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Technical report

Fredrik Walter

CARABAS-II Campaign Vidsel 2002
Forest Report

Sensor Technology
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Report title

CARABAS-II Campaign Vidsel 2002. Forest Report.

Abstract (not more than 200 words)

In relation to studies performed by the Swedish Defence Research Agency (FOI) on detection of targets hidden in foliage a detailed forest inventory in the study area was carried out. The inventory took place nearby the small former farming hamlet of Nausta at the RFN Vidsel test range in northern Sweden.

The forest at each study site was divided into homogenous forest stands with respect to forest characteristics. The inventory resulted in stand-wise average estimations of important forest parameters, e.g. stem volume, stem number density, tree height, and stem diameter. The positions for the concealed terrain vehicles deployed by FOI were obtained using carrier-phase differential GPS-registrations. At each such object location careful measurements of single tree positions and single tree characteristics were made, which makes it possible to create detailed models of the forest nearby the objects imaged by the CARABAS-II VHF SAR sensor.

The field measurements were conducted 2002-06-12—15 by Fredrik Walter, Dianthus, and Johan Fransson, Swedish University of Agricultural Sciences. The collected and processed forest data presented here are also available in digital form on a CD issued by FOI. The corresponding file names are given throughout this report.

Keywords

Forest inventory, stem volume, stem density, stem diameter, tree height, SAR, VHF, CARABAS-II, Vidsel

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CARABAS-II Flygkampanj Vidsel 2002. Skogsrapport.

Sammanfattning (högst 200 ord)

I samband med att Totalförsvarets Forskningsinstitut (FOI) samlade in radardata för studier kring upptäckt av mål under vegetationsmask genomfördes även en detaljerad skogsinventering av markområdet. Inventeringen utfördes i omgivningarna kring Nausta by inom försöksområdet RFN Vidsel i södra Lappland.

Varje studerat skogsområde delades in i homogena skogsbestånd med avseende på vissa skogskaraktäristika. Inventeringen resulterade i skattningar av viktiga skogsparametrar såsom stamvolym, stamtäthet, trädhöjd och stamdiameter. Positionerna för de i skogen utplacerade terrängfordonen mättes in med en fasdifferentiell GPS-mottagare. Kring varje sådant objekt utfördes noggranna mätningar av befintliga enskilda träd. Detta gör det möjligt att skapa en detaljerad modell av skogen i närheten av målen som stöd vid analysen av de erhållna radarbilderna på VHF-bandet från det flygburna sensorsystemet CARABAS-II.

Fältmätningarna utfördes 2002-06-12—15 av Fredrik Walter, Dianthus, och Johan Fransson, Sveriges Lantbruksuniversitet. Insamlat och bearbetat skogligt data som här presenteras finns även tillgängligt i digital form på en CD som kan erhållas från FOI. Tillhörande filnamn finns angivna i rapporten.

Nyckelord

Skogsinventering, stamvolym, stamtäthet, stamdiameter, trädhöjd, SAR, VHF, CARABAS-II, Vidsel

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Introduction

An extensive data collection using the CARABAS-II sensor was performed in the late spring of 2002 (Pierson et al., 2003). The primary reason for this campaign was to gather data in support of a change detection study. The purpose of this study was to investigate the performance of a VHF band SAR system at detecting concealed targets as a function of various operating conditions (Ulander et al., 2003). In relation to these activities a detailed forest inventory in the study area was carried out. The inventory took place nearby the small former farming hamlet of Nausta at the RFN Vidsel test range in Sweden.

The forest at each study site was divided into homogenous forest stands with respect to forest characteristics. The inventory resulted in stand-wise average estimations of important forest parameters, e.g. stem volume, stem number density, tree height, and stem diameter. Positions of the twenty-five terrain vehicles deployed in various configurations were collected using GPS-measurements (Lundberg et al., 2003). At each location careful measurements of single tree positions and single tree characteristics were made, which makes it possible to create detailed models of the forest nearby the concealed targets imaged by CARABAS-II.

The field measurements were conducted 2002-06-12—15 by Fredrik Walter, Dianthus, and Johan Fransson, Swedish University of Agricultural Sciences. The collected and processed forest data presented in the following are also available in digital form on a CD (Compact Disc) from FOI. The associated file names are referenced throughout the document.

General forest description

The test site is situated in northern Sweden, at Latitude 66.4° and Longitude 19.3°. The test site is within a nature reserve and is therefore moderately affected by recent silvicultural actions, e.g. clear-cuttings and thinnings. The dominating tree species is Scots pine (*Pinus sylvestris,* L.) (99%). Other existing species are birch (*Betula pubescens,* Ehrh.) and Norway spruce (*Picea abies,* Karst.). The forest land is rather low productive, with an average annual timber production of approximately 2 m^3 ha^{-1}. The dominant soil type is till, i.e. coarse and mainly podsolic soil of glacial origin, and with a mineral content dominated by quartz. The field layer consists of mainly cowberry (*Vaccinium vitis-idaea,* L.) and lichens from the *Cladina* genus, e.g. *Cladina arbuscula,* Wallr., and *Cladina rangiferina,* L. The ground elevation varies moderately from 470-500 m above sea level. In figure 1, the study areas, called forest 1 and forest 2, are shown.

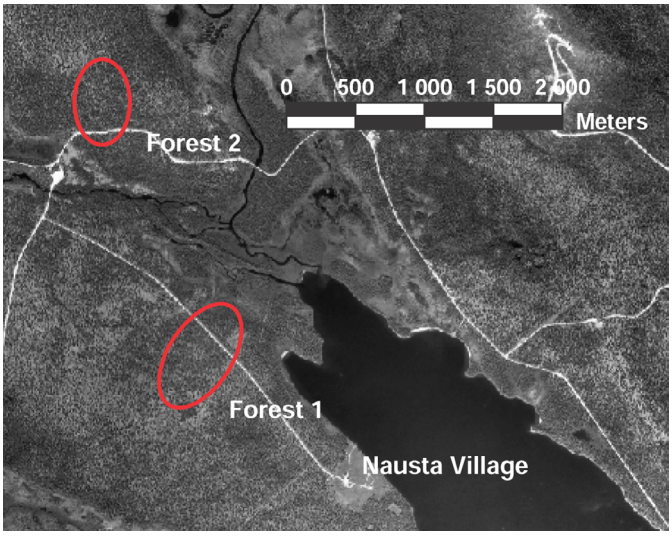

Figure 1. Overview of the test site with the study areas forest 1 and forest 2 shown (©Aerial Photo: Lantmäteriverket 2001. Ref. nr. L2002/308).

Stand-wise field inventory

Forest stand delineation

Forest inventories are often performed at forest stand level, where a number of forest parameters are measured including stem volume, stem diameter and tree height. Therefore, prior to conducting measurements, the areas forest 1 and forest 2 were divided into 5 smaller homogenous forest stands. The criterion for delineation was to minimize the variation of stem volume, age, and stem number density in each stand. The delineation was made using field observations and by manual interpretation of aerial photos. The resulting stands are shown in figure 2 and 3. The forest stand borders were stored in ESRI shape-file format and can be found on the CD in the files CDDRIVE:\GIS\FORESTSTANDS.* .

General description of the forest stands

Stand 1
Park like mature pine forest, sparsely populated by trees. Small micro-topographic variation with a ground slope of 2° in northeast direction. Large blocks present occasionally.

Stand 2
Mature pine forest. Small micro-topographic variation with a ground slope of 0.5-1.5° in northeast direction. A zone of larger blocks is present in the area between stand 1 and stand 2.

Stand 3
Rather dense and mature pine forest. Even ground surface with a ground slope of 1° in northeast direction. A large number of blocks are present close to the neighboring road.

Stand 4
Middle-aged pine forest. Flat ground surface with small micro-topographic variation. The primary braches of the trees are larger than in average forests.

Stand 5
Middle-aged pine forest, with a mature second tree layer from the previous forest succession. Small micro-topographic variation with a ground slope of 2° to the south.

Sample plot measurements

Forest parameters were measured in the 5 forest stands using *the forest management planning package* (Jonsson et al., 1993). In each stand, circular sample plots with a radius of 10 m were placed in a systematic grid, where the position for each plot corresponded to the centre point of the deployed objects studied by FOI. In total, measurements were performed at 100 sample plots (see figure 2 and 3). In table 1, the distribution of sample plots in each stand is presented. At each plot, all trees were callipered at breast height, i.e. at 1.3 m above ground surface, and for randomly selected sample trees, chosen with a probability proportional to basal area, tree height was also measured. Hence, ground data for each stand were collected using an objective and unbiased method. All sample plot data collected were stored directly into handheld field computers. The most important forest stand parameters derived from the sample plot measurements were stem volume (m^3 ha^{-1}), average stem diameter (cm), basal area (m^2 ha^{-1}) tree height (dm) and stem number density (stems ha^{-1}).

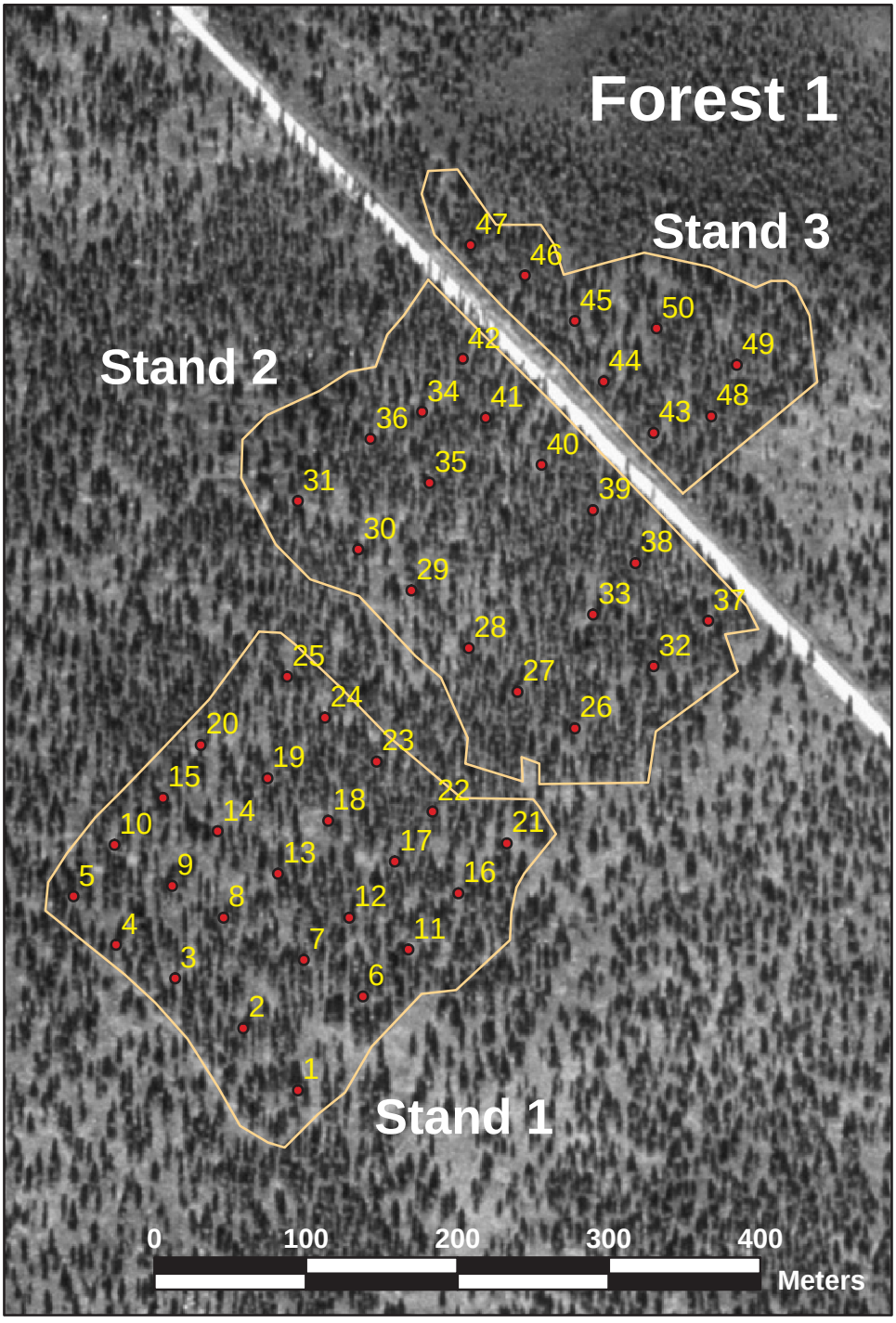

Figure 2. Forest 1 with the delineated forest stands 1, 2 and 3. The numbered dots represent the sample plots used for measuring forest parameters. The position for each sample plot has been acquired from differential GPS-measurements. The figure can be found on the CD in the file CDDRIVE:\IMAGES\FOREST1.EPS (©Aerial Photo: Lantmäteriverket 2001. Ref. nr. L2002/308).

