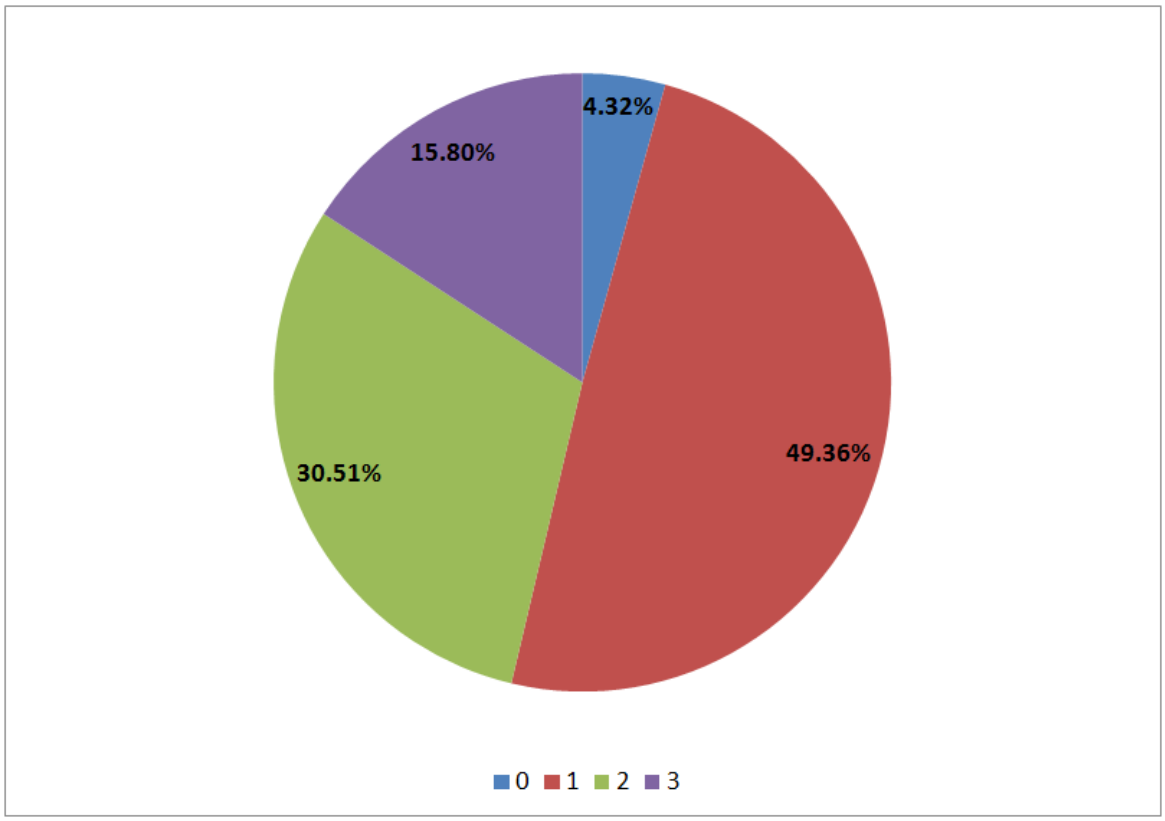

Figure 7. The percentage of needle retention classifications recorded.

Needle class one was the most commonly observed needle class retention in the survey. The descriptive statistics for the needle retention class data are shown in Table 7.

Table 7 . The descriptive statistics for the needle retention class data

Statistic	Value
Mean	1.58
Median	1
Mode	1
Std. Deviation	0.80
Sample Variance	0.65
Range	3

3.6 CROWN DIEBACK

Crown Die back was assessed on 4028 live *P. radiata* trees. The crown die back data is summarised in Figure 8 and Figure 9.

