**Data History—Scot’s Data**

***Lixi Kong updated 10/01/2013***

*Complete census was made at* 0th, 3rd, 6th, 9th, 12th, 18th, and 24th year*. Different plots have different starting year, so 0th, 3rd, 6th, 9th, 12th, 18th, 24th year could be different Calendar years for different plots. And the difference could be as many as about 4 years. DBH and Status were collected in each census year. On a sub‐sample of trees, height and height to base of live crown were measured.*

***All data sets got from Scot are in: R:\MOOSHUBB\longterm\lixi kong\Hazard\usrdata from Scot***

***All SAS programs got from Scot are in: R:\MOOSHUBB\longterm\lixi kong\Hazard\code from Scot***

# SAS program summary

Scot gave Lixi a bunch of code in 2010. Scot indicated some important ones, and Lixi copied the code (including inc files included) into one word documents for convenience: ***SAS code.doc.*** It includes contents from these files: ***presci1.inc, prethina.inc, mkgrep.inc, prethinb.inc, mkpltaggg2.inc, mkperehaz1.inc, mkhazm\*.inc.***

SAS program estimates bole volume: ***treebvol.doc*** (Scot discovered and sent to Lixi in 2013)

SAS program fits self-thinning line: ***mkhthin.inc/mkhthin.doc*** (Scot discovered and sent to Lixi in 2013)

# Data for all trees in all plots

***Tree.ssd***

**INSTALL:** 22 installations (sites) in total.

**PLOT:** 125 plots in total. Each installation has 4~8 plots. There are replicates of control and different thinning type plots.

**SI**: Site index (height of dominant and co-dominant trees at a specified age in a stand). A sample of healthy dominant and co-dominant trees of the predominant species on each plot was measured for total height and total age to determine site index.

**PLTAREA**: Plot area in hectares (square shaped). 0.05(over 1200 stems per hectare), 0.07(860~1200 stems per hectare), or 0.1(600~860 stems per hectare). Plots were selected to meet the requirement of at least 60 live trees per plot before thinning.

**STORIGIN**: C=; N=; P=.

**MAJORSPP**: major species.

**ELEVAT**: elevation in 10ms.

**ASPECT**

**SLOPE:** slope in %.

**THINTYPE**: “control plot”; “20% removed”, “35% removed”, or” 50% removed”. A modified crown thinning was done in the dormant season, based on the following criteria:

1. Good quality dominant and co-dominant trees of the predominant species were favored as residuals;
2. Residual stems were distributed approximately uniformly throughout the plot and buffer;
3. A d/D ratio (mean diameter of live stems removed in thinning divided by mean stand diameter before thinning) was maintained at 0.80–0.90;
4. The total live basal area removed was kept within 5% of the prescribed thinning percent;
5. Malformed, damaged, and diseased co-dominant and intermediate trees were removed;
6. Broad-leaf species, wolf trees, and slender, wind-blown stems were removed whenever possible;
7. All dead trees were removed.

Thinning levels of 20, 35, and 50% of live basal area corresponded to approximately 80, 65, and 50% canopy closure after thinning, respectively.

**THINLVL**: 0=control; 1=20% removed; 2=35% removed; 3=50% removed

**TREE**: tree tag number

**SPP:** species abbreviations.

* FD=Douglas fir
* HW=western hemlock
* B= Balsam
* CW= western red cedar
* DR=red alder
* MB=bigleaf maple
* PL=lodgepole pine
* PW=western white pine
* SS= sitka spruce
* VB= bitter cherry
* WI=some kind of willow?

**SPPSTR**: “Douglas-fir”, “Western hemlock”, or “other species”.

**SPPNO:** 1=Douglas fir; 2=Western hemlock; 3=Other species.

**SPN**: codes for each available species.

**X/Y**: These were determined at plot establishment by a right angle prism. location data with the center of the plot as origin in meters. -11.73~15.1 for 0.05ha( should be approximately 22.36m\*22.36m) plot; -13.65~13.39 for 0.07 (26.45\*26.45m) plot ; -16.22~15.81 for 0.1 ha plot(31.62m\*31.62m). Missing for about 2% of all trees.

