

Scots Pine Timber Quality in North Scotland

Steering Group Meeting – 22nd January 2009

Task 2: Timber quality assessment methods -
update



Objective and approach

- To develop and test methods to assess the quality of Scots pine timber in standing trees and logs
- Incorporate criteria of importance:
 - Straightness
 - Knots
- Evaluate use of acoustic tools
- Field test methods and validate in sawmill studies of material from 3 sample stands



Sample Stands

- 3 Scots pine stands, aged around 80:
 - Cawdor Estate, near Nairn (higher quality)
 - Munlochy, Black Isle (average quality)
 - Harriets, Dornoch (poorer quality)
- Stand level measurements:
 - DBH, top height, stem straightness, acoustic testing on standing trees

Results - sample stand characteristics

	Cawdor	Munlochy	Harriets
Planting Year	1928	1926	1930
Age at felling	79	81	77
Stems/ha	310	252	300
Mean DBH (cm)	33.6	34.7	32.0
Top Height (m)	19.51	21.59	18.88
General Yield Class	6	8	6
Mean ST300 acoustic velocity	4.7	4.61	4.73
Mean stem straightness score	5.3	4.9	4.3

Sample tree, log and sawn timber assessment

- Sample trees and logs (30 per stand):
 - Branching, green log yield, acoustic testing of logs
- Sawn timber:
 - Appearance grading of battens and boards
 - Acoustic assessment of battens (dynamic MOE – in sawmill and by Napier CTE)
 - Bending tests to determine MOE/MOR of a sub-sample of battens (Napier CTE)

Predicting green log yield

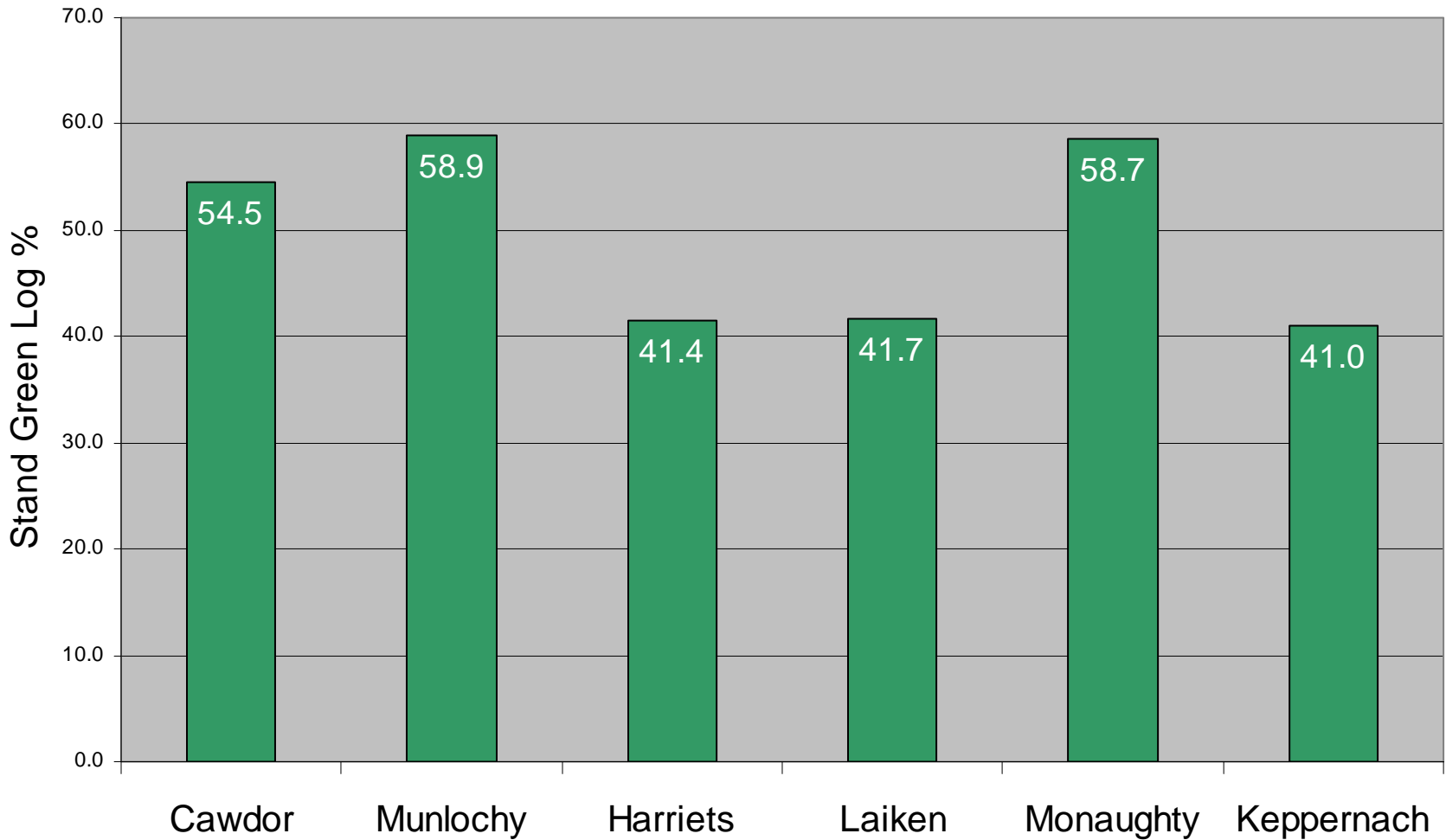
- The best standing tree measurements for predicting green log yield per tree were:
 - Stem straightness score
 - Height of lowest dead branch
- No (or weak) relationship with other branch indices or DBH
- Acoustic measurement not related to green log yields
- Statistical model for green log yield estimation, from 3 stands, gave $R^2 = 0.32$