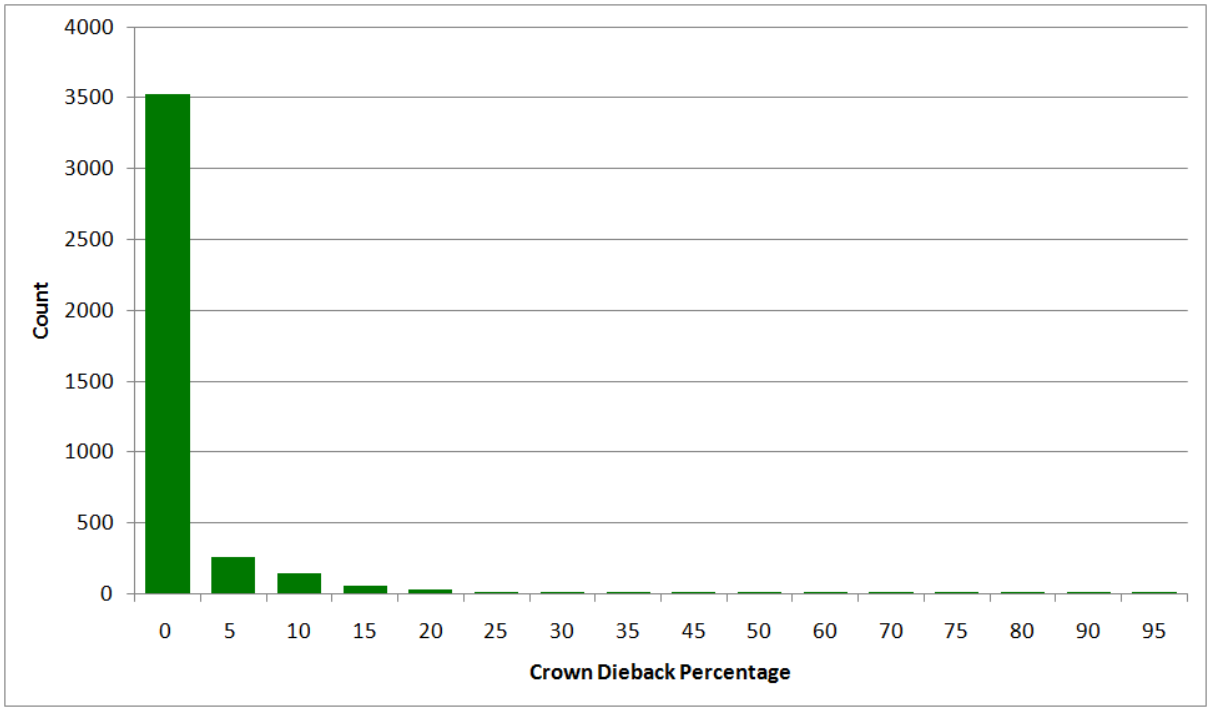

Figure 8 . The distribution of the crown dieback data obtained.