In control plots

|  |  |  |  |
| --- | --- | --- | --- |
| Plotarea | Max(2\*abs(X)) | Max(2\*abs(Y)) | Estimated plot length(for NI calculation purpose) |
| 0.05 | 23.46 | 23.02 | 24 |
| 0.07 | 27.31 | 26.46 | 28 |
| 0.1 | 32.46 | 32.39 | 32 |

Plot was corrected for slope? (How they set up the plot for plot area? Plot area is projected plot area?) Look into the protocols.

Divide plots into 4\*4 m quadarts for NI calculation. For 0.05 and 0.01, have to exclude plants in the outer quadrat because not all trees were tagged. (25-quadrats is not quite available.)

**XY**: X\*Y.

**X97/y97:** Missing for about 35 % of all trees.Missing for about 6% of the fir in CONTROL plots.

**STAT0-STAT6, STAT97:** 1=LIVE; 0=DEAD; 2=? (only in 18th and 24th year).

Trees come back alive:

|  |  |
| --- | --- |
| YRMORT | N(Come back alive) |
| 0th | 0 |
| 3rd | 2 |
| 6th | 5 |
| 9th | 3 |
| 12th | 3 |
| 18th | 22 |

**DBH0-DBH6, DBH7/D1-D7**: DBH measured in cm at plot establishment before thinning (census 0), and after thinning in 0th, 3rd, 6th, 9th, 12th, 18th, and 24th year. Different plots have different starting year, so 0th, 3rd, 6th, 9th, 12th, 18th, 24th year could be different Calendar years for different plots. DBH0 is DBH measured at plot establishment, then for most of the cases, DBH1=D1; DBH2=D2…..DBH97=D7. Details see the table below.

DBH7 was only collected for installation 71 and 72, and for these plants had DBH7 collected, there is also a DBH97 collected. For other installation where DBH97 was collected, DBH7 was NOT recorded.

|  |  |  |
| --- | --- | --- |
|  | cnt | Consistency with D# |
| DBH1 | 16294 | 6 DBH1 is NOT equal to D1 (all 6 plants have DBH0=DBH1). The rest consistent |
| DBH2 | 10324 | 160 DBH2 is NOT equal to D2 (all 160 plants have DBH1=DBH2). The rest consistent. |
| DBH3 | 10284 | 377 DBH3 is NOT equal to D3 (375 plants have DBH2=DBH3). The rest consistent. |
| DBH4 | 9886 | 354 DBH4 is NOT equal to D4 (352 plants have DBH3=DBH4). The rest consistent. |
| DBH5 | 9605 | 304 DHB5 is NOT equal to D5 (303 plants have DBH4=DBH5). The rest consistent. |
| DBH6 | 9373 | 830 DBH6 is NOT equal to D6 (818 plants have DBH5=DBH6). The rest consistent. |
| DBH97 | 9894 | 531 DBH97 is NOT equal to D7 (516 plants have DBH6=DBH97). The rest consistent |
| DBH7 | 508 | 484 DBH7 is NOT equal to D7. The rest consistent. |

**HTMEA0-HTMEA6, HT97/H1-H7**: HT measured in m at plot establishment before thinning (census 0), and after thinning in year of In pure stands at least 10 trees per plot were measured for height (most sample trees were co-dominants, although some dominants were also measured); 2) in stands with an approximately even mix of fir and hemlock at least 10 trees were measured for each species; Selection of height sample trees was altered over the course of the project. (Darling 1989)

|  |  |  |
| --- | --- | --- |
|  | cnt | Consistency with HT1-HT7 |
| HTMEA1 | 1565 | 3 HEMEA1 is NOT equal to H1. The rest consistent |
| HTMEA2 | 1458 | 1 HEMEA2 is NOT equal to H2. The rest consistent |
| HTMEA3 | 1928 | 2 HTMEA3 is NOT equal to H3. The rest consistent |
| HTMEA4 | 2538 | 1 HTMEA4 is NOT equal to H4. The rest consistent. |
| HTMEA5 | 2426 | 1 HTMEA5 is NOT equal to H5. The rest consistent |
| HTMEA6 | 3699 | 3 HTMEA6 is NOT equal to H6. The rest consistent |
| HT97 | 3709 | 8 HT97 is NOT equal to H7. The rest consistent |
| HTMEA7 | 186 | 167 HTMEA7 is NOT equal to H7. The rest consistent |