Validation of green log yield prediction

- Three additional stands assessed to field test assessment methods and validate prediction of green log yield from stem straightness and lowest dead branch assessment
- Stands with ongoing harvesting operations used:
 - Laiken, near Nairn (FC, Inverness Forest District)
 - Monaughty, near Forres (FC, Moray Forest District)
 - Keppernach, near Nairn (Cawdor Estate)
- 30 sample trees felled and green log yield assessed

Results - sample stand characteristics

	Laiken	Monaughty	Keppernach
Planting Year	1953	1928	1939
Age at felling	55	80	69
Stems/ha	687	393	367
Mean DBH (cm)	29.5	33.4	30.1
Top Height (m)	23.2	22.49	21.55
General Yield Class	14	8	8
Mean ST300 acoustic velocity	4.40	4.65	4.25
Mean stem straightness score	4.3	5.3	4.7



Predicting green log yield

- Data from three additional sites added to first data set
- New statistical model developed predicting green log yield per tree from stem straightness score and HLDB:

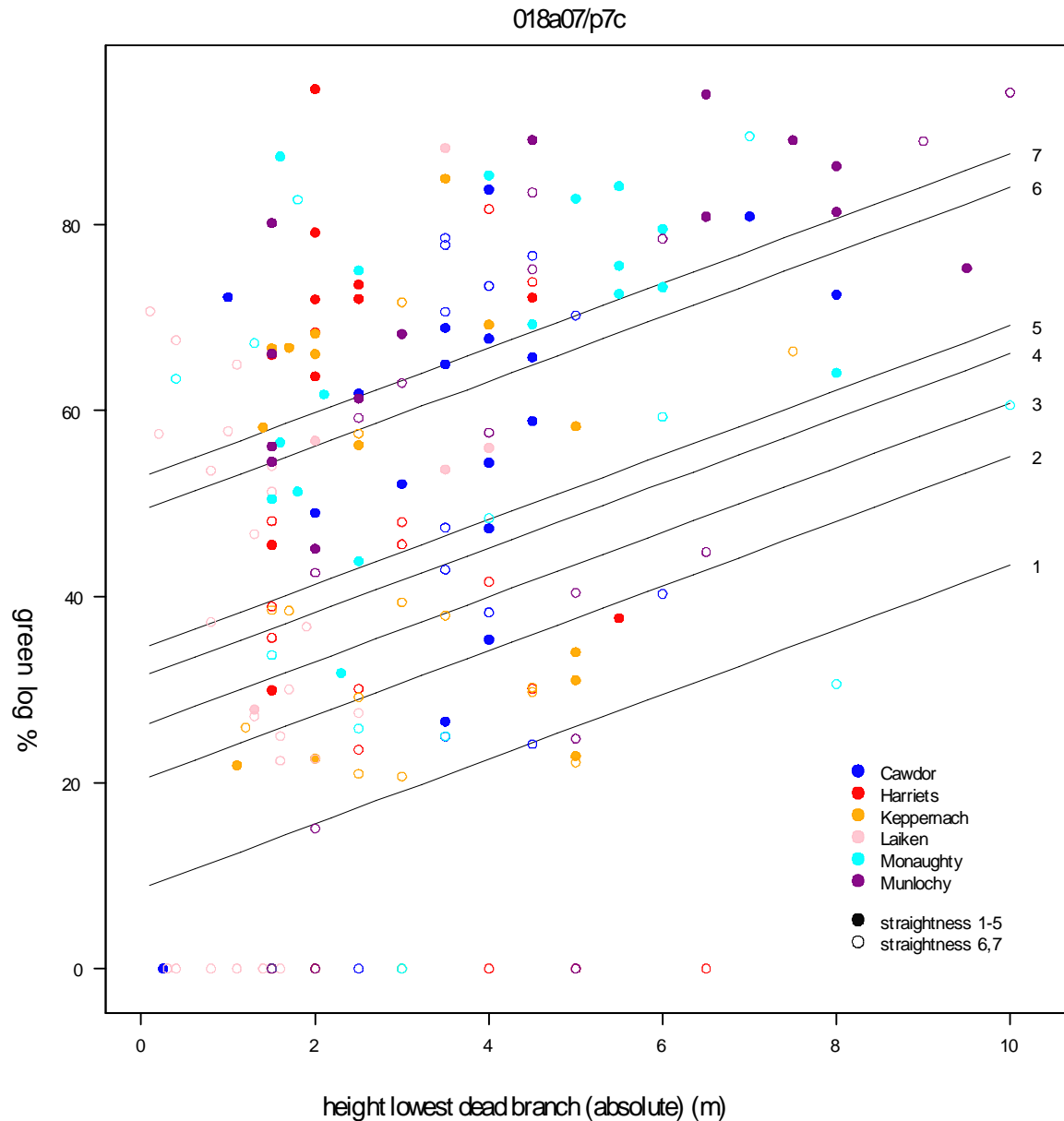
$$GL\% = 8.617 + s + 3.478h$$

GL% = proportion of log volume predicted to be green

s = fixed effect for straightness score (1=0, 2=11.66, 3=17.44, 4=22.71, 5=25.74, 6=40.60 and 7=44.20)

h = height of lowest dead branch

- $R^2 = 0.49$
- Confidence intervals for predictions range from 6% - 30% (average 14%)



Conclusions and next steps

- Validation trial confirmed results from first three stands:
 - stem straightness score and height of lowest dead branch can be used to predict green log yield per tree
- Stem straightness score and HLDB being used in survey (Task 3), together with acoustic testing
- Research Note to be published:
 - Methodology for assessment of timber quality in Scots pine
 - Overview of results of timber quality evaluation – mechanical properties and appearance grading
- Test green log prediction models at stand level...

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