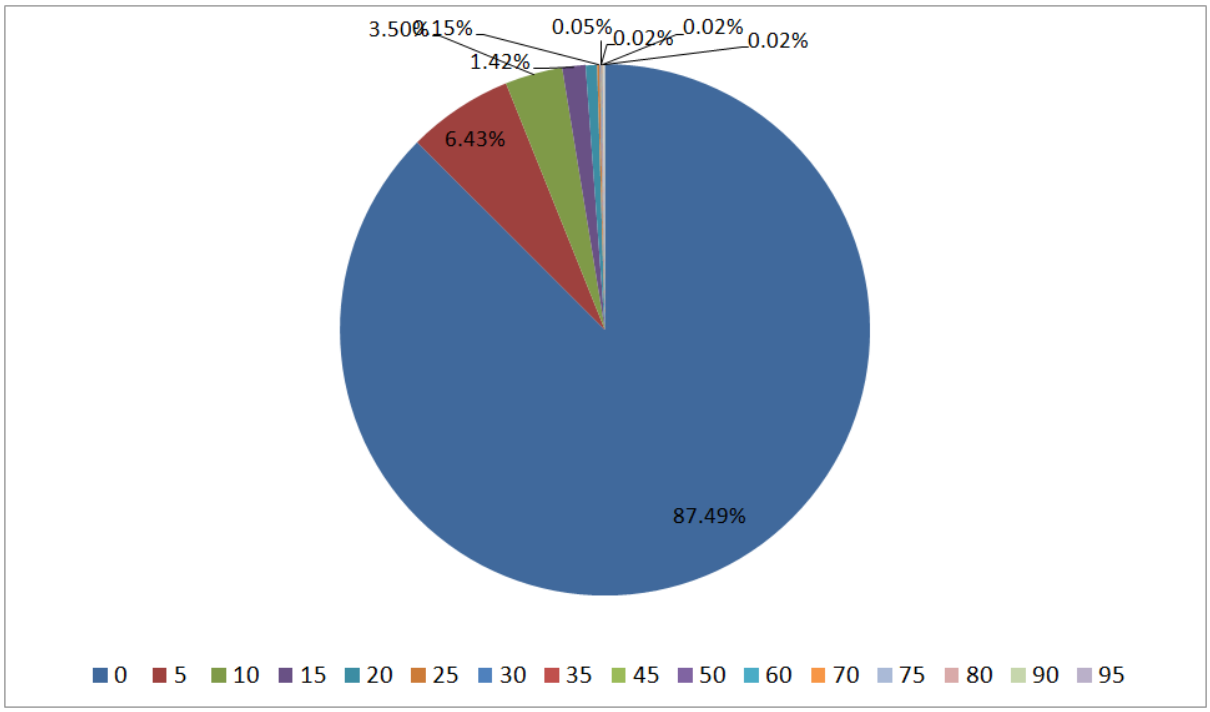

Figure 9 . The percentage of crown dieback scores recorded.

No crown dieback was recorded in the majority of trees (87.49%) whereas significant dieback (affecting greater than 10% of the tree crown) was only observed in 6.08% of trees measured. The descriptive statistics calculated for crown dieback are presented in Table 8.

Table 8 . The descriptive statistics calculated for the crown dieback data collected.

Statistic	Value
Mean	1.26
Median	0
Mode	0
Std. Deviation	4.93
Sample Variance	24.28
Range	95

3.7 Crown Depth

Crown depth was recorded on 4095 live *P. radiata* trees with a dbh of 2.5 cm or greater. The results obtained are summarised in Figure 10 and Figure 11.