HTMEA7 was only collected for installation 71 and 72, and for these plants had HTMEA7 collected, there is also a HT97 collected. For other installation where HT97 was collected, DBH7 was NOT recorded.

**HTTR0-HTTR7**: All integers. Recorded for more trees that had HTMEA.

**CRNCLS0-CRNCL7:**

* 1=dominant
* 2=co-dominant
* 3=intermediate
* 4=overtopped
* 5=veteran (only in the 6th census year, year of 1991).
* 6=understory in hard copy documents? Not found in the data?

**TREECLS0-TREECLS7**:

* 1=residual.
* 2=suspect.
* 3=dead potential
* 4=dead useless
* 5: veteran or wolf tree (trees in distinctly older age class than the main stand being sampled).
* 6=cut down. A tree that has been cut since the last measurement.

**SCARBOT0-SCARBOT7/SCARMID0-SCARMID7/SCARTOP0-SCARTOP7:** scar classification at the base (below breast height at 1.3 m); mid (between breast height and half the total tree height), and top (between half the total tree height and the top of the tree) collected at plot establishment, 0th, 3rd, 6th, 9th, 12th, 18th, and 24th year.

* 1=single open scar
* 2=single closed scar
* 3=single open scar and single closed scar
* 4=multiple open scars
* 5=multiple closed scars
* 6=single closed scar and multiple open scars
* 7=single open scar and multiple closed scars
* 8=multiple open scars and multiple closed scars.

**CONK0-CONK7/FORKCRK0-FORKCRK7 /FROST0-FROST7:** position of conks(fruiting body of a wood destroying fungus), forks and crooks(a fork is the result of two leaders on a tree having grown at the same time, a crook is an old fork beginning to disappear), and frost crack collected at plot establishment, 0th, 3rd, 6th, 9th, 12th, 18th, and 24th year.

* 1=lower third of total tree height
* 2=middle third of total tree height
* 3=upper third of total tree height
* 4=lower and middle thirds of total tree height
* 5=middle and upper thirds of total tree height
* 6=Lower and upper thirds of total tree height
* 7=all three sections of the tree

**MISTLTO0-MISTLTO7:** at plot establishment, 0th, 3rd, 6th, 9th, 12th, 18th, and 24th year, degree of crown infection was estimated for each third of the tree height by the number of branches within that third which have been infected by mistletoe as follows, and the codes were added up to get a total rating for the tree.

* 0= no infection
* 1= less than 50%
* 2: more than 50%.

**ROOTROT0-ROOTROT2, ROOTROT6:**

**DEADTOP0-DEADTOP7:** a 3 was recorded if there is a dead top at plot establishment, 0th, 3rd, 6th, 9th, 12th, 18th, and 24th year

**BRKNTOP0-BRKNTOP7:** a 3 was recorded if there is a broken top at plot establishment, 0th, 3rd, 6th, 9th, 12th, 18th, and 24th year

**HTBRK0-HTBRK7:** height to the broken top recordedat plot establishment, 0th, 3rd, 6th, 9th, 12th, 18th, and 24th year

**LEANSWP0-LEANSWP7:** a lean is measured as the deviation of the stem of a tree from the vertical, and ta sweep is a gradual bending in the stem of a tree and is measured as the deviation between an imaginary line drawn from the point of germination through the center of the seep and another imaginary line drawn from the point of germination to the top of the tree

* 1=minor. The deviation is between 5 and 10 degrees
* 2=major. The deviation is greater than 10 degrees.