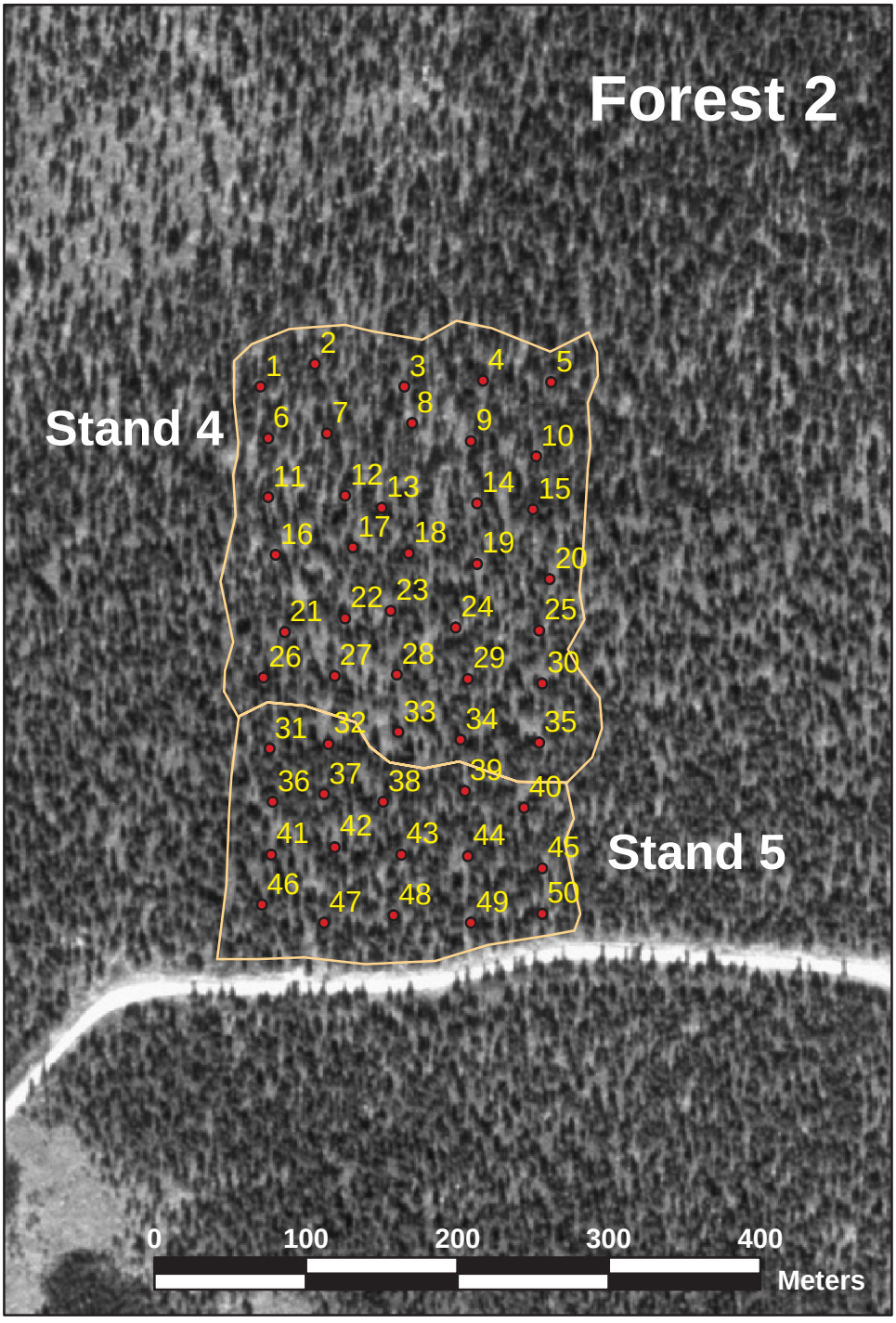

Figure 3. Forest 2 with the delineated forest stands 4 and 5. The numbered dots represent the sample plots used for measuring forest parameters. The position for each sample plot has been acquired from differential GPS-measurements. The figure can be found on the CD in the file CDDRIVE:\IMAGES\FOREST2.EPS (©Aerial Photo: Lantmäteriverket 2001. Ref. nr. L2002/308).

Table 1. The distribution of forest stands and sample plots in forest 1 and forest 2.

Forest	**1**			**2**	
Stand	**1**	**2**	**3**	**4**	**5**
Sample plot	**1-25**	**26-42**	**43-50**	**1-30, 33-35**	**31,32, 36-50**

Detailed single tree measurements

On each sample plot, detailed measurements of single tree positions and single tree characteristics were made. By collecting this kind of data it is possible to build detailed models of the forest on each sample plot. The position for each tree was collected by measuring the distance and direction from each tree to the sample plot centre. The distance was measured using an acoustic measuring device with sub-centimeter accuracy. The direction was measured using a Silva mirror-sighting compass with directions in the range of 0-400º. The directions were collected with a precision of ±1º. I figure 4, examples of these measurements are depicted.

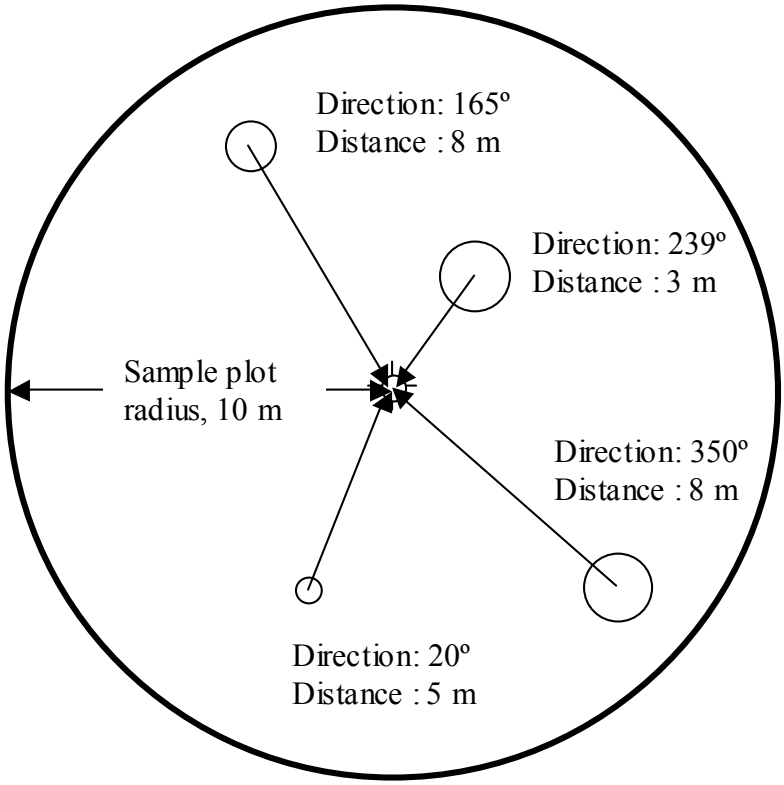

Figure 4. Example of directions and distances collected at each sample plot.

In Appendix A, a C/C++ source code is found for calculating the Swedish National Grid (RT90) X- and Y-coordinates from the direction and distance data. Note that the X-axis is pointing in vertical direction, and the Y-axis is pointing in horizontal direction.

In addition to the position, the following descriptions of tree characteristics were also collected for each tree:

- Tree species. In principal all trees were Scots pines (*Pinus sylvestris,* L.).
- Tree shape. The shapes are; 0) normal, 1) large branches, 2) relatively large branches along the whole stem, 3) large branches along the whole stem and 4) old growth shape. In figure 5 these shapes are depicted.
- Variable indicating if the tree is more than normally curved.
- Number of leading shots. Normally, only one leading shot per tree.
- Variable indicating if the tree is suppressed by another tree.
- Variable indicating if the tree is dry (dead).
- Variable indicating if the tree is infected by the Stem rust fungus (*Endocronartium pini,* Pers.), which infects and kills a few meters of the leading shot. In figure 5, the typical shape of an infected tree is shown.
- Age. If the tree was old, the age was estimated.
- Additional comments.

The diameter and height values collected during the sample plot measurement procedure were also used here for each individual tree. However, additional height measurements were performed if the number of randomly measured heights was less than 2 or if the height of a particular tree differed considerably from the other trees on the sample plot. All observed single tree data were in this case registered manually on a paper form and later transferred to a computer.

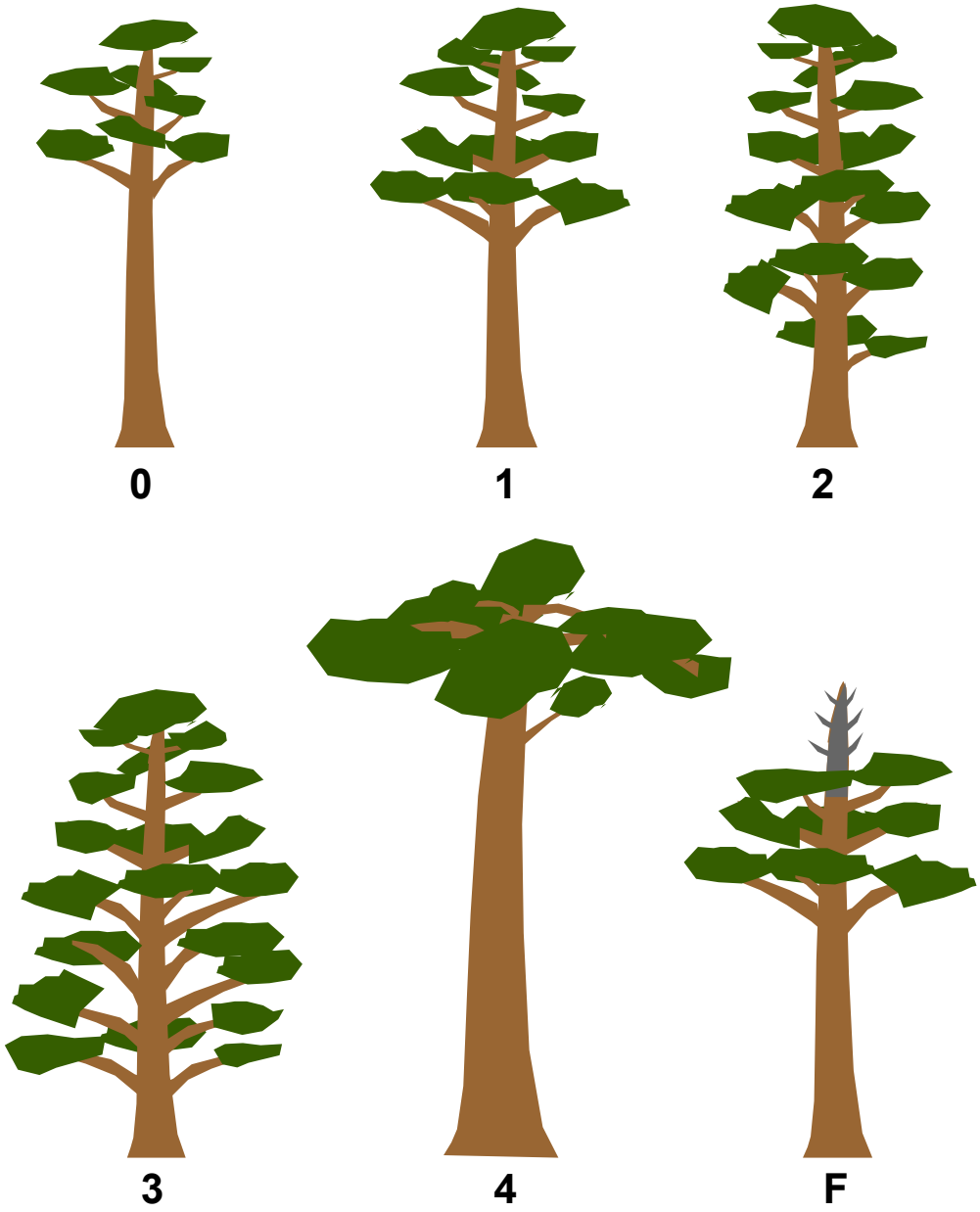

Figure 5. The different shapes registered for each tree on the sample plot. The shapes are; 0) normal, 1) large branches, 2) relatively large branches along the whole stem, 3) large branches along the whole stem and 4) old growth shape. The drawing assigned letter F depicts a tree infected by Stem rust fungus (*Endocronartium pini,* Pers.).

Derivation of forest parameters

Derivation of single tree parameters

For each tree *i* at sample plot *j*, stem volume and tree height were derived. For the randomly selected sample trees, for which tree height was measured, stem volume V_k in m^3 was calculated using the Näslund Scots pine volume function:

$$V_k = \frac{\left(0.09314 \times \left(\frac{D_k}{100}\right)^2 + 0.03069 \times \left(\frac{D_k}{100}\right)^2 \times h_k + 0.002818 \times \left(\frac{D_k}{100}\right) \times h_k^2\right)}{1000}, \quad [1]$$

where D_k and h_k are the measured diameter and height in meters for the *k*th randomly selected sample tree, respectively (Näslund, 1940). A secondary volume function was derived by developing a regression model from all randomly selected sample trees in forest 1 and forest 2. The following model were used (Holm, 2002):

$$\ln(V_k) = \alpha + \beta \times \ln(D_k)$$
$$\Rightarrow \quad [2]$$
$$V_k = e^{\alpha + \beta \times \ln(D_k)}.$$

In figure 6, ln(*V*) is plotted against ln(*D*).

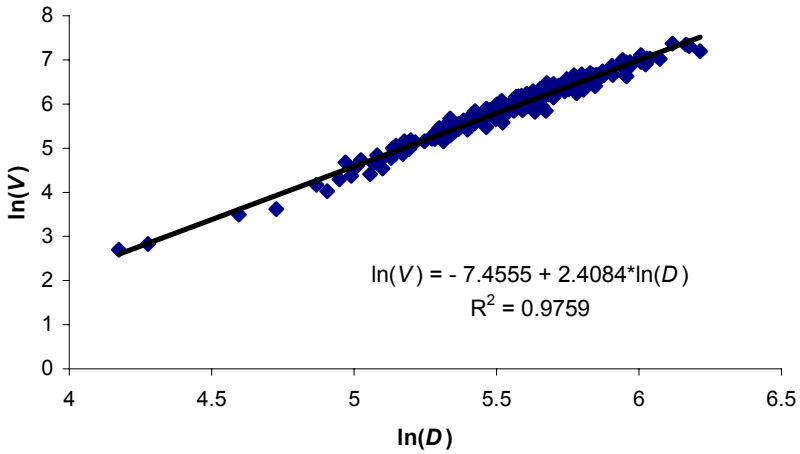

Figure 6. The regression model describing the relationship between ln(*V*) and ln(*D*).