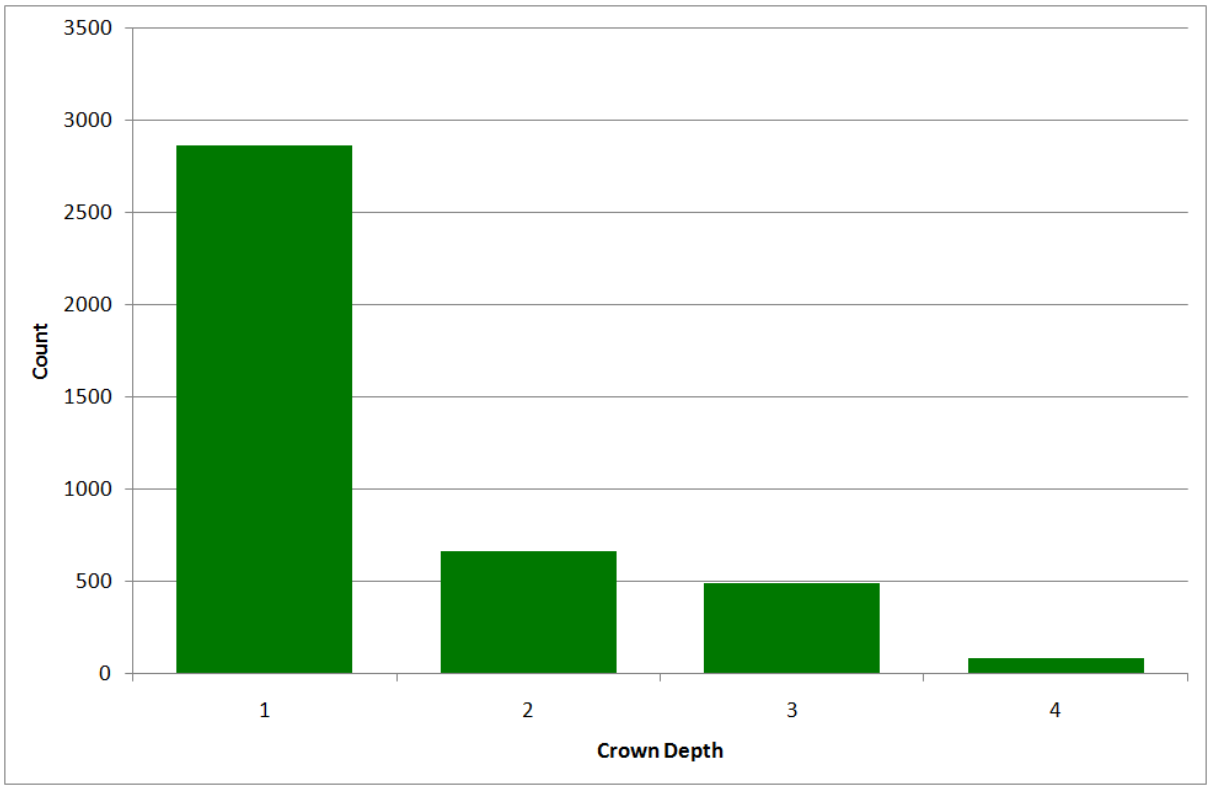

Figure 10 . The distributionof crown depth classification recorded

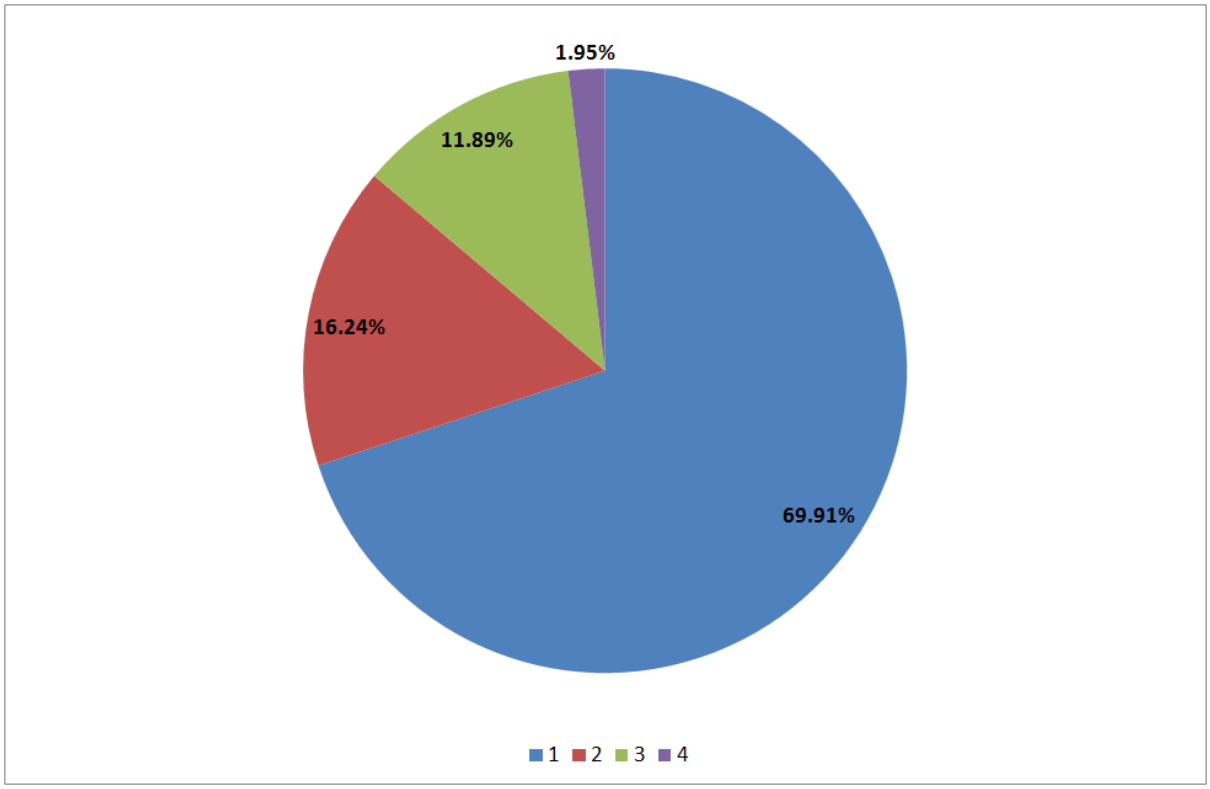

Figure 11. The percentage of crown depth scores recorded.

A crown depth of 1 was recorded for the majority (69.91%) of trees in the survey. It is important that further analysis is carried out to investigate the effect of tree age on this variable. The descriptive statistics calculated for crown depth are displayed in Table 9.