**CRNBS0-CRNBS7**

**CRNWD1-3**

**CRNWDMD1,2**

**CRNHT1-3**

**CRNHTMD1, 2**

**AGEBOR6**

**HTBOR6**

**BORYEAR6**

**HTCRWN97**

**DECAY97**

**INJRY97**

**BOL97**

**LEAN97**

**HCOND97**

**ZWL97**

**JOIN97**

**NOTE97**

**LEADER97**

**BOLE97**

**DECAYY97**

**STATWARN**

**DEACYFLG**

**FOC1-FOC10**

**CUT:**

**YTHIN**

**MTHIN**

**DTHIN**

**TRTPLTEQ**

**IN**

**FSTAT1E**

**FSTAT0-FSTAT6**

**DEAD**

**XYCHK**

**IDPLOT**

**IDTREE**

**OFFSET**

**ROTPLT**

**DBHAGEST**

**TOTAGEST**

**DPLTWT**

**DTRTWT**

**Z**

**B0-B7**

**CRNHTI**

**HTI**

**DBHI**

**CRLENI**

**PLCI**

**CRLENE**

**PLCE**

**ID**

**S0-S7**

**HFLAG0-HFLAG7**

# Data with DBH interpolation

**Ttree.ssd**

Scot will need to look for it.

# Installation (site) Data

**Inst.ssd**

Site level data.

# Plot data

**Plot.ssd**

This data set has plot level data. As Scot recall, he took this data set from the foresty Minisitry and no change was made to this data set by him

**RECTYPE**

**RECSEL**

**INSTALL**

**PLOT**

**PSTAT**

**COMFLAG**

**BHAGEST**

**TOTAGEST**

**SI**

**SISRC**

**PLTAREA**

**PLTSHP**

**YM1-YM7:** year of establishment (also year of thinning and/or fertilizer treatments applied in dormant season, year of preliminary measurements), initial measurement (0th year), 3rd, 6th, 9th, 12th, 18th measurement.

