

EXECUTIVE SUMMARY

This implementation of the Individual-tree Growth Model (IGM) is intended to illustrate the use of the individual tree approach and to enable the growth model to be evaluated and compared. It demonstrates the data required for running these models and shows how the individual trees develop through time. Example data are provided.

Facilities are provided for introducing actual tree lists from inventory data (MARVL V2 format), and using them to produce stand-level growth projections. Data can be exported for further analysis or comparisons with actual re-measurements.

The growth and survival functions of the model are described in the SGM Cooperative reports Nos. 34, 47, 54, 58, 59 and 60. The validation of the IGM is the subject of a separate SGMC report (Shula and Gordon, in prep.).

A Guide to Using the

Individual-Tree Growth Model (IGM)

forest research / industry
Stand Growth Modelling Cooperative

Version 1.0
First Printed February 1999
Copyright © 1999 **Forest Research** / Industry Stand Growth Modelling Cooperative
Last Updated February 1999

Disclaimer

While every effort has been made to ensure the accuracy of this document **Forest Research** shall not be responsible for any errors or omissions and reserves the right to make changes without notice.

Trademarks

This manual refers to several brand and product names which are trademarks or registered trademarks of their respective holders.



New Zealand Forest Research Institute Limited
Private Bag 3020
Rotorua
New Zealand

Telephone: +64 7 347 5899
Facsimile: +64 7 347 9380

Contents

Overview	1
Scope	1
Getting Started	3
Installation	3
Typical Installation Procedure.....	3
Users' Guide.....	3
Manual Conventions.....	3
First time use	4
Main Form.....	4
Site Form.....	5
Tree Form.....	5
Data Transfer.....	6
Commands	7
File Commands.....	7
New	7
Open.....	7
Save	7
Save As.....	7
Import.....	8
Export.....	8
Exit	8
Edit Commands	8
Site	8
Trees.....	9
View Commands.....	9
Site	9
Current Trees.....	9
Help Commands	9
Contents.....	9
About.....	10
File Formats	11
Stand files	11
MARVL V2 files	12

Overview

Scope

- This implementation of the Individual tree growth model is intended to illustrate the use of the individual tree approach and to enable the growth model to be evaluated and compared.
- It demonstrates the data required for running these models and shows how the individual trees develop through time. Example data are provided.
- Facilities are provided for introducing actual tree lists from inventory data (Marvl V2 format), and using them to produce stand-level growth projections.
- Data can be exported for further analysis or comparisons with actual re-measurements.
- The growth and survival functions of the model is described in the SGM coop. reports Nos.34, 47, 54, 58, 59 and 60.
- The validation of the IGM is the subject of a separate SGMC report (Shula and Gordon, in prep.).

Getting Started

Installation

Typical Installation Procedure

1. Shut down running applications
2. Insert the diskette
3. Select **Run...** from the **Start** menu
4. Browse to **A:\SETUP.EXE**
5. Click **OK**.
6. Follow the installation procedure dialogs.
7. If requested, re-start the system for immediate use.

Users' Guide

This users' guide is available in two forms: as a printed manual and as on-line help in Windows Help format.

Manual Conventions

Bold is used to identify commands or to emphasize certain terms, when a new term is used for the first time or when a term has an unusual meaning.

ALL CAPITALS are used for file names and folders.

Menu commands are separated by a vertical bar, as in "**Menu | Choice**". Rather than saying "choose the Save command from the File menu", this manual says "choose **File | Save**"

First time use

Main Form

Start the application by selecting **IGMDemo** from the start menu. Initially the **EXAMPLE.STD** file will be opened.

	Initial Stand	Current Stand
Age (years)	12	12
Stocking (stems/ha)	470	
Basal Area (sq.m/ha)	83.258	
Mean top height (m)	43.422	
Mean Dbh (cm)	47.432	

The initial state of the stand is shown in the Initial Stand panel. By pressing the **Grow** button the stand is grown from its initial state to the age selected in the Current Stand panel. This age can be altered using the spin buttons or by high-lighting the field and typing in a new age.

Site Form

The site form is used for altering the details about the site and stand. Not all fields are necessary for all functions, so this form contains a super-set of the information required.

IGM Stand /Site Data

Region: HBay, Nelson, Westland

Age (years): 12

Altitude (m asl): 100

Rainfall (mm):

Month	Rainfall (mm)
Jan	200
Feb	200
Mar	200
Apr	200
May	200
Jun	200

Nutrient Score:

Nitrogen: 5

Phosphorus: 5

Mortality Adjustment: 100

OK Cancel Print

Tree Form

This form shows the tree list with all details about each tree in the list. The form will scroll to display parts of long lists.

IGM Initial Tree List

OK Cancel Print

	ID	Dbh (cm)	Height (m)	Stems/ha
1	1/1	42.4	34.7	2.857
2	1/2	41.5	34.6	2.857
3	1/3	30.7	32.0	2.857
4	1/4	41.3	34.5	2.857
5	1/5	44.6	35.1	2.857
6	1/6	27.2	30.9	2.857
7	1/7	27.5	31.0	2.857
8	1/8	38.4	33.9	2.857
9	1/9	24.9	30.0	2.857
10	1/10	18.0	26.4	2.857
11	1/11	30.7	32.0	2.857

Data Transfer

Predicted growth data can be transferred to other applications for comparisons or further analysis. The simplest way to do this is to use the **File | Export** command to copy or append the predicted stand data to a file. The file is written with comma-separated values (.CSV format) which is readable by most applications such as spreadsheets.