Table 9 . The descriptive statistics calculated for the crown depth variable

Statistic	Value
Mean	1.46
Median	1
Mode	1
Std. Deviation	0.78
Sample Variance	0.60
Range	3

3.8 DOTHISTROMA

Dothistroma percentage was assessed on 3949 live *P. radiata* trees with a dbh of 2.5cm or greater. The distribution for the Dothistroma percentage classes observed is presented in Figure 12.

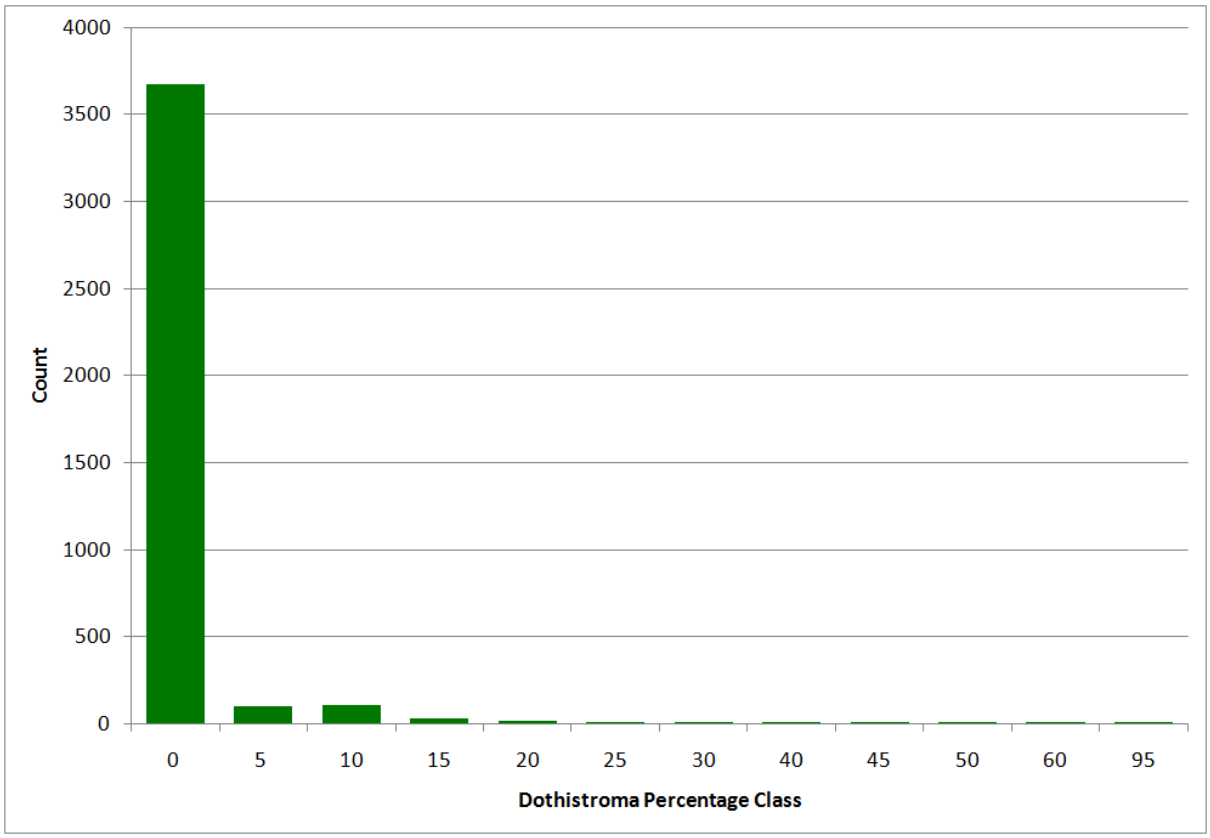

Figure 12 . The distribution for the Dothistroma percentage classes obtained.

Figure 12 indicates that only the vast majority of trees (96%) had either 0 or 5% Dothistroma class. The descriptive statistics calculated for Dothistroma class are presented in Table 10.

Table 10 . The descriptive statistics for the dothisroma classes observed.

Statistic	Value
Mean	0.79
Median	0
Mode	0
Std. Deviation	3.83
Sample Variance	14.76
Range	95

3.9 RESIN BLEEDING

Resin bleeding was assessed on 2973 live *P. radiata* trees with a dbh of 2.5 cm or greater in the current measurement period. The distribution of resin bleeding codes is shown in Figure 13; the calculated descriptive statistics are presented in Table 11.