In order to avoid logarithmic bias after applying the function, the following volume correction factor *v.c.f.* was calculated (Holm, 2002):

$$v.c.f. = \frac{\sum_{k=1}^{m} V_k}{\sum_{k=1}^{m} \hat{V}_k}, \quad [3]$$

where V_k is the stem volume for the randomly selected tree k of total m trees, calculated using equation [1], and $\hat{V}_k$ is the corresponding fitted stem volume using regression model [2]. Finally, for each tree i, i.e. the trees without any measured height, the stem volume was calculated as:

$$V_i = e^{(-7.5+2.4*\ln(D_i))} \times v.c.f. \quad [4]$$

For estimating single tree heights the Ulf Söderberg height function for Scots pine in northern Sweden has been used (Holm, 2002):

$$\begin{aligned} \ln(h) = & -8.2899265 + 0.45083557 \times LAT - 0.12937072\text{E}-03 \times BA^2 \\ & - 0.35449180\text{E}-02 \times LAT^2 - 0.20261239\text{E}-06 \times ALT^2 + 0.12172447 \\ & + 0.14141522\text{E}-02 \times SI - 279.94617 \times 1.0/(DIAM + 50.0) \\ & + 6781.5571 \times (1.0/(DIAM + 50.0))^2 - 8.0058818 \times 1.0/(AGE + 10.0) \\ & + 100.55799 \times (1.0/(AGE + 10.0))^2 - 0.18990472\text{E}-02 \times AGE \\ & - 0.66679015\text{E}-01 \times DIAM / AGE - 0.15622060 \times DIAM / MAXDIAM \\ & + 0.22919925\text{E}-01 \times (DIAM / MAXDIAM)^2 + 0.11472975\text{E}-01 \times BA, \end{aligned} \quad [5]$$

where h is the single tree height in dm, *LAT* is the latitude in degrees for the actual sample plot, *BA* is the basal area in $m^2\,ha^{-1}$ for the actual sample plot, *ALT* is the altitude in m for the actual sample plot, *SI* is the site index in dm for the actual sample plot, *DIAM* is the breast height diameter in mm, *AGE* is the age at breast height in years, and *MAXDIAM* is the maximum tree diameter in mm for the actual sample plot.

In order to avoid bias after applying the height function, the following height correction factor *h.c.f.* was calculated in each stand:

$$h.c.f. = \frac{\sum_{k=1}^{m} h_k}{\sum_{k=1}^{m} \hat{h}_k}, \quad [6]$$

where h_k is the measured height for the randomly selected tree k of total m trees and $\hat{h}_k$ is the corresponding estimated height using function [5]. Finally, in each stand the corresponding correction factor (*h.c.f.*) was applied to all estimated heights.

In figure 7, measured single tree height, *h,* is plotted against corresponding bias corrected estimated heights using [5] and [6].

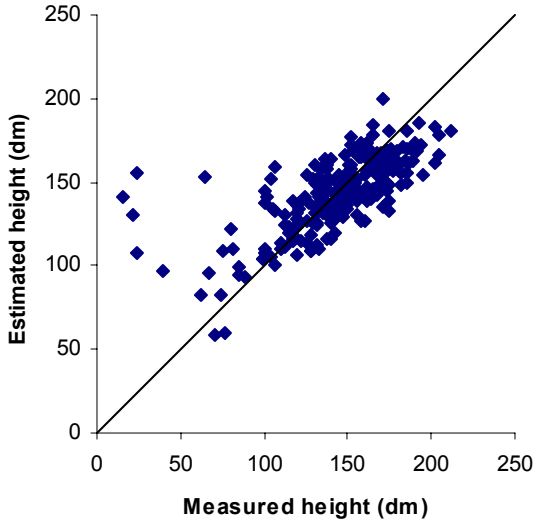

Figure 7. Measured tree heights plotted against corresponding estimated heights. The outlayers correspond to trees with damaged leading shots, e.g. broken trees.

Derivation of sample plot parameters

Based on the field measurements, basal area, average diameter, stem number density, stem volume and average tree height were derived from each sample plot. The basal area BA in m^2 ha^{-1} for sample plot *j* was calculated as:

$$BA_j = \sum_{i=1}^{n}\left(\frac{\pi D_i^2}{4}\right) * \frac{10000}{\pi r^2}, \quad [7]$$

where *n* is the number of trees in sample plot *j*, D_i is the diameter in meters for sample plot tree *i* and *r* is the sample plot radius in meters. The basal area weighted average diameter *D* in meters for sample plot *j* was calculated as:

$$D_j = \frac{\sum_{i=1}^{n}\left(D_i^3\right)}{\sum_{i=1}^{n}\left(D_i^2\right)}. \quad [8]$$

The stem number density *SD* in stems ha^{-1} for sample plot *j* was calculated as:

$$SD_j = n * \frac{10000}{\pi r^2}. \quad [9]$$

The stem volume *V* in m^3 ha^{-1} for sample plot *j* was calculated as:

$$V_j = \sum_{i=1}^{n} V_i * \frac{10000}{\pi r^2}, \quad [10]$$

where V_i is the stem volume for tree *i*, derived from equations [1] or [4].

Derivation of stand parameters

At stand level, basal area, average diameter, stem number density and stem volume were derived from the arithmetic average of the corresponding sample plot parameters as:

$$\overline{X_l} = \frac{\sum_{j=1}^{p_l} X_j}{p_l}, \quad [11]$$

where *X* is the parameter of interest for stand *l* and sample plot *j*, respectively, and p_l is the number of sample plots in stand *l*.

Accuracy measures for the single tree estimates

The accuracy measure for the single tree estimates of stem volume, *V*, and tree height, *h*, was derived in terms of root mean square error, *RMSE*, and was calculated as:

$$RMSE_V = \sqrt{\frac{\sum_{k=1}^{m}\left(V_k - \hat{V}_k\right)^2}{m}} \quad [12]$$

and

$$RMSE_h = \sqrt{\frac{\sum_{k=1}^{m}\left(h_k - \hat{h}_k\right)^2}{m}}, \quad [13]$$

where V_k is the stem volume for the randomly selected tree k of total m trees, calculated using equation [1], $\hat{V}_k$ is the corresponding fitted stem volume using equation [4], h_k is the measured height for the randomly selected tree k, and $\hat{h}_k$ is the corresponding fitted height using [5] and [6].

Accuracy measures for the sample plot measurements

The parameters at sample plot level are derived from direct measurements of all trees on each plot, and are therefore considered to be error free. Hence, no accuracy measures were derived for the parameters at sample plot level.

Accuracy measures for the stand level estimates

Despite the positioning of sample plots in a systematic grid, the sample plot measurements are considered as random samples from the total stand population. The standard error *SE* is therefore used as accuracy measure for the stand level estimates and is calculated as:

$$SE_l = \frac{\sigma_l}{\sqrt{p_l}}, \quad [14]$$

where SE_l is the standard error of the parameter of interest for stand l, p_l is the number of sample plots in stand l, and σ_l is the standard deviation of the parameter of interest and is calculated as:

$$\sigma_l = \sqrt{\frac{\sum_{j=1}^{p_l}(X_j - \overline{X_l})^2}{p_l}}, \quad [15]$$

where X_j is the parameter of interest for sample plot j and $\overline{X_l}$ is the arithmetic average for the parameter in stand l.

Inventory result

Single tree parameter measurements and estimates

In total, measurements and estimates were made for 903 single trees. The single tree inventory data can be found on the CD in the file CDDRIVE:\SINGLETREES\INVENTORYDATA.XLS. In the file the following columns are used:

- Forest Forest ID 1 or 2.
- StandID Stand ID 1-5.
- PlotID Plot ID 1-50.
- Diameter Stem diameter in mm.
- Height Tree height for the randomly selected trees in dm.
- Direction Direction in 0-400º from tree to sample plot centre.
- Distance Distance from tree to sample plot centre in meters.
- Spec Tree species, 1=Scots pine, 2=Norway spruce, and 3=birch.
- Shape Shape according to figure 5. Blank fields correspond to normal shape.
- Curv Variable indicating if the tree is more than normally curved.
- Lead Number of leading shots. Blank fields correspond to one leading shot.
- Supr Variable indicating if the tree is suppressed by another tree.
- Dry Variable indicating if the tree is dry (dead).
- Age Estimated age for old growth trees in years.
- Fung Variable indicating if the tree is infected by Stem rust fungus.
- Comment Additional comment.

The derived single tree parameters stem volume and height can be found on the CD in the file CDDRIVE:\SINGLETREES\RESULT.XLS. In addition to the columns above the following columns for the derived parameters exist:

- PredHeight Predicted height for all trees in dm using [5] and [6].
- Volume Stem volume for the randomly selected trees in dm^3 calculated using volume function [1].
- PredVolume Stem volume for all trees in dm^3 estimated using the secondary volume function [4].
- Height to be used Measured height if it exists, otherwise predicted height.
- Volume to be used Calculated stem volume if it exists, otherwise predicted volume.

The most important parameters can be found in Appendix B, single tree parameters.

For the single tree stem volume estimates and height estimates the accuracies in terms of *RMSE* were 0.064 m^3 and 1.73 m, respectively.

Sample plot parameter measurements

The sample plot level parameters can be found on the CD in the file CDDRIVE:\SAMPLEPLOTS\RESULT.XLS. In the file the following columns are used:

- BA Basal area in m^2 ha^{-1}.
- Diameter Basal area weighted average diameter in mm.
- Stem number Stem number density in stems ha^{-1}.
- Volume Stem volume of living trees in m^3 ha^{-1}.
- Volume dry Stem volume of dry (dead) trees in m^3 ha^{-1}.
- Total age Estimated total age in years.
- Tree height Arithmetic average tree height in dm.

These parameters can also be found in Appendix C, sample plot parameters.

Additional comments and coordinates for each sample plot, acquired from differential GPS-measurements, can be found on the CD in the file CDDRIVE:\SAMPLEPLOTS\SAMPLEPLOTS.XLS. In the file the following columns are used:

- RMS The standard deviation of the sample plot position in meters acquired from the GPS-measurements. These figures can be used for evaluating the accuracy of the GPS-positioning.
- x (RT90) The coordinate along the **vertical** axis in the Swedish National Grid coordinate system in meters.
- y (RT90) The coordinate along the **horizontal** axis in the Swedish National Grid coordinate system in meters.
- Altitude (RH70) The geoid height in meters.
- Comment Additional comments for the sample plot.

These parameters can also be found in Appendix D, sample plot coordinates. The coordinates for sample plots 34 and 35 in forest 1 and 48 in forest 2 are rather uncertain. In figure 2, sample plot 34 should be between plots 29 and 40. The uncertainty is strengthened by its large RMS value. A large RMS value is also found for plot 35. For plot 48 in forest 2, on the other hand, the exact position was not found during the forest inventory, due to a missing marker stick at the sample plot centre.

Stand level parameter estimates

The stand level parameters can be found on the CD in the file CDDRIVE:\STANDS\RESULT.XLS. In the file the following rows are used:

- Altitude — The average height above sea level in meters.
- Volume — Stem volume of living trees in $m^3\ ha^{-1}$.
- Volume dry — Stem volume of dry (dead) trees in $m^3\ ha^{-1}$.
- Growth — Annual volume growth in $m^3\ ha^{-1}\ year^{-1}$.
- BA — Basal area in $m^2\ ha^{-1}$.
- Stem number — Stem number density in stems ha^{-1}.
- Height — Arithmetic average tree height in meters.
- Diameter — Basal area weighted average diameter in cm.

For each parameter the accuracy in terms of standard error *SE* is presented. The parameters can also be found in Appendix E, stand parameters.

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Appendix A, treecoord.cpp

Below, the C/C++ code for calculating the Swedish National Grid (RT90) X- and Y-coordinates from the direction and distance data for the single trees on each sample plot is given. Note that in the orthogonal RT90 coordinate system the X-axis is the vertical axis and the Y-axis is the horizontal one. This code is found on the CD in the file CDDRIVE:\CODE\TREECOORD.CPP

```
#include <math.h>
#include <iostream.h>
#include <iomanip.h>

int treeCoord(float centreRT90X, float centreRT90Y,
        float direction, float distance,
        float* treeRT90X, float* treeRT90Y)
{
    // centreRT90X Sample plot RT90 X centre coordinate (vertical axis in meters)
    // centreRT90Y Sample plot RT90 Y centre coordinate (horizontal axis meters)
    // directon    Direction in 0-400 degrees from tree to sample plot centre
    //             North = 0, East = 100, etc.
    // distance    Distance from tree pith to sample plot centre (meters)
    // treeRT90X   Tree pith RT90 X coordinate (meters)
    // treeRT90Y   Tree pith RT90 Y coordinate (meters)

    *treeRT90X = centreRT90X + distance*sin(((300-direction)/400.0)*2*3.141592654);
    *treeRT90Y = centreRT90Y + distance*cos(((300-direction)/400.0)*2*3.141592654);

    return 0;
}

int main(int argc, char* argv[])
{
    float centreX = atof(argv[1]);
    float centreY = atof(argv[2]);
    float direction = atof(argv[3]);
    float distance = atof(argv[4]);

    float treeX;
    float treeY;

    treeCoord(centreX, centreY, direction, distance, &treeX, &treeY);

    cout << setprecision(10);
    cout << "Tree RT90 X: " << treeX << "\n";
    cout << "Tree RT90 Y: " << treeY << "\n";

    return 0;
}
```

Appendix B, single tree parameters

Single tree parameters. This data can be found on the CD in the file CDDRIVE:\SINGLETREES\RESULT.XLS.