This is cross checked with hard copy report by Darling and Stone and some are not consistent:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| INS | YM1 | YM2 | YM3 | YM4 | YM5 | YM6 | YM7 | pre | init | YR3 | YR6 | YR9 | YR12 | YR18 | pre | init | yr3 | yr6 | yr9 | yr12 | yr18 |
| 1 | 72 | **73** | 75 | 78 | 81 | 84 | 90 | 72 | **72** | 75 | 78 | 81 | 84 | 90 |  | 1 |  |  |  |  |  |
| 4 | 72 | **73** | 75 | 78 | 81 | 84 | 90 | 72 | **72** | 75 | 78 | 81 | 84 | 90 |  | 1 |  |  |  |  |  |
| 8 | 72 | **73** | 75 | 78 | 81 | 84 | 90 | 72 | **72** | 75 | 78 | 81 | 84 | 90 |  | 1 |  |  |  |  |  |
| 9 | 72 | **73** | 75 | 78 | 81 | 84 | 90 | 72 | **72** | 75 | 78 | 81 | 84 | 90 |  | 1 |  |  |  |  |  |
| 14 | 72 | **73** | 75 | 78 | 81 | 84 | 90 | 72 | **72** | 75 | 78 | 81 | 84 | 90 |  | 1 |  |  |  |  |  |
| 15 | 72 | **73** | 75 | 78 | 81 | 84 | 90 | 72 | **72** | 75 | 78 | 81 | 84 | 90 |  | 1 |  |  |  |  |  |
| 16 | 72 | 72 | 75 | 78 | **80** | 84 | 90 | 72 | 72 | 75 | 78 | **81** | 84 | 90 |  |  |  |  | 1 |  |  |
| 17 | 72 | **73** | 75 | 78 | 81 | 84 | 90 | 72 | **72** | 75 | 78 | 81 | 84 | 90 |  | 1 |  |  |  |  |  |
| 19 | 73 | **74** | 76 | 79 | 82 | 85 | 91 | 73 | **73** | 76 | 79 | 82 | 85 | 91 |  | 1 |  |  |  |  |  |
| 20 | 73 | **74** | 76 | 79 | 82 | 85 | 91 | 73 | **73** | 76 | 79 | 82 | 85 | 91 |  | 1 |  |  |  |  |  |
| 21 | 73 | **74** | 76 | 79 | 82 | 85 | 91 | 73 | **73** | 76 | 79 | 82 | 85 | 91 |  | 1 |  |  |  |  |  |
| 22 | 73 | **74** | 76 | 79 | 82 | 85 | 91 | 73 | **73** | 76 | 79 | 82 | 85 | 91 |  | 1 |  |  |  |  |  |
| 23 | 73 | **74** | 76 | 79 | 82 | 85 | 91 | 73 | **73** | 76 | 79 | 82 | 85 | 91 |  | 1 |  |  |  |  |  |
| 24 | 73 | **74** | 76 | 79 | 82 | 85 | 91 | 73 | **73** | 76 | 79 | 82 | 85 | 91 |  | 1 |  |  |  |  |  |
| 25 | 73 | **74** | 76 | 79 | 82 | 85 | 91 | 73 | **73** | 76 | 79 | 82 | 85 | 91 |  | 1 |  |  |  |  |  |
| 26 | 73 | **74** | 76 | 79 | 82 | 85 | 91 | 73 | **73** | 76 | 79 | 82 | 85 | 91 |  | 1 |  |  |  |  |  |
| 27 | 73 | **74** | 76 | 79 | 82 | 85 | 91 | 73 | **73** | 76 | 79 | 82 | 85 | 91 |  | 1 |  |  |  |  |  |
| 28 | 73 | **74** | 76 | 79 | 82 | 85 | 91 | 73 | **73** | 76 | 79 | 82 | 85 | 91 |  | 1 |  |  |  |  |  |
| 30 | 73 | **74** | 76 | 79 | 82 | 85 | 91 | 73 | **73** | 76 | 79 | 82 | 85 | 91 |  | 1 |  |  |  |  |  |
| 31 | 73 | **74** | 76 | 79 | 82 | 85 | 92 | 73 | **73** | 76 | 79 | 82 | 85 | 91 |  | 1 |  |  |  |  | 1 |
| 33 | 73 | **74** | 76 | 79 | 82 | 85 | 91 | 73 | **73** | 76 | 79 | 82 | 85 | 91 |  | 1 |  |  |  |  |  |
| 36 | 73 | **74** | 76 | 79 | 82 | 85 | 91 | 73 | **73** | 76 | 79 | 82 | 85 | 91 |  | 1 |  |  |  |  |  |
| 37 | 73 | **74** | 76 | 79 | 82 | 85 | 91 | 73 | **73** | 76 | 79 | 82 | 85 | 91 |  | 1 |  |  |  |  |  |
| 39 | 73 | **74** | 76 | 79 | 82 | 85 | 91 | 73 | **73** | 76 | 79 | 82 | 85 | 91 |  | 1 |  |  |  |  |  |
| 40 | 74 | 74 | **78** | 80 | 83 | 86 | 92 | 74 | 74 | **77** | 80 | 83 | 86 | 92 |  |  | 1 |  |  |  |  |
| 53 | 74 | 74 | 77 | **81** | 83 | 86 | 92 | 74 | 74 | 77 | **80** | 83 | 86 | 92 |  |  |  | 1 |  |  |  |
| 58 | 74 | 74 | 77 | 80 | 83 | 86 |  | 74 | 74 | 77 | 80 | 83 | 86 | **92** |  |  |  |  |  |  | 1 |
| 71 | 71 | 71 | 74 | 77 | 80 | 83 | **86** | 71 | 71 | 74 | 77 | 80 | 83 | **89** |  |  |  |  |  |  | 1 |
| 72 | 71 | **72** | 74 | 77 | 80 | 83 | **86** | 71 | **71** | 74 | 77 | 80 | 83 | **89** |  | 1 |  |  |  |  | 1 |
| 73 | 73 | **74** | 76 | 79 | 82 | 85 | 91 | 73 | **73** | 76 | 79 | 82 | 85 | 91 |  | 1 |  |  |  |  |  |
| 74 | 73 | **74** | 76 | 79 | 82 | 85 | 91 | 73 | **73** | 76 | 79 | 82 | 85 | 91 |  | 1 |  |  |  |  |  |
| 75 | 73 | **74** | 76 | 79 | 82 | 85 | 91 | 73 | **73** | 76 | 79 | 82 | 85 | 91 |  | 1 |  |  |  |  |  |
| 77 | 74 | **75** | 77 | 80 | 83 | 86 | 92 | 74 | **74** | 77 | 80 | 83 | 86 | 92 |  | 1 |  |  |  |  |  |
| 80 | 75 | **76** | 78 | 81 | 84 | 87 | 93 | 75 | **75** | 78 | 81 | 84 | 87 | 93 |  | 1 |  |  |  |  |  |
| 81 | 76 | **78** | **81** | **84** | **87** | **93** |  | 75 | **75** | **78** | **81** | **84** | **87** | **93** | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 82 | 75 | **78** | **81** | **84** | **87** | **93** |  | 75 | **75** | **78** | **81** | **84** | **87** | **93** |  | 1 | 1 | 1 | 1 | 1 | 1 |
| 83 | 75 | **78** | **81** | **84** | **87** | **93** |  | 75 | **75** | **78** | **81** | **84** | **87** | **93** |  | 1 | 1 | 1 | 1 | 1 | 1 |
| 84 | 76 | **78** | **81** | **84** | **87** |  |  | 75 | **75** | **78** | **81** | **84** | **87** | **93** | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 85 | 76 | **78** | **81** | **84** | **87** | **93** |  | 75 | **75** | **78** | **81** | **84** | **87** | **93** | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