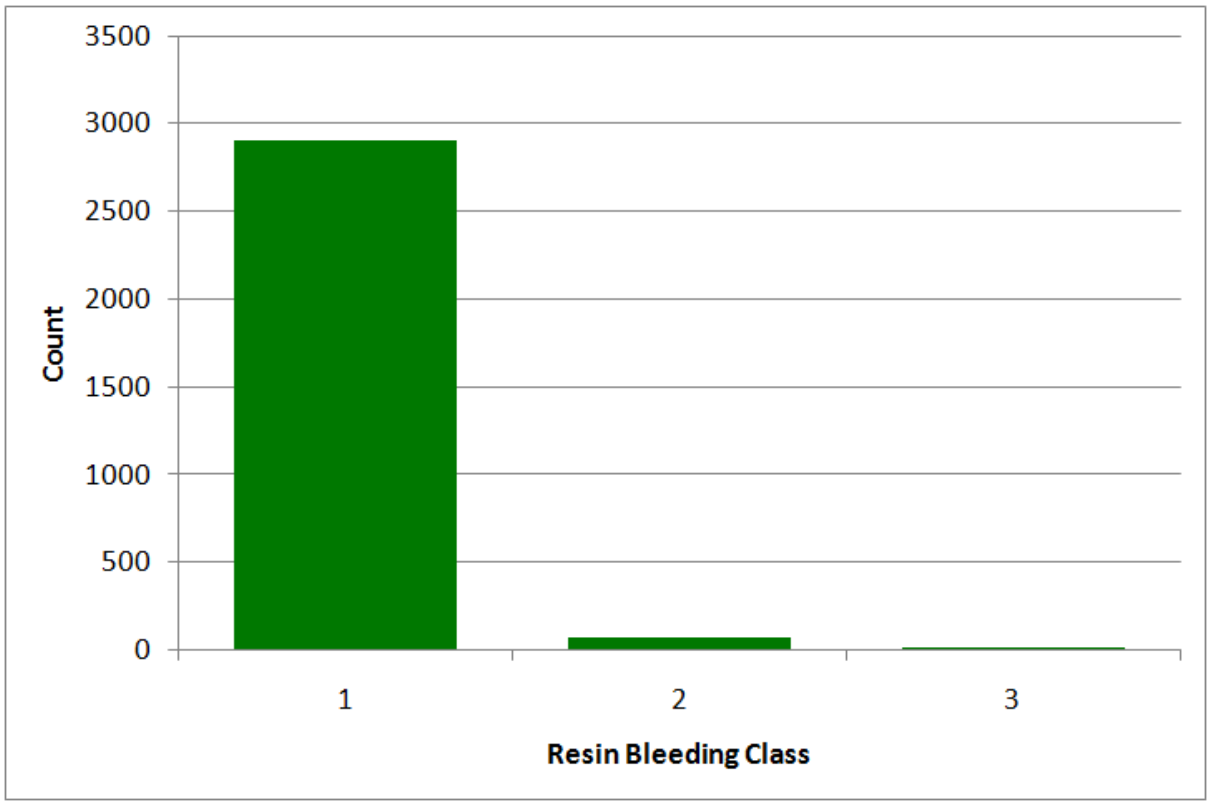

Figure 13. The distribution of resin bleeding codes observed

Table 11. The descriptive statistics calculated for the observed resin bleeding.

Statistic	Value
Mean	1.03
Median	1
Mode	1
Std. Deviation	0.17
Sample Variance	0.02
Range	2

4 CONCLUSION

The first measurement of the NZ FCM programme commissioned by the NZFOA has been successfully carried out by Interpine. There is a requirement for significant analysis of the data for the current measurement period. It is essential that measurement of FCM indicators over the now established plot network is continued so that trends in forest condition can be assessed over time.

For further information please contact:

Jonathan Dash
Resource Forester
B.Sc. (Hons) M.Sc. For. MNZIF
Email: jonathan.dash@interpine.co.nz
Mobile: 021 435 628
Telephone: 07 345 7573
Facsimile: 07 345 7571

Disclaimer