Forest	StandID	PlotID	Diameter (mm)	Height to be used (dm)	Volume to be used (dm^3)	Direction (0-400 deg)	Distance (m)
1	1	1	381	170.14	947.72	123	3.79
1	1	1	224	141.77	263.70	167	4.59
1	1	1	434	158.00	1119.31	198	2.73
1	1	1	391	183.00	1037.91	23	7.64
1	1	1	236	149.00	321.33	110	6.3
1	1	2	319	153.05	617.89	319	4.33
1	1	2	271	144.84	417.20	383	7.91
1	1	2	240	146.00	326.16	2	9.57
1	1	2	366	163.00	822.28	74	7.27
1	1	3	396	160.72	1040.09	242	9.65
1	1	3	341	171.00	746.64	242	2.62
1	1	3	236	105.00	238.68	173	7.32
1	1	4	410	168.00	1055.89	297	4.6
1	1	4	357	162.00	778.76	366	5.23
1	1	5	211	135.32	228.34	230	7.73
1	1	5	320	160.00	622.56	260	9.92
1	1	5	228	140.58	275.19	281	8.41
1	1	5	221	138.49	255.28	302	7.88
1	1	5	336	162.14	700.19	319	5.19
1	1	5	349	169.00	773.27	129	2.63
1	1	5	340	189.00	812.42	399	1.86
1	1	6	279	154.06	447.48	146	4.84
1	1	6	249	147.28	340.24	193	5.93
1	1	6	334	162.96	690.19	249	5.19
1	1	6	321	202.00	771.67	146	9.43
1	1	6	344	174.00	771.49	278	7.74
1	1	6	272	148.00	421.74	337	6.34
1	1	6	279	168.00	496.03	47	5.92
1	1	6	144	128.00	107.42	103	1.89
1	1	7	263	142.78	388.15	381	3.56
1	1	7	256	141.29	363.74	0	9.7
1	1	7	248	139.48	336.96	22	5.99
1	1	7	208	128.62	220.60	30	9.22
1	1	7	282	146.45	459.16	66	4.07
1	1	7	277	168.00	489.11	259	6.76
1	1	7	276	155.00	452.00	86	9.84
1	1	8	309	144.32	572.26	341	6.89
1	1	8	264	150.00	402.50	381	7.22
1	1	8	268	127.00	359.02	100	4.51
1	1	9	240	149.98	311.37	320	6.17
1	1	9	313	166.51	590.27	11	9.83
1	1	9	245	151.41	327.23	38	8.9
1	1	9	476	186.00	1550.81	307	8.28
1	1	9	315	148.00	562.55	320	2.63
1	1	9	252	133.00	330.92	378	1.79

Forest	StandID	PlotID	Diameter (mm)	Height to be used (dm)	Volume to be used (dm^3)	Direction (0-400 deg)	Distance (m)
1	1	9	299	136.00	472.00	91	8.52
1	1	10	232	138.23	286.96	156	8.52
1	1	10	230	137.67	281.04	170	5.83
1	1	10	278	185.00	537.59	97	6.76
1	1	10	228	138.00	280.82	109	6.62
1	1	10	323	174.00	681.85	252	8.18
1	1	10	355	180.00	845.98	334	8.2
1	1	11	146	109.78	94.06	7	4.21
1	1	11	313	161.53	590.27	142	9.48
1	1	11	287	156.92	479.01	168	9.25
1	1	11	436	173.14	1311.35	223	7.9
1	1	11	181	129.00	168.70	69	5.58
1	1	11	386	188.00	1036.89	257	8.93
1	1	12	251	146.93	346.86	32	3.62
1	1	12	299	157.19	528.67	177	10
1	1	12	373	166.95	900.50	308	5.65
1	1	12	415	176.00	1126.90	101	5.67
1	1	12	261	154.00	402.85	345	5.67
1	1	13	296	65.00	515.99	146	9.84
1	1	13	210	132.49	225.74	264	7.97
1	1	13	322	138.00	552.98	98	2.95
1	1	13	347	173.00	780.71	107	8.18
1	1	13	410	170.00	1066.99	232	3.37
1	1	14	153	103.99	105.29	15	8.05
1	1	14	135	67.00	56.16	281	3.52
1	1	14	392	171.00	981.85	45	8.83
1	1	15	346	161.97	751.43	89	6.5
1	1	15	411	167.64	1137.51	189	9.85
1	1	15	412	170.00	1077.26	277	6.96
1	1	15	419	173.00	1130.97	24	9.9
1	1	16	120	40.00	58.65	269	2.62
1	1	16	298	163.46	524.42	343	9.7
1	1	16	267	156.57	402.52	120	6.21
1	1	16	199	135.36	198.31	128	3.21
1	1	16	216	141.57	241.59	154	8.29
1	1	16	374	174.90	906.33	269	7.15
1	1	16	250	104.00	265.32	351	8.28
1	1	16	280	107.00	339.51	17	8.4
1	1	16	454	212.00	1590.52	144	7.02
1	1	17	271	147.03	417.20	85	5.3
1	1	17	261	144.82	381.08	127	6.79
1	1	17	221	134.24	255.28	189	9.44
1	1	17	413	163.00	1043.06	325	6.55
1	1	17	311	145.00	538.93	167	6.53
1	1	18	306	154.73	558.97	365	9.7
1	1	18	302	154.11	541.54	399	6.96
1	1	18	134	101.32	76.51	14	7.92
1	1	18	243	142.14	320.83	144	3.85
1	1	18	251	144.10	346.86	184	8.38
1	1	18	270	148.30	413.50	239	9.01

Forest	StandID	PlotID	Diameter (mm)	Height to be used (dm)	Volume to be used (dm^3)	Direction (0-400 deg)	Distance (m)
1	1	18	208	132.09	220.60	274	9.56
1	1	18	268	149.00	412.10	163	9.98
1	1	18	272	182.00	507.54	201	5.35
1	1	19	251	147.78	346.86	309	7.56
1	1	19	255	148.77	360.32	375	2.86
1	1	19	263	150.68	388.15	18	4.36
1	1	19	283	154.98	463.09	18	7.9
1	1	19	269	152.04	409.82	263	6.69
1	1	19	112	90.66	49.67	270	5.92
1	1	19	304	175.00	608.66	300	9.25
1	1	19	385	155.00	869.22	146	7.46
1	1	20	318	152.24	613.23	202	3.66
1	1	20	336	154.53	700.19	233	8.23
1	1	20	266	162.00	437.36	387	9.86
1	1	20	321	152.00	597.55	311	5.5
1	1	21	348	152.83	761.94	34	7.5
1	1	21	353	153.34	788.57	74	7.25
1	1	21	276	154.00	449.42	153	7
1	1	21	289	165.00	522.90	175	6.82
1	1	22	230	16.00	281.04	331	8.21
1	1	22	234	142.71	292.95	163	6.71
1	1	22	270	151.29	413.50	192	8.61
1	1	22	231	141.89	283.99	290	5.28
1	1	22	147	110.25	95.62	316	5.64
1	1	22	226	140.47	269.41	383	8.41
1	1	22	181	125.20	157.82	22	6.96
1	1	22	73	66.56	17.72	22	6.63
1	1	22	196	130.83	191.18	37	8.74
1	1	22	272	151.70	420.92	27	2.32
1	1	22	269	151.08	409.82	84	6.1
1	1	22	287	154.58	479.01	123	9.24
1	1	22	294	152.00	502.86	192	2.87
1	1	22	225	164.00	319.01	267	8.99
1	1	23	208	137.35	220.60	390	2.38
1	1	23	281	157.10	455.24	18	8.7
1	1	23	196	133.03	191.18	81	9.9
1	1	23	379	170.80	935.78	124	9.89
1	1	23	193	131.90	184.21	314	5.31
1	1	23	326	170.00	680.01	100	5.69
1	1	23	330	166.00	681.85	250	5.83
1	1	23	239	161.00	352.90	333	8.27
1	1	23	269	160.00	442.12	353	9.44
1	1	24	310	137.00	576.73	297	8.86
1	1	24	113	87.81	50.75	147	4.61
1	1	24	199	126.32	198.31	335	6.33
1	1	24	272	145.64	420.92	369	8.66
1	1	24	310	152.17	576.73	82	9.4
1	1	24	330	195.00	788.51	267	8.76
1	1	25	357	159.24	810.26	12	9.38
1	1	25	261	173.00	447.14	47	6.2

Forest	StandID	PlotID	Diameter (mm)	Height to be used (dm)	Volume to be used (dm^3)	Direction (0-400 deg)	Distance (m)
1	1	25	338	177.00	756.84	97	7.12
1	1	25	343	163.00	723.79	265	9.44
1	2	26	159	125.29	115.51	171	2.12
1	2	26	196	142.10	191.18	195	6.98
1	2	26	129	108.75	69.81	195	8.1
1	2	26	154	122.72	106.96	210	8.42
1	2	26	271	165.95	417.20	365	3.35
1	2	26	431	187.21	1275.43	38	8.8
1	2	26	228	153.78	275.19	105	3.9
1	2	26	290	163.00	520.75	222	6.15
1	2	26	279	175.00	514.64	365	2.88
1	2	27	216	143.78	241.59	156	4.8
1	2	27	246	152.69	330.45	191	8.16
1	2	27	284	161.49	467.04	366	4.26
1	2	27	268	158.09	406.16	9	6.15
1	2	27	325	173.00	686.59	239	5.61
1	2	27	281	151.00	457.52	97	4.85
1	2	28	345	173.03	746.21	21	9.25
1	2	28	181	131.99	157.82	221	8.26
1	2	28	201	139.93	203.14	221	9.47
1	2	28	225	148.15	266.55	294	7.05
1	2	28	320	169.64	622.56	331	8.46
1	2	28	289	165.00	522.90	394	4.99
1	2	28	203	102.00	173.33	135	9.79
1	2	29	323	169.81	636.71	175	2.12
1	2	29	372	175.73	894.70	347	9.12
1	2	29	307	164.00	585.42	253	4.51
1	2	29	295	160.00	529.66	354	2.9
1	2	30	320	173.29	622.56	137	5.11
1	2	30	275	164.59	432.18	193	7.93
1	2	30	406	202.00	1222.09	400	8.85
1	2	30	227	129.00	262.64	68	8.83
1	2	30	313	194.00	707.74	104	9.95
1	2	31	368	152.00	781.83	134	4.79
1	2	31	336	180.00	759.49	216	6.05
1	2	31	315	175.00	652.52	253	7.19
1	2	32	280	180.93	451.35	168	7.3
1	2	32	243	170.74	320.83	169	6.2
1	2	32	232	167.14	286.96	185	5.12
1	2	32	134	120.68	76.51	189	3.65
1	2	32	142	125.57	87.97	277	2.96
1	2	32	178	145.05	151.60	333	4.24
1	2	32	365	195.55	854.69	315	7.98
1	2	32	274	179.46	428.41	351	6.19
1	2	32	276	179.96	435.98	13	3.57
1	2	32	266	177.40	398.90	32	9.15
1	2	32	153	131.96	105.29	81	8.92
1	2	32	286	182.33	475.00	82	9.16
1	2	32	291	183.45	495.24	109	7.28
1	2	32	202	155.84	205.58	118	8.62

Forest	StandID	PlotID	Diameter (mm)	Height to be used (dm)	Volume to be used (dm^3)	Direction (0-400 deg)	Distance (m)
1	2	32	161	120.00	126.14	148	3.07
1	2	32	415	171.00	1098.44	277	3.28
1	2	33	233	146.94	289.95	138	8.94
1	2	33	189	132.08	175.15	151	9.88
1	2	33	344	168.42	741.02	324	5.59
1	2	33	108	91.30	45.51	324	5.88
1	2	33	142	110.73	87.97	373	3.86
1	2	33	264	182.00	478.85	87	5.4
1	2	33	208	175.00	290.61	270	4.28
1	2	34	171	129.41	137.63	178	2.13
1	2	34	279	164.53	447.48	250	6.61
1	2	34	217	147.61	244.29	299	5.76
1	2	34	245	156.20	327.23	364	2.81
1	2	34	191	138.00	179.65	24	5.39
1	2	34	345	175.47	746.21	125	6.96
1	2	34	322	160.00	628.93	214	9.95
1	2	34	249	151.00	361.07	252	4.84
1	2	35	292	171.98	499.35	113	3.37
1	2	35	246	160.90	330.45	152	7.74
1	2	35	230	156.08	281.04	297	7.67
1	2	35	164	129.65	124.45	300	3.1
1	2	35	218	152.10	247.01	337	7.9
1	2	35	261	164.94	381.08	377	7.44
1	2	35	151	123.01	102.01	379	5.06
1	2	35	93	87.08	31.74	3	6.01
1	2	35	202	146.25	205.58	400	9.15
1	2	35	250	162.02	343.54	13	6.82
1	2	35	165	130.14	126.29	21	9.77
1	2	35	113	100.61	50.75	30	9.63
1	2	35	138	115.85	82.12	42	8.06
1	2	35	205	147.39	213.01	46	5.6
1	2	35	236	134.00	292.86	218	8.44
1	2	35	322	152.00	601.21	248	8.2
1	2	36	113	93.53	50.75	199	2.54
1	2	36	221	141.63	255.28	340	9.92
1	2	36	304	160.65	550.22	98	4.35
1	2	36	253	150.41	353.55	117	8.09
1	2	36	294	167.00	546.62	386	2.85
1	2	36	245	175.00	399.43	38	8.83
1	2	37	187	139.04	170.72	168	3.4
1	2	37	207	146.76	218.05	228	6.02
1	2	37	238	156.77	305.16	216	7.6
1	2	37	208	147.12	220.60	230	9
1	2	37	248	159.55	336.96	296	5.99
1	2	37	229	154.09	278.10	22	7.8
1	2	37	255	161.37	360.32	26	5.33
1	2	37	253	160.86	353.55	23	4.27
1	2	37	285	168.16	471.01	61	6.34
1	2	37	269	164.74	409.82	122	9.37
1	2	37	262	184.00	476.56	214	9.57