**MM1-MM7:**

**DM1-DM7:**

# Bole Volume Data for Control plots only

**Treebvol.ssd**

This data set has bole volume estimated for trees in all species in control plots that had DBH measured (Some Heights were estimated). Maximal basal area in each plot for hazard model was calculated basing on this part of data (variable “maxpbv” in ttree2.ssd)

We estimated height in one of two ways. For trees missing measurements in only some periods (n = 1088 of 3621 trees), we used non‐linear growth curve regressions using SAS Proc NLMIXED growth curve models (Wolfinger 1999). Prediction errors were 0.2‐1.1m, with greatest errors in taller trees. For trees with no height measurements in any census (n = 1810), we used regression models with measurement period, individual diameter, prior 3 yr diameter growth, plot density and the mean height of the tallest trees in each plot. (Tree density in a plot was expressed on a ha‐1 basis, and the trees corresponding to the tallest 100 trees ha‐1 used in this calculation). Prediction errors were 0.5‐1.9 m, with the greatest errors again in taller trees.

Individual bole volume was calculated using dbh and tree height, together with equations for bole taper

**SPPNO**

**INSTALL**

**PLOT**

**TREE**

**BV0-BV7:** bole volume estimated at plot establishment, 0th, 3rd, 6th, 9th, 12th, 18th, and 24th year. If there is a decrease in bole volume, bole volume was set to be the same as previous year in hazard analysis, but not corrected in this data set.

# Tree Data for Scot’s Hazard Analysis

**Ttree2.ssd**

Complete census was made at yr 0(year of 1973), 3(1976), 6(1979), 9(1982), 12(1985), 18(1991), and 24(1997). DBH and Status were collected in each census year. On a sub‐sample of trees, height and height to base of live crown were measured. Three periods were estimated for hazards: yr6~yr12; yr 12~18; yr 18~24. For each of the 22 site (installation), 2 plots.

The first period was said to be the 3rd~9th year in the manuscript, but Lixi crosschecked “pbv” in “ttree2” and BVs in “treebvol”, and “died” in “ttree2” and STATs in “tree”, and looked at code “presci1.inc” with Scot and decided, the first period was actually 6th~12th year.