Forest	StandID	PlotID	Diameter (mm)	Height to be used (dm)	Volume to be used (dm^3)	Direction (0-400 deg)	Distance (m)
1	2	37	277	167.00	486.49	47	9.29
1	2	38	326	179.58	651.05	35	2.89
1	2	38	228	156.79	275.19	86	7.58
1	2	38	297	174.54	520.20	243	8.69
1	2	38	279	170.76	447.48	288	4.55
1	2	38	268	168.17	406.16	301	8.24
1	2	38	202	147.47	205.58	380	6.39
1	2	38	224	155.46	263.70	21	8.05
1	2	38	367	193.00	961.76	163	9.96
1	2	38	290	190.00	598.23	378	8.45
1	2	39	184	134.12	164.20	165	2.76
1	2	39	296	166.46	515.99	190	5.72
1	2	39	208	143.35	220.60	310	4.39
1	2	39	232	151.19	286.96	27	5.86
1	2	39	329	171.76	665.57	71	4.31
1	2	39	200	140.44	200.72	110	7.15
1	2	39	292	205.00	650.43	213	4.88
1	2	39	249	185.00	433.78	345	3
1	2	40	325	179.90	646.25	170	9.94
1	2	40	285	172.52	471.01	187	9.39
1	2	40	369	185.54	877.42	229	7.79
1	2	40	218	153.78	247.01	315	8.2
1	2	40	335	181.39	695.18	383	3.33
1	2	40	328	175.00	706.32	263	5.14
1	2	40	355	165.00	782.79	68	7.75
1	2	41	339	172.32	715.34	226	6.61
1	2	41	214	143.00	255.97	176	1.51
1	2	41	309	168.00	605.80	176	5.95
1	2	41	391	165.00	946.56	306	9.73
1	2	42	210	148.29	225.74	143	5.47
1	2	42	344	179.08	741.02	237	6.41
1	2	42	302	172.65	541.54	280	2.7
1	2	42	276	167.38	435.98	3	4.62
1	2	42	216	150.42	241.59	392	9.73
1	2	42	245	159.54	327.23	51	5.39
1	2	42	278	167.82	443.63	116	8.26
1	2	42	239	157.80	308.26	114	5.52
1	2	42	222	150.00	286.86	188	7.97
1	2	42	171	106.00	127.77	11	7.76
1	3	43	328	171.79	660.71	135	4.89
1	3	43	265	159.80	395.30	190	9.69
1	3	43	225	148.64	266.55	195	7.31
1	3	43	264	159.56	391.72	239	4.61
1	3	43	190	136.00	177.39	344	5.05
1	3	43	263	159.32	388.15	52	9.1
1	3	43	299	167.01	528.67	43	4.59
1	3	43	224	145.00	283.29	287	3.88
1	3	43	381	205.00	1093.60	394	7.68
1	3	44	342	166.83	730.68	224	8.37
1	3	44	326	164.75	651.05	334	6.72

Forest	StandID	PlotID	Diameter (mm)	Height to be used (dm)	Volume to be used (dm^3)	Direction (0-400 deg)	Distance (m)
1	3	44	277	156.29	439.79	395	9.88
1	3	44	300	152.00	523.20	136	7.31
1	3	44	354	160.00	757.61	360	6.52
1	3	45	267	159.12	402.52	191	7.53
1	3	45	262	157.91	384.61	208	4.86
1	3	45	299	165.85	528.67	266	3.03
1	3	45	314	168.46	594.82	47	8.52
1	3	45	397	178.05	1046.42	122	7.76
1	3	45	268	135.00	378.24	381	8.19
1	3	45	267	180.00	484.59	12	5.59
1	3	46	226	145.98	269.41	160	4.33
1	3	46	193	134.79	184.21	177	2.61
1	3	46	174	127.11	143.52	176	9.05
1	3	46	240	149.99	311.37	227	5.07
1	3	46	207	139.85	218.05	316	8.3
1	3	46	232	147.75	286.96	340	7.98
1	3	46	182	130.46	159.93	348	3.81
1	3	46	237	149.16	302.08	379	8.6
1	3	46	227	146.28	272.29	8	8.76
1	3	46	225	145.68	266.55	41	5.09
1	3	46	198	136.65	195.92	90	8.95
1	3	46	253	153.36	353.55	90	4.91
1	3	46	295	180.00	588.73	295	4.93
1	3	46	203	147.00	236.66	116	8.23
1	3	47	173	130.41	141.54	176	9.46
1	3	47	233	152.66	289.95	203	5.28
1	3	47	235	153.25	295.98	249	5.9
1	3	47	224	149.87	263.70	267	3.57
1	3	47	191	138.05	179.65	345	2.54
1	3	47	222	149.23	258.07	349	8.52
1	3	47	289	166.36	487.09	0	7.31
1	3	47	253	158.23	353.55	41	6.7
1	3	47	216	147.25	241.59	47	3.41
1	3	47	266	161.43	398.90	75	6.56
1	3	47	329	173.01	665.57	139	8.34
1	3	47	130	108.36	71.12	143	5.93
1	3	47	299	191.00	638.06	198	8.71
1	3	47	259	138.00	360.48	320	6.38
1	3	48	306	173.64	558.97	179	6.52
1	3	48	345	179.49	746.21	280	5.28
1	3	48	280	168.52	451.35	289	9.77
1	3	48	244	159.50	324.02	323	9.83
1	3	48	218	151.34	247.01	360	5.9
1	3	48	270	166.26	413.50	26	8.54
1	3	48	296	171.79	515.99	80	7.57
1	3	48	262	164.31	384.61	97	9.82
1	3	48	277	167.86	439.79	97	4.11
1	3	48	218	139.00	258.87	213	4.49
1	3	48	304	162.00	568.03	328	7.97
1	3	48	177	140.00	173.56	360	9.9

Forest	StandID	PlotID	Diameter (mm)	Height to be used (dm)	Volume to be used (dm^3)	Direction (0-400 deg)	Distance (m)
1	3	48	285	185.00	564.31	77	3.18
1	3	49	278	153.61	443.63	147	6.14
1	3	49	204	134.13	210.52	252	9.51
1	3	49	245	146.22	327.23	247	6.57
1	3	49	294	156.55	507.63	302	5.16
1	3	49	169	120.73	133.79	347	7.04
1	3	49	287	155.31	479.01	97	9.4
1	3	49	202	132.00	213.22	254	4.52
1	3	49	246	137.00	323.82	369	6.82
1	3	49	260	137.00	360.94	21	7.05
1	3	50	298	166.22	524.42	161	7.93
1	3	50	129	105.85	69.81	221	6.89
1	3	50	155	119.82	108.64	240	3.51
1	3	50	310	168.34	576.73	307	4.92
1	3	50	244	153.82	324.02	383	7.33
1	3	50	375	176.65	912.17	46	8.02
1	3	50	292	158.00	513.40	247	7.33
1	3	50	200	150.00	234.08	272	8.84
1	3	50	294	157.00	517.41	12	6.23
1	3	50	236	155.00	332.80	18	3.76
2	4	1	216	129.16	241.59	224	6.16
2	4	1	112	88.17	49.67	223	7.01
2	4	1	133	98.95	75.14	230	6.57
2	4	1	225	131.41	266.55	220	9.01
2	4	1	108	85.97	45.51	210	7.8
2	4	1	92	76.70	30.93	256	9.16
2	4	1	147	105.39	95.62	341	5.76
2	4	1	207	126.74	218.05	21	9.13
2	4	1	138	101.32	82.12	43	4.48
2	4	1	75	66.14	18.91	42	5.15
2	4	1	184	119.68	164.20	100	8.02
2	4	1	111	87.62	48.61	147	7.77
2	4	1	158	110.04	113.77	157	5.11
2	4	1	155	108.81	108.64	182	6.35
2	4	1	253	137.37	353.55	182	6.68
2	4	1	206	121.00	205.61	272	9.46
2	4	1	262	161.00	422.25	332	6.9
2	4	1	195	120.00	183.37	55	8.04
2	4	1	236	150.00	323.24	99	7.96
2	4	2	292	144.03	499.35	4	3.17
2	4	2	254	137.88	356.93	399	8.94
2	4	2	264	139.72	391.72	7	9.66
2	4	2	163	111.70	122.63	251	6.7
2	4	2	286	143.20	475.00	288	9.62
2	4	2	120	91.88	58.65	290	9.96
2	4	2	96	78.47	34.27	314	9.45
2	4	2	165	112.50	126.29	361	8.67
2	4	2	299	135.00	469.03	120	6.34
2	4	2	252	137.00	339.48	254	7.03
2	4	3	139	100.71	83.56	14	3.35

Forest	StandID	PlotID	Diameter (mm)	Height to be used (dm)	Volume to be used (dm^3)	Direction (0-400 deg)	Distance (m)
2	4	3	98	79.14	36.01	87	9.97
2	4	3	228	131.56	275.19	98	8.44
2	4	3	88	73.18	27.79	111	6.7
2	4	3	78	66.99	20.78	112	6.64
2	4	3	212	127.44	230.95	138	9.1
2	4	3	175	115.64	145.52	142	8.1
2	4	3	141	101.64	86.49	294	9.35
2	4	3	247	135.79	333.70	289	6.83
2	4	3	207	126.03	218.05	290	7.37
2	4	3	183	118.48	162.06	294	3.8
2	4	3	172	114.54	139.58	322	3.27
2	4	3	175	117.00	145.24	132	3.87
2	4	3	314	165.00	615.20	151	9.62
2	4	4	128	96.03	68.51	384	9.56
2	4	4	242	135.54	317.66	389	4.44
2	4	4	147	105.01	95.62	10	8.17
2	4	4	246	136.38	330.45	30	4.88
2	4	4	172	115.25	139.58	32	5.4
2	4	4	137	100.42	80.70	57	7.98
2	4	4	191	121.90	179.65	61	6.19
2	4	4	225	131.61	266.55	76	9.28
2	4	4	302	145.39	541.54	101	7.07
2	4	4	189	121.24	175.15	304	9.09
2	4	4	209	160.00	270.25	357	4.84
2	4	4	309	166.00	599.36	138	9.3
2	4	5	94	74.81	32.57	291	7.46
2	4	5	196	119.48	191.18	299	9.88
2	4	5	83	68.31	24.14	311	3.33
2	4	5	213	124.31	233.59	360	8.18
2	4	5	230	128.52	281.04	128	8.25
2	4	5	102	79.35	39.65	172	5.38
2	4	5	287	138.84	479.01	173	6.09
2	4	5	263	148.00	394.83	257	2
2	4	5	280	143.00	433.23	226	6.23
2	4	6	140	95.46	85.02	265	9.58
2	4	6	173	108.86	141.54	279	5.74
2	4	6	257	132.05	367.17	2	9.53
2	4	6	167	106.63	130.01	60	6.39
2	4	6	175	109.59	145.52	109	3.28
2	4	6	95	72.62	33.41	120	9.27
2	4	6	93	71.49	31.74	139	5.93
2	4	6	253	135.00	337.81	319	4.03
2	4	6	221	115.00	226.10	34	7.31
2	4	6	169	100.00	119.02	176	5.73
2	4	6	163	104.00	114.52	208	8.25
2	4	7	150	105.17	100.39	279	6.86
2	4	7	161	109.72	119.04	299	4.56
2	4	7	151	105.60	102.01	336	5.39
2	4	7	179	116.46	153.66	25	5.13
2	4	7	125	93.51	64.71	125	5.79

Forest	StandID	PlotID	Diameter (mm)	Height to be used (dm)	Volume to be used (dm^3)	Direction (0-400 deg)	Distance (m)
2	4	7	222	129.29	258.07	207	8.06
2	4	7	182	117.50	159.93	229	5.48
2	4	7	174	114.68	143.52	241	5.8
2	4	7	225	145.00	285.77	389	3.69
2	4	7	171	110.00	131.78	11	8.12
2	4	7	296	158.00	527.28	133	7.17
2	4	7	291	153.00	495.69	149	7.44
2	4	8	116	85.76	54.05	322	6.98
2	4	8	209	120.19	223.16	324	9.06
2	4	8	142	97.77	87.97	381	4.6
2	4	8	194	116.14	186.52	391	7.31
2	4	8	181	112.20	157.82	5	9.96
2	4	8	206	119.42	215.53	77	9.2
2	4	8	198	117.27	195.92	111	9.49
2	4	8	132	93.38	73.79	193	8.49
2	4	8	183	112.83	162.06	224	6.48
2	4	8	220	122.86	252.51	235	7.27
2	4	8	176	101.00	129.93	297	7.73
2	4	8	208	115.00	200.74	120	7.79
2	4	9	138	92.82	82.12	323	5.04
2	4	9	92	70.11	30.93	27	4.05
2	4	9	146	96.18	94.06	28	5.04
2	4	9	198	114.03	195.92	229	3.49
2	4	9	276	130.14	435.98	251	5.05
2	4	9	247	140.00	332.60	187	4.91
2	4	9	72	70.00	16.96	258	4.6
2	4	10	148	104.43	97.19	389	8.29
2	4	10	107	83.90	44.50	390	9.67
2	4	10	74	64.10	18.31	72	9.7
2	4	10	56	52.52	9.36	80	3.03
2	4	10	331	147.62	675.36	102	3.07
2	4	10	200	123.71	200.72	153	6.48
2	4	10	196	122.47	191.18	229	4.77
2	4	10	73	63.46	17.72	240	1.65
2	4	10	102	81.07	39.65	248	7.07
2	4	10	253	136.87	353.55	259	7.33
2	4	10	261	134.00	356.80	102	5.98
2	4	10	157	75.00	82.18	102	9.98
2	4	10	228	144.00	291.48	215	9.82
2	4	11	122	91.31	61.03	394	3.07
2	4	11	199	122.90	198.31	32	3.42
2	4	11	263	138.47	388.15	32	6.28
2	4	11	116	88.16	54.05	140	8.78
2	4	11	173	114.00	141.54	244	9.68
2	4	11	169	112.48	133.79	311	5.92
2	4	11	204	113.00	190.42	76	9.37
2	4	11	386	131.00	756.46	234	3.7
2	4	12	170	117.45	135.70	81	7.22
2	4	12	329	152.69	665.57	109	8.92
2	4	12	114	90.81	51.84	161	8.56

Forest	StandID	PlotID	Diameter (mm)	Height to be used (dm)	Volume to be used (dm^3)	Direction (0-400 deg)	Distance (m)
2	4	12	95	79.67	33.41	196	5.02
2	4	12	84	72.79	24.84	209	5.79
2	4	12	128	98.35	68.51	215	8.82
2	4	12	247	140.47	333.70	230	9.57
2	4	12	138	103.37	82.12	240	4.94
2	4	12	345	154.03	746.21	251	6.63
2	4	12	229	136.28	278.10	289	3.35
2	4	12	191	125.14	179.65	313	6.07
2	4	12	281	150.00	454.86	396	4.87
2	4	12	255	135.00	343.07	18	7.83
2	4	13	144	96.94	90.99	106	4.82
2	4	13	94	72.69	32.57	115	5.56
2	4	13	156	101.72	110.33	112	9.12
2	4	13	84	67.04	24.84	121	8.07
2	4	13	202	116.58	205.58	151	9.59
2	4	13	167	105.75	130.01	157	5.83
2	4	13	180	110.12	155.73	232	4.63
2	4	13	163	104.32	122.63	246	8.77
2	4	13	234	124.12	292.95	78	9.77
2	4	13	160	103.22	117.27	84	6.54
2	4	13	113	62.00	37.41	294	8.58
2	4	13	162	99.00	108.66	20	8.69
2	4	14	155	102.76	108.64	131	3.62
2	4	14	130	92.06	71.12	250	5.45
2	4	14	231	125.50	283.99	287	6.32
2	4	14	258	130.69	370.62	313	7.78
2	4	14	209	120.26	223.16	89	5.82
2	4	14	246	142.00	334.07	204	8.64
2	4	14	260	132.00	349.58	287	3.67
2	4	15	99	82.09	36.90	183	3.2
2	4	15	281	146.03	455.24	209	4.47
2	4	15	289	147.21	487.09	238	3.26
2	4	15	261	142.64	381.08	271	6.37
2	4	15	308	149.65	567.81	290	9.52
2	4	15	182	121.65	159.93	290	9.35
2	4	15	286	146.78	475.00	311	7.88
2	4	15	165	115.18	126.29	45	6.41
2	4	15	223	134.22	260.88	59	5.7
2	4	15	174	118.70	143.52	129	8.93
2	4	15	83	72.18	24.14	97	5.17
2	4	15	261	168.00	435.43	218	4.72
2	4	15	208	142.00	240.66	84	9.05
2	4	16	304	146.74	550.22	171	9.96
2	4	16	319	148.40	617.89	182	6.84
2	4	16	238	135.55	305.16	361	8.42
2	4	16	164	112.71	124.45	357	6.61
2	4	16	332	130.00	558.23	99	6.19
2	4	16	223	120.00	238.51	225	5.51
2	4	16	291	100.00	346.96	349	8.08
2	4	17	201	117.37	203.14	367	7.44

Forest	StandID	PlotID	Diameter (mm)	Height to be used (dm)	Volume to be used (dm^3)	Direction (0-400 deg)	Distance (m)
2	4	17	247	128.07	333.70	371	9.47
2	4	17	212	120.32	230.95	396	7.66
2	4	17	181	111.33	157.82	29	8.01
2	4	17	178	110.34	151.60	44	5.07
2	4	17	150	107.00	99.68	200	9.48
2	4	17	260	140.00	367.77	13	3.23
2	4	18	232	135.28	286.96	105	4.26
2	4	18	218	131.23	247.01	177	6.39
2	4	18	116	88.07	54.05	223	8.09
2	4	18	116	88.07	54.05	243	7.01
2	4	18	159	109.44	115.51	323	7.96
2	4	18	157	108.55	112.04	306	4.05
2	4	18	96	76.51	34.27	347	7.39
2	4	18	144	102.54	90.99	355	6.86
2	4	18	113	86.40	50.75	376	9.35
2	4	18	70	60.26	16.01	11	8.13
2	4	18	255	133.00	338.69	157	5.05
2	4	18	227	138.00	278.41	8	4.61
2	4	18	152	120.00	112.77	78	7.82
2	4	18	404	187.00	1128.53	265	9.13
2	4	19	91	70.03	30.13	163	9.23
2	4	19	222	120.95	258.07	170	9.68
2	4	19	136	92.56	79.29	173	8.36
2	4	19	223	121.18	260.88	215	7.23
2	4	19	141	85.00	73.25	62	7.75
2	4	19	274	156.00	448.15	342	8.73
2	4	20	109	82.25	46.53	299	7.97
2	4	20	117	86.37	55.18	305	8.36
2	4	20	120	87.87	58.65	306	7.88
2	4	20	298	136.85	524.42	31	6.45
2	4	20	91	72.32	30.13	45	8.5
2	4	20	285	135.32	471.01	54	8.73
2	4	20	110	82.77	47.56	54	6.33
2	4	20	112	83.82	49.67	179	6.11
2	4	20	96	75.17	34.27	179	6.44
2	4	20	172	133.00	156.88	308	7.66
2	4	20	203	142.00	229.50	42	2.92
2	4	21	248	140.84	336.96	326	10
2	4	21	259	143.28	374.09	33	4.55
2	4	21	129	97.53	69.81	80	3.07
2	4	21	165	114.39	126.29	162	8.11
2	4	21	127	96.48	67.23	194	9.71
2	4	21	201	127.79	203.14	205	8.78
2	4	21	199	127.13	198.31	205	3.9
2	4	21	130	98.05	71.12	236	8.62
2	4	21	169	116.04	133.79	241	8.53
2	4	21	77	66.94	20.15	272	5.1
2	4	21	58	54.45	10.18	280	4.95
2	4	21	91	75.81	30.13	274	5.68
2	4	21	276	146.65	435.98	272	6.23

Forest	StandID	PlotID	Diameter (mm)	Height to be used (dm)	Volume to be used (dm^3)	Direction (0-400 deg)	Distance (m)
2	4	21	229	145.00	295.78	306	6.13
2	4	21	324	125.00	514.75	101	5.83
2	4	21	203	120.00	198.38	183	9.15
2	4	22	120	89.15	58.65	290	2.67
2	4	22	127	92.64	67.23	390	3.73
2	4	22	272	136.72	420.92	8	4.13
2	4	22	300	140.54	532.94	30	7.57
2	4	22	151	103.52	102.01	44	4.32
2	4	22	77	64.83	20.15	65	9.2
2	4	22	211	123.96	228.34	263	7.57
2	4	22	254	142.00	355.68	31	4.53
2	4	22	240	144.00	322.23	87	8.07
2	4	23	105	77.25	42.52	313	9.14
2	4	23	89	68.50	28.56	344	9.89
2	4	23	225	122.36	266.55	347	7.49
2	4	23	142	94.97	87.97	36	7.56
2	4	23	110	79.85	47.56	223	9.88
2	4	23	204	116.86	210.52	215	8.14
2	4	23	210	118.52	225.74	211	5.97
2	4	23	137	92.79	80.70	246	9.19
2	4	23	222	121.62	258.07	262	9.4
2	4	23	180	110.00	145.69	386	5.85
2	4	23	197	117.00	183.10	113	8.84
2	4	24	154	24.00	106.96	279	5.92
2	4	24	169	113.81	133.79	293	5.7
2	4	24	343	149.42	735.84	69	5.96
2	4	24	59	54.79	10.61	195	6.22
2	4	24	105	83.30	42.52	196	6.22
2	4	24	134	98.60	76.51	203	6.58
2	4	24	360	150.53	826.76	212	8.91
2	4	24	92	75.68	30.93	248	6.18
2	4	24	66	59.34	13.90	256	6.64
2	4	24	246	140.00	329.96	37	7.13
2	4	24	285	153.00	475.85	187	6.63
2	4	25	248	21.00	336.96	71	7.1
2	4	25	297	137.60	520.20	18	4.3
2	4	25	117	86.05	55.18	60	6.42
2	4	25	87	69.63	27.03	60	2.96
2	4	25	209	121.17	223.16	92	3.34
2	4	25	195	117.21	188.84	67	8.22
2	4	25	169	108.62	133.79	149	7.03
2	4	25	117	86.05	55.18	185	7.7
2	4	25	120	87.56	58.65	201	8.95
2	4	25	170	128.00	148.29	131	7.85
2	4	25	190	119.00	173.05	243	7.52
2	4	26	440	162.78	1340.51	364	2.87
2	4	26	132	91.81	73.79	364	9.94
2	4	26	88	67.60	27.79	389	6.32
2	4	26	223	128.00	260.88	129	7.5
2	4	26	218	126.47	247.01	317	9.75

Forest	StandID	PlotID	Diameter (mm)	Height to be used (dm)	Volume to be used (dm^3)	Direction (0-400 deg)	Distance (m)
2	4	26	244	121.00	286.61	135	9.48
2	4	26	147	85.00	79.49	206	9.88
2	4	26	179	131.00	167.32	330	8.6
2	4	27	238	126.57	305.16	16	4.84
2	4	27	263	131.19	388.15	121	4.32
2	4	27	251	129.10	346.86	167	5.44
2	4	27	243	127.58	320.83	255	7.6
2	4	27	159	99.00	104.75	235	5.74
2	4	27	179	113.00	147.40	340	5.47
2	4	28	314	145.17	594.82	3	3.77
2	4	28	271	139.29	417.20	228	8.88
2	4	28	318	145.60	613.23	301	7.68
2	4	28	214	126.00	229.32	280	8.56
2	4	28	327	138.00	570.01	362	8.79
2	4	29	189	115.68	175.15	338	5.67
2	4	29	172	110.11	139.58	369	9.65
2	4	29	130	93.01	71.12	382	8.63
2	4	29	283	135.41	463.09	12	8.75
2	4	29	128	92.07	68.51	209	6.12
2	4	29	216	123.12	241.59	266	8
2	4	29	273	148.00	424.79	125	2.84
2	4	29	184	125.00	169.52	131	6.77
2	4	29	130	89.00	64.80	249	6.15
2	4	30	227	128.00	272.29	229	9.17
2	4	30	147	94.97	95.62	398	5.91
2	4	30	213	115.55	233.59	4	8.66
2	4	30	72	58.01	17.14	99	6.46
2	4	30	96	71.37	34.27	388	9.05
2	4	30	222	118.00	233.09	50	5.1
2	4	33	93	73.63	31.74	87	2.55
2	4	33	145	100.16	92.52	131	4.22
2	4	33	197	119.35	193.54	143	4.58
2	4	33	209	122.83	223.16	173	7.87
2	4	33	51	47.85	7.47	188	8.36
2	4	33	260	134.40	377.57	382	5.71
2	4	33	330	149.00	620.05	5	4.58
2	4	33	287	117.00	383.55	273	8.01
2	4	34	216	125.38	241.59	51	3.15
2	4	34	210	123.83	225.74	94	6.64
2	4	34	223	127.09	260.88	135	5.38
2	4	34	113	86.19	50.75	142	4.79
2	4	34	131	95.17	72.45	160	8.97
2	4	34	152	104.43	103.64	165	9.92
2	4	34	166	109.91	128.14	175	9.04
2	4	34	228	128.25	275.19	234	4.32
2	4	34	193	119.01	184.21	258	6.88
2	4	34	226	127.79	269.41	399	9.68
2	4	34	179	114.52	153.66	40	8.58
2	4	34	234	139.00	297.32	267	6.84
2	4	34	220	141.00	266.85	15	6.68