***Tree2.ssd*** is the data set Scot used for his thesis, which only includes Douglas fir trees from the control plots. ***Tree.ssd*** *has other data from 20%, 35%, and 50% basal area removed plots too.*

Main variables in **tree2.ssd**

**SPPNO:** 1=Douglas Fir. 2=Western Hemlock. 3=other species.

**INSTALL:** installation number

**PLOT:** plot number

**TREE:** tree tag number.

**SI:** site index. Scot Divided into 3 classes for hazard analysis. If SI <=24 then it’s ‘L’; if 24<SI<= 29 then it’s ‘M’; if SI > 29, then it’s “H”

**DWT:** weight variable. **dwt=1/pltarea**

**DIED: “**died” for period 5, 6, and 7 correspond to STAT3, STAT5, and STAT6 in “tree” data set after “come back alive” trees were corrected for status.

* 1=dead at end of a hazard period
* 0=live at end of a hazard period

**PERIOD:** hazard periods.

* 5: first hazard period. 6th ~12th year.
* 6: second hazard period. 12th~18th year.
* 7: third hazard period. 18th~24th year.

**PPBV:** prior prior bole volume. Bole volume three years before the first two hazard periods, and 6 years before the 3rd hazard period. ppbv for period 5, 6, and 7 correspond to BV2, BV4, and BV5 in “treebvol” data set.

**PBV:** prior bole volume for each of the three hazard periods. PBV for period 5, 6, and 7 correspond to BV3, BV5, and BV6 in “treebvol” after decrease in BV was corrected.

**MAXPBV:** maximal prior bole volume (**pbv**) for each plot for each of the three hazard periods.

**EGBV:** estimated growth in bole volume over 3 years prior to the first two hazard period and 6 years prior to the 3rd hazard period. This seem to be result from liner fit rather than nonlinear fit mentioned in the paper, which could be the reason why growth is not independent with size.

***EPBV:*** estimated prior bole volume for each of the three hazard periods. ***epbv=ppbv+egbv.*** Notice this is different than **PBV**, sometimes when PBV is missing, there is a EPBV estimated.

**GBV:** actual growth in bole volume over 3/6 years prior to hazard period. Details see CPGBV

**CPGBV:** For the last hazard period (yr18~yr24), because we didn’t have census in yr 15, so we only have growth from previous 6 years (yr12~yr18), so ***cpgbv=gbv/2*** for the last period. ***cpgbv=gbv*** for the other two hazard periods. Because estimated BV was corrected the same as pervious census when there is a decrease in BV, so for this case, gbv=0, in order to avoid taking log of 0s, **cpgbv** was set to be **0.0003** for this case.

**LTPN**: Ln of total prior density for each plot. Unit?

**LTN:** Ln of total density for each plot.

**DCMH:**offset variable. **dcmh=log(-1\*(ltn-ltpn));**

***Main variable in Hazard analysis that were not in the ttree2 data set:***

**LRS:** Local relative size. In the paper, **LRS-1** was used, and it was named as **lrepbv** in the SAS codes.

*lrepbv=ln(maxpbv/epbv) when maxpbv>epbv;*

*lrepbv=0 if maxpbv <=epbv;*

**rGR**: residual growth, and it was named as **lpgperf** in the SAS codes**.**

*if (cpgbv le 0) then cpgbv = 0.00003*

*Lpgperf=ln(cpgbv/egbv) when cpgbv/egbv<10*

*Lpgperf=log(10) when cpgbv/egbv>=10*

# SDP (stage of stand development) for Scot’s Hazard Analysis

**Sdpset.ssd**

***Model used:***

***ltn = b0 + (b1\*ltbv) - ((b0 + (b1\*ltbv0) - ltn0))\*exp(b2\*(ltbv-ltbv0))***

**INSTALL**

**PLOT**

**PERIOD:** 3 hazard periods.

**TASY:** b0+b1\*ltn

**PTASY:** (YPTHIN/TASY)\*100

**PSDP:** dummy variable to indicate whether it’s prior or on the thinning line. If PTASY >99, then PSDP=1; if 90<PTASY <=99 then PSDP=2; if PTASY <=90 then PSDP=3. IF PSDP =1, then it’s prior to self-thinning line; if PSDP>=2, then it’s on self-thinning line;

**YPTHIN:** predicted log of total bole volume