Forest	StandID	PlotID	Diameter (mm)	Height to be used (dm)	Volume to be used (dm^3)	Direction (0-400 deg)	Distance (m)
2	4	35	121	89.70	59.84	33	5.99
2	4	35	148	102.53	97.19	49	8.98
2	4	35	136	97.08	79.29	237	4.43
2	4	35	282	139.87	459.16	269	4.5
2	4	35	211	120.00	213.99	29	5.59
2	4	35	406	170.00	1046.59	335	9.32
2	5	31	127	96.13	67.23	311	2.24
2	5	31	217	130.61	244.29	60	5.02
2	5	31	149	106.62	98.78	79	6.03
2	5	31	144	104.36	90.99	83	4.96
2	5	31	155	109.23	108.64	148	6.58
2	5	31	272	142.47	420.92	161	9.88
2	5	31	171	115.71	137.63	187	6.99
2	5	31	320	148.80	622.56	273	8.68
2	5	31	262	140.72	384.61	315	8.15
2	5	31	199	131.00	205.72	88	8.96
2	5	31	246	121.00	291.24	304	8.5
2	5	32	169	111.38	133.79	20	8.37
2	5	32	148	103.01	97.19	42	8.68
2	5	32	279	142.00	427.58	12	4.37
2	5	32	234	137.00	293.60	380	8.44
2	5	32	385	135.00	771.95	93	9.94
2	5	36	356	24.00	804.81	360	8.5
2	5	36	255	142.23	360.32	144	3.6
2	5	36	171	117.83	137.63	158	2.66
2	5	36	253	141.82	353.55	206	3.18
2	5	36	252	141.61	350.20	339	8.05
2	5	36	178	120.51	151.60	341	8.65
2	5	36	302	149.89	541.54	79	4.79
2	5	36	163	114.60	122.63	78	5.55
2	5	36	208	113.00	197.82	322	3.96
2	5	36	275	152.00	441.12	82	6.11
2	5	37	255	149.36	360.32	175	7.61
2	5	37	121	98.98	59.84	222	9.54
2	5	37	120	98.41	58.65	219	7.29
2	5	37	175	125.12	145.52	229	6.94
2	5	37	219	140.30	249.75	236	9.37
2	5	37	104	88.90	41.55	251	8.59
2	5	37	119	97.84	57.48	283	8.25
2	5	37	271	152.57	417.20	265	6
2	5	37	260	150.42	377.57	270	5.08
2	5	37	144	111.20	90.99	276	2.7
2	5	37	301	157.43	537.23	375	4.96
2	5	37	156	116.93	110.33	6	4.66
2	5	37	142	110.21	87.97	15	3.94
2	5	37	194	132.29	186.52	38	4.63
2	5	37	249	148.04	340.24	67	8.73
2	5	37	218	151.00	278.51	342	5.76
2	5	37	390	170.00	966.98	103	9.16
2	5	38	151	94.99	102.01	71	7.91

Forest	StandID	PlotID	Diameter (mm)	Height to be used (dm)	Volume to be used (dm^3)	Direction (0-400 deg)	Distance (m)
2	5	38	217	119.91	244.29	153	9.84
2	5	38	171	103.44	137.63	209	7.37
2	5	38	191	111.09	179.65	236	5.16
2	5	38	107	73.47	44.50	248	5.63
2	5	38	85	61.34	25.56	249	5.77
2	5	38	172	103.84	139.58	265	8.46
2	5	38	131	85.70	72.45	345	5.63
2	5	38	205	140.00	231.03	46	6.94
2	5	38	500	140.00	1334.62	309	3.05
2	5	39	260	147.76	377.57	170	7.37
2	5	39	234	141.99	292.95	221	8.84
2	5	39	154	114.47	106.96	251	9.92
2	5	39	202	132.94	205.58	332	8.67
2	5	39	86	76.59	26.29	366	8.67
2	5	39	143	109.30	89.47	3	9.88
2	5	39	260	147.76	377.57	23	9.73
2	5	39	165	119.27	126.29	12	5.77
2	5	39	211	135.72	228.34	40	4.56
2	5	39	162	118.00	120.83	88	4.63
2	5	39	289	152.77	487.09	99	7.49
2	5	39	318	181.00	685.28	121	9.19
2	5	39	198	139.00	214.54	303	4.07
2	5	39	255	147.00	369.45	326	9.77
2	5	39	260	132.00	349.58	371	9.53
2	5	39	217	137.00	253.32	64	4.14
2	5	40	246	100.00	330.45	45	5.05
2	5	40	223	131.88	260.88	326	9.97
2	5	40	275	142.39	432.18	331	9.71
2	5	40	266	140.91	398.90	351	8.96
2	5	40	161	111.74	119.04	346	6.4
2	5	40	77	67.41	20.15	328	5.45
2	5	40	285	143.89	471.01	328	3.76
2	5	40	142	103.51	87.97	372	9.04
2	5	40	234	134.52	292.95	103	8.99
2	5	40	209	128.14	223.16	124	8.51
2	5	40	236	171.00	363.61	278	6.11
2	5	41	151	81.00	102.01	292	6.84
2	5	41	245	143.45	327.23	289	5.67
2	5	41	106	86.59	43.50	302	5.61
2	5	41	130	100.12	71.12	391	5.11
2	5	41	143	106.76	89.47	24	5.32
2	5	41	113	90.71	50.75	78	8.62
2	5	41	178	122.27	151.60	108	9.53
2	5	41	275	150.00	432.18	167	8.51
2	5	41	310	171.00	619.38	300	4.71
2	5	41	99	74.00	32.92	316	6.87
2	5	41	276	145.00	426.29	383	8.96
2	5	41	322	152.00	601.21	146	6.16
2	5	41	346	130.00	605.61	34	9.57
2	5	42	210	124.97	225.74	8	7.83

Forest	StandID	PlotID	Diameter (mm)	Height to be used (dm)	Volume to be used (dm^3)	Direction (0-400 deg)	Distance (m)
2	5	42	97	73.10	35.13	33	6.5
2	5	42	64	53.08	12.91	59	4.76
2	5	42	186	116.32	168.53	174	6.02
2	5	42	103	76.57	40.60	258	7.82
2	5	42	210	124.97	225.74	253	8.33
2	5	42	51	45.05	7.47	268	9.73
2	5	42	271	143.00	406.33	59	4.32
2	5	42	481	175.00	1499.58	345	8.89
2	5	43	155	117.78	108.64	347	6.45
2	5	43	217	141.51	244.29	13	8.54
2	5	43	177	127.41	149.55	47	8.22
2	5	43	163	121.45	122.63	53	8.71
2	5	43	141	110.90	86.49	63	8.95
2	5	43	154	117.31	106.96	98	8.45
2	5	43	161	120.55	119.04	100	6.86
2	5	43	234	146.32	292.95	106	6.78
2	5	43	137	108.82	80.70	125	8.02
2	5	43	216	141.20	241.59	131	4.68
2	5	43	247	149.58	333.70	93	3.51
2	5	43	286	157.42	475.00	161	2.77
2	5	43	173	125.76	141.54	161	5.12
2	5	43	207	138.36	218.05	185	7.61
2	5	43	264	153.33	391.72	220	9.19
2	5	43	203	137.04	208.04	247	8.72
2	5	43	164	80.00	94.04	370	9.56
2	5	43	413	153.00	987.03	353	9.97
2	5	44	124	94.74	63.47	283	8.9
2	5	44	208	128.10	220.60	286	9.79
2	5	44	259	140.02	374.09	349	7.78
2	5	44	216	130.32	241.59	358	2.47
2	5	44	223	132.15	260.88	379	5.38
2	5	44	97	79.70	35.13	50	6.42
2	5	44	101	82.06	38.72	144	7.06
2	5	44	228	133.40	275.19	190	6.26
2	5	44	164	113.06	124.45	213	4.67
2	5	44	219	130.00	246.45	264	9.87
2	5	44	196	132.00	201.03	364	4.59
2	5	44	65	76.00	14.85	148	9.54
2	5	44	318	172.00	654.50	219	7.53
2	5	45	185	114.67	166.36	267	6.17
2	5	45	209	122.10	223.16	298	7.85
2	5	45	51	47.29	7.47	304	7.65
2	5	45	60	52.88	11.05	366	9.05
2	5	45	156	103.88	110.33	45	8.27
2	5	45	127	90.90	67.23	109	9.86
2	5	45	244	130.83	324.02	113	2.4
2	5	45	222	125.61	258.07	150	4.13
2	5	45	124	89.42	63.47	174	7.3
2	5	45	151	101.80	102.01	204	9.76
2	5	45	171	109.72	137.63	198	7.78

Forest	StandID	PlotID	Diameter (mm)	Height to be used (dm)	Volume to be used (dm^3)	Direction (0-400 deg)	Distance (m)
2	5	45	90	71.07	29.33	195	8.01
2	5	45	238	147.00	322.80	40	9.67
2	5	45	228	158.00	316.53	109	6.45
2	5	46	218	132.57	247.01	21	5.12
2	5	46	113	90.10	50.75	18	5.97
2	5	46	238	137.51	305.16	19	8.48
2	5	46	229	135.39	278.10	61	7.66
2	5	46	218	132.57	247.01	102	4.68
2	5	46	253	140.69	353.55	149	5.82
2	5	46	250	140.09	343.54	268	6.31
2	5	46	289	146.76	487.09	306	6.42
2	5	46	204	128.59	210.52	387	9.33
2	5	46	273	144.00	414.74	76	6.36
2	5	46	259	142.00	369.53	347	5.66
2	5	47	254	140.27	356.93	347	4.93
2	5	47	202	127.30	205.58	377	9.05
2	5	47	182	120.70	159.93	390	7.98
2	5	47	179	119.62	153.66	4	5.47
2	5	47	105	84.90	42.52	62	8.53
2	5	47	236	136.40	299.02	182	5.6
2	5	47	180	119.98	155.73	189	8.05
2	5	47	231	135.22	283.99	208	6.11
2	5	47	308	148.63	567.81	241	8.96
2	5	47	273	131.00	382.25	79	6.7
2	5	47	249	156.00	371.66	323	9.02
2	5	48	229	130.00	278.10	53	5.4
2	5	48	141	100.45	86.49	110	6.31
2	5	48	214	126.27	236.24	192	9.36
2	5	48	261	136.51	381.08	215	7.92
2	5	48	228	129.77	275.19	238	8.84
2	5	48	257	135.80	367.17	288	9.58
2	5	48	94	75.98	32.57	300	9.83
2	5	48	181	137.00	177.83	201	8.34
2	5	48	294	151.00	499.96	338	7.86
2	5	49	157	109.66	112.04	73	7.02
2	5	49	282	143.14	459.16	110	9.51
2	5	49	228	132.72	275.19	197	8.69
2	5	49	189	121.60	175.15	223	8.83
2	5	49	216	129.66	241.59	249	7.82
2	5	49	64	58.69	12.91	379	6.68
2	5	49	217	129.93	244.29	387	7.42
2	5	49	57	54.10	9.76	388	9.1
2	5	49	248	137.18	336.96	397	8.95
2	5	49	150	106.68	100.39	56	7.61
2	5	49	268	124.00	351.84	115	6.38
2	5	49	171	122.00	143.89	190	8.36
2	5	49	227	175.00	344.33	365	6.18
2	5	50	129	96.19	69.81	156	3.67
2	5	50	178	117.27	151.60	261	8.17
2	5	50	222	130.86	258.07	265	9.95

Forest	StandID	PlotID	Diameter (mm)	Height to be used (dm)	Volume to be used (dm^3)	Direction (0-400 deg)	Distance (m)
2	5	50	72	63.23	17.14	339	9.37
2	5	50	116	89.43	54.05	355	4
2	5	50	130	96.69	71.12	400	7.85
2	5	50	277	142.21	439.79	21	6.77
2	5	50	173	115.42	141.54	35	8.29
2	5	50	260	142.00	372.34	279	7.7
2	5	50	236	145.00	313.71	59	8.48
2	5	50	347	173.00	780.71	384	8.16

Appendix C, sample plot parameters

Sample plot parameters. This data can be found on the CD in the file CDDRIVE:\SAMPLEPLOTS\RESULT.XLS.

Forest	StandID	PlotID	BA (m2/ha)	Diameter (mm)	Stem number (stems/ha)	Volume (m3/ha)	Volume dry (m3/ha)	Total age (years)	Tree height (dm)
1	1	1	14.8	374	159	121	0	131	160.382
1	1	2	9.2	314	127	69	0	136	151.724
1	1	3	8.2	349	95	63	0	156	145.574
1	1	4	7.4	387	64	58	0	136	165
1	1	5	15	309	223	117	0	136	156.362
1	1	6	16.1	299	255	126	0	136	160.538
1	1	7	11.8	263	223	85	0	136	145.946
1	1	8	5.9	283	95	42	0	136	140.441
1	1	9	17.4	347	223	142	0	136	152.985
1	1	10	11.7	293	191	88	0	136	158.816
1	1	11	14.3	355	191	115	0	133	153.061
1	1	12	13.3	345	159	106	0	136	160.215
1	1	13	10.9	351	127	85	18	130	135.698
1	1	14	4.9	339	95	35	0	127	113.998
1	1	15	11.6	398	95	95	38	136	168.151
1	1	16	18.3	337	255	150	2	149	137.207
1	1	17	9.7	337	127	75	13	136	146.819
1	1	18	14.2	271	255	106	3	136	145.308
1	1	19	14.8	301	223	115	2	136	146.863
1	1	20	9.7	315	127	73	0	136	155.194
1	1	21	7	311	95	52	27	136	156.293
1	1	22	17.4	249	414	128	10	134	128.469
1	1	23	17.2	297	286	135	0	136	154.131
1	1	24	10.7	292	191	79	0	134	140.655
1	1	25	10.7	333	127	83	0	136	168.061
1	2	26	13.4	316	223	109	6	136	149.311
1	2	27	11.1	278	191	86	0	136	156.675
1	2	28	11.7	280	223	91	0	136	147.104
1	2	29	10.6	330	127	86	0	136	167.385
1	2	30	12.3	331	159	102	0	136	172.576
1	2	31	8.7	342	95	70	0	136	169
1	2	32	25.2	297	446	217	5	132	161.691
1	2	33	8.8	259	223	62	0	184	143.783
1	2	34	13.4	277	255	105	0	136	152.777
1	2	35	18.4	239	509	142	0	135	139.626
1	2	36	8.8	271	159	66	2	136	148.036
1	2	37	18	250	382	141	0	136	159.122
1	2	38	17.6	293	286	146	0	136	170.643
1	2	39	12.9	268	255	99	0	136	162.165
1	2	40	17.9	329	223	153	0	136	173.305
1	2	41	10.2	337	127	83	0	134	162.079
1	2	42	16.2	269	318	129	0	136	155.898
1	3	43	17.2	294	286	136	0	136	161.347
1	3	44	12.9	325	159	102	0	136	159.974
1	3	45	15.7	311	223	126	0	136	163.484
1	3	46	17.4	229	446	126	0	136	145.29

Forest	StandID	PlotID	BA (m2/ha)	Diameter (mm)	Stem number (stems/ha)	Volume (m3/ha)	Volume dry (m3/ha)	Total age (years)	Tree height (dm)
1	3	47	20.5	257	446	159	0	135	151.221
1	3	48	23.9	281	414	195	0	136	163.747
1	3	49	12.9	260	255	95	5	136	141.394
1	3	50	16.9	294	286	134	2	136	151.07
2	4	1	15	202	605	96	0	102	111.992
2	4	2	13.3	258	318	92	0	104	123.285
2	4	3	12.2	218	446	79	0	103	112.507
2	4	4	13.1	242	350	88	6	103	128.05
2	4	5	9.8	243	286	65	0	106	113.969
2	4	6	8.8	205	318	54	1	105	104.705
2	4	7	12.1	223	382	79	0	103	121.606
2	4	8	10.1	191	382	61	0	104	109.624
2	4	9	4.8	225	191	28	7	169	102.008
2	4	10	11.4	238	414	75	0	104	102.665
2	4	11	9.7	273	255	65	0	104	114.042
2	4	12	15.4	264	414	108	0	103	119.845
2	4	13	7.7	175	382	44	0	104	97.085
2	4	14	8.3	232	223	54	0	104	120.878
2	4	15	16.1	258	382	114	6	104	129.878
2	4	16	13.1	289	223	94	0	104	127.747
2	4	17	7.5	217	223	47	0	106	119.332
2	4	18	11.9	263	414	80	10	137	111.846
2	4	19	5.5	220	191	34	0	106	107.721
2	4	20	8.1	223	350	49	0	97	101.73
2	4	21	15.2	233	509	102	0	124	112.984
2	4	22	9.7	242	286	64	0	103	115.997
2	4	23	8	193	318	48	1	106	101.916
2	4	24	11.6	291	318	80	4	102	100.334
2	4	25	7.8	208	318	48	12	103	98.4646
2	4	26	10.7	310	255	74	0	175	114.842
2	4	27	7.6	235	191	48	0	143	121.827
2	4	28	10.6	300	159	76	0	106	139.568
2	4	29	8.8	221	286	55	0	98	115.254
2	4	30	4.6	202	191	27	0	106	98.1486
2	4	33	8.2	269	223	55	8	103	108.685
2	4	34	12.4	205	414	79	0	105	119.436
2	4	35	8.1	320	159	56	3	105	120.493
2	5	31	12.6	240	350	85	0	104	122.44
2	5	32	8.3	301	159	57	0	99	125.685
2	5	36	14	280	255	101	9	103	121.766
2	5	37	19.8	259	541	144	0	103	129.374
2	5	38	11.8	351	286	78	3	239	103.393
2	5	39	19.6	242	509	140	0	105	133.303
2	5	40	13.6	241	350	93	0	104	125.054
2	5	41	16.4	272	414	117	0	124	119.465
2	5	42	11.4	349	286	84	0	140	103.575
2	5	43	21.1	254	573	153	0	104	130.451
2	5	44	12.8	231	414	85	0	102	118.75
2	5	45	9.6	203	382	60	5	106	104.67
2	5	46	15.3	246	350	105	0	125	133.68

Forest	StandID	PlotID	BA (m2/ha)	Diameter (mm)	Stem number (stems/ha)	Volume (m3/ha)	Volume dry (m3/ha)	Total age (years)	Tree height (dm)
2	5	47	13.9	241	350	95	0	105	129.112
2	5	48	10.3	244	255	69	3	103	124.771
2	5	49	13.2	227	414	88	0	106	118.812
2	5	50	10.9	255	318	73	9	103	119.222

Appendix D, sample plot coordinates

Sample plot coordinates. This data can be found on the CD in the file CDDRIVE:\SAMPLEPLOTS\SAMPLEPLOTS.XLS.

Forest	StandID	PlotID	RMS	x (RT90)	y (RT90)	Altitude (RH70)
1	1	1	0.518	7367768.666313	1654346.596003	499.831733
1	1	2	0.572	7367809.087202	1654310.944307	499.987965
1	1	3	0.511	7367842.979534	1654265.794685	498.727450
1	1	4	0.714	7367864.277999	1654226.481115	499.317042
1	1	5	0.467	7367896.907730	1654199.206027	498.015552
1	1	6	0.652	7367830.433369	1654389.304752	494.882891
1	1	7	1.249	7367854.178559	1654351.177437	498.863614
1	1	8	0.792	7367882.768983	1654297.745226	496.576797
1	1	9	0.627	7367903.200212	1654263.494278	496.371731
1	1	10	0.760	7367930.120234	1654225.416447	495.352691
1	1	11	0.540	7367861.733880	1654419.434971	493.890006
1	1	12	0.534	7367882.266870	1654380.580219	496.072030
1	1	13	0.550	7367910.987998	1654333.976583	495.644542
1	1	14	0.642	7367939.097789	1654293.689710	497.054349
1	1	15	0.463	7367961.159198	1654257.965022	492.068653
1	1	16	0.575	7367898.247247	1654452.310755	489.598071
1	1	17	0.592	7367919.051423	1654410.385935	492.587111
1	1	18	0.472	7367946.933779	1654366.546099	490.734197
1	1	19	0.632	7367974.201165	1654327.055359	489.774373
1	1	20	0.509	7367996.045854	1654282.921183	491.035568
1	1	21	1.944	7367931.665977	1654484.570837	488.864157
1	1	22	0.606	7367952.245964	1654435.746847	488.168890
1	1	23	0.612	7367985.083154	1654398.693514	488.816990
1	1	24	0.806	7368014.765609	1654364.283783	486.872507
1	1	25	1.373	7368041.755942	1654339.905777	488.078799
1	2	26	0.846	7368007.278415	1654529.524555	483.264946
1	2	27	3.697	7368031.448656	1654491.544257	492.111969
1	2	28	0.745	7368060.671608	1654459.613526	484.423164
1	2	29	0.718	7368098.196542	1654421.356421	484.100005
1	2	30	2.669	7368125.707887	1654386.863642	482.728976
1	2	31	1.126	7368157.739212	1654346.841165	480.989029
1	2	32	1.330	7368048.798281	1654582.258396	486.048297
1	2	33	0.789	7368082.205528	1654541.324930	481.462065
1	2	34	**10.000**	7368216.558082	1654428.628097	504.499873
1	2	35	**8.911**	7368169.959371	1654434.190255	484.485039
1	2	36	0.664	7368198.860775	1654394.307927	482.873755
1	2	37	0.627	7368078.793069	1654617.559049	480.443921
1	2	38	1.530	7368116.977247	1654569.463982	480.122055
1	2	39	0.613	7368151.051106	1654542.038578	479.968615
1	2	40	1.339	7368181.783385	1654507.736642	480.640524
1	2	41	1.049	7368212.747902	1654470.717320	480.745888
1	2	42	1.315	7368251.232981	1654455.517990	481.998500
1	3	43	0.962	7368202.064019	1654581.989108	478.008093
1	3	44	0.625	7368236.590366	1654548.911230	477.331605
1	3	45	0.597	7368276.275680	1654529.987823	475.368959
1	3	46	0.935	7368306.730345	1654496.422542	475.679442

Forest	StandID	PlotID	RMS	x (RT90)	y (RT90)	Altitude (RH70)
1	3	47	1.195	7368326.035875	1654460.388019	478.568288
1	3	48	0.871	7368213.928359	1654619.893372	477.600928
1	3	49	0.791	7368247.483107	1654636.763462	474.014464
1	3	50	0.794	7368271.543545	1654583.356526	476.380369
2	4	1	0.028	7370079.126864	1653646.452875	500.634005
2	4	2	0.541	7370094.095028	1653683.065229	498.067016
2	4	3	1.208	7370079.839073	1653741.511131	500.811461
2	4	4	1.570	7370083.285707	1653793.407342	492.283182
2	4	5	0.663	7370082.295116	1653838.455800	493.954600
2	4	6	0.494	7370045.882086	1653651.778791	502.248368
2	4	7	0.411	7370048.939585	1653690.974789	501.744271
2	4	8	0.511	7370055.564097	1653747.143015	499.176081
2	4	9	0.448	7370043.150733	1653785.776534	498.637260
2	4	10	0.529	7370033.943220	1653828.774222	496.693819
2	4	11	0.359	7370006.955543	1653651.298750	502.850420
2	4	12	0.577	7370007.139766	1653702.775360	501.939393
2	4	13	0.763	7369999.931417	1653726.651989	499.721211
2	4	14	0.830	7370002.571557	1653790.221359	497.666631
2	4	15	0.594	7369998.125143	1653826.989494	497.087243
2	4	16	0.652	7369968.052902	1653657.140797	503.951117
2	4	17	0.666	7369973.460678	1653708.125038	502.390655
2	4	18	0.781	7369969.871625	1653744.800425	501.016440
2	4	19	0.652	7369962.176280	1653789.790413	499.257197
2	4	20	0.726	7369952.340100	1653837.944824	499.755264
2	4	21	0.545	7369917.514753	1653662.548277	503.464404
2	4	22	0.607	7369926.744834	1653702.785031	502.418860
2	4	23	0.625	7369931.532036	1653733.251280	503.660623
2	4	24	0.689	7369920.819906	1653775.477661	502.948667
2	4	25	0.666	7369918.834842	1653831.217949	501.372230
2	4	26	0.394	7369887.662121	1653648.290441	502.128459
2	4	27	0.704	7369888.703777	1653695.721702	500.931587
2	4	28	0.393	7369889.103954	1653736.417578	500.978430
2	4	29	0.554	7369886.540502	1653784.124931	501.314940
2	4	30	0.507	7369883.064908	1653832.335085	502.582999
2	5	31	0.667	7369840.954854	1653652.381898	502.595792
2	5	32	0.366	7369843.899398	1653691.883503	502.663823
2	4	33	0.526	7369851.109506	1653737.366586	501.836924
2	4	34	0.515	7369846.974640	1653778.285902	502.642169
2	4	35	0.241	7369844.835127	1653831.020288	500.753761
2	5	36	0.526	7369805.758978	1653654.895749	504.180910
2	5	37	0.590	7369810.075438	1653689.120216	500.841121
2	5	38	0.227	7369805.882030	1653727.427189	504.150816
2	5	39	0.690	7369812.368458	1653782.175899	502.019464
2	5	40	0.785	7369801.131624	1653820.747110	502.479728
2	5	41	0.625	7369770.642418	1653653.977395	500.012046
2	5	42	0.446	7369775.771144	1653695.289457	501.213131
2	5	43	0.536	7369770.090766	1653739.560309	500.502419
2	5	44	0.483	7369769.947894	1653783.490978	503.505269
2	5	45	0.537	7369761.382331	1653833.118310	499.092513
2	5	46	0.023	7369737.356922	1653647.719987	496.584715
2	5	47	0.458	7369725.479880	1653689.166112	498.735152

Forest	StandID	PlotID	RMS	x (RT90)	y (RT90)	Altitude (RH70)
2	5	48	0.571	7369730.780005	1653734.922441	498.995503
2	5	49	0.566	7369725.522478	1653785.949120	499.378677
2	5	50	0.491	7369731.537679	1653832.671790	497.085972

Appendix E, stand parameters

Forest stand parameters. This data can be found on the CD in the file CDDRIVE:\STANDS\RESULT.XLS.

	Stand 1	*SE (%)*	Stand 2	*SE (%)*	Stand 3	*SE (%)*	Stand 4	*SE (%)*	Stand 5	*SE (%)*
Altitude	490	-	490	-	490	-	500	-	500	-
Volume (m3/ha)	93.7	6.3	111.1	8.7	134.0	8.4	67.3	5.8	95.6	7.1
Volume dry (m3/ha)	4.4	43.1	0.8	58.8	0.9	73.0	1.7	32.9	1.7	44.3
Growth (m3/ha/year)	1.15	5.2	1.38	5.3	1.54	4.6	1.46	4.8	1.75	5.5
BA (m2/ha)	12.09	6.3	13.84	7.8	17.19	7.6	10.21	5.1	13.79	6.4
Stem number (stems/ha)	177	9.1	247	11.1	314	12.2	314	5.8	365	7.1
Height (m)	15.00	1.7	15.83	1.6	15.47	2.0	11.36	1.6	12.14	1.9
Diameter (cm)	32.01	2.4	29.00	2.7	27.95	3.9	24.23	2.6	25.93	3.7

Appendix F, addresses

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