Alternatively the forms support a **Copy** command. Use the right mouse button to activate a local menu and select the **Copy** command. This will place the data on the clipboard. Switch tasks (**Alt-Tab**) to the target application and **Edit | Paste (Ctrl-V)** the data at the required location.

Commands

File Commands

New

Use this command to create a new stand (site details and tree list). You will be prompted to save the current stand. If you have altered any information about the current stand and want to save this then press **Yes**.

A file name dialog will then prompt for a *new* file name. The conventional file type (extension) is **STD** (as an abbreviation for stand).

Having entered a new file name the details of the site can be entered in the site form (see Site Form, page 5) and the tree list information can be entered in the tree form. Full details are required for each tree, so where tree height has not been measured you will have to calculate estimates. (The data **Import** command will automatically estimate missing height values).

Once these forms are completed the current stand parameters (Age, stocking, basal area, mean top height and mean Dbh) will be displayed on the main form.

Open

Use the file dialog to select an existing stand file to **open**. You will first be prompted to save the current stand. If you have altered any information about the current stand and want to save this then press **Yes**.

Once the file has been selected the current stand parameters (Age, stocking, basal area, mean top height and mean Dbh) will be displayed on the main form.

Save

The **save** command saves the current stand (in its initial state) to file.

Save As

The **Save As** command is used to copy the initial state of the open stand to a new file.

Import

The **import** command is used to import tree lists from MARVL V2 data files. The file should be in the correct format (ie. able to be processed by MARVL). The resulting tree list is composed of the trees in all the plots found in the first (or only) stratum. The stratum age is retrieved and used in the stand details.

Tree identity is composed of plot number and tree number. Dbh is read directly from the MARVL data. Tree height is also taken from the data if it is present. If not, an estimate of tree height is made from a Dbh / height relationship fitted to the Dbh / height data for the stratum. Tree weight is calculated from the plot type, plot area / BAF / line length, tree Dbh where appropriate and the number of plots in the stratum.

You will first be prompted to save the current stand. If you have altered any information about the current stand and want to save this then press **Yes**.

Use the file dialog to select a MARVL V2 format file. If the file is in the wrong format a message will be displayed and the import will stop.

When the data have been extracted from the MARVL file, specify a new file in the file dialog to contain the imported stand with its tree list. At this point the site form will be displayed for entry of the site information that is not known by MARVL.

Once the site form is completed the current stand parameters (Age, stocking, basal area, mean top height and mean Dbh) will be displayed on the main form. From this point on you can work with the new (STD) file and any alterations will be saved in this file.

Export

The **export** command is used to write the current stand parameters to file in comma-separated format. This format can be opened by most spreadsheets.

If a new file is specified in the file dialog then column headings will be written to the file together with the stand parameters. If an existing file is specified then the only the stand parameters will be appended to the file.

By repeatedly exporting the current stand information to the same file, a time series can be constructed in a format that is easily charted within a spreadsheet.

Exit

Use the **Exit** command to leave the IGM demonstration. You will first be prompted to save the current stand. If you have altered any information about the current stand and want to save this then press **Yes**.

Edit Commands

Site

The site / stand information can be altered on this form. The fields are:

Field	Details
Region	Select the growth modelling region from this list. NB. Westland currently uses the Nelson components of the model.
Age	Enter the stand age in years
Altitude	Enter the stand altitude in metres a.s.l.
Rainfall	Average rainfall is required by month
Nitrogen score	These scores are defined by Hunter <i>et al</i> in the Atlas of Radiata Pine Nutrition. The scores are 1 - deficient, 2 - marginal (high probability of deficiency), 3 - marginal (medium probability of deficiency), 4 - marginal (low probability of deficiency), 5 - satisfactory (high probability of deficiency), 6 - satisfactory (medium probability of deficiency), 7 - satisfactory (low probability of deficiency).
Phosphorus score	Definitions as for Nitrogen
Mortality Adjustment	Can be set to any value between zero (no mortality) and 200%. Full mortality predicted by the model is obtained at 100%.

Trees

The tree list can be altered on this form. Trees are shown on a scrolling grid, one tree per row. The columns are Tree identity, Dbh, Height and Stems per hectare.

The stems per hectare field gives the expansion factor, or weighting, of the tree.

View Commands

Site

The site / stand information can be viewed but not altered), on this form

Current Trees

This form displays the tree list of the current stand. Trees are shown on a scrolling grid, one tree per row. The columns are Tree identity, Dbh, Height and Stems per hectare.

The stems per hectare field gives the expansion factor, or weighting, of the tree.

Help Commands

Contents

The command opens the help file.

About

Displays the application title and version number.

File Formats

Stand files

The stand data (site details and tree list) are held in INI file format. These files are simple text files and can be edited if necessary.

There are two sections [Site] and [Trees]. Each variable is specified in the format: KeyWord=Value

Within the tree list the value is a composite field comprising tree identity, Dbh, height and weighting. An Example of a file:

```
[Site]
Region=CNI
Age=25
Rain_Jan=130
Rain_Feb=130
Rain_Mar=130
Rain_Apr=130
Rain_May=130
Rain_Jun=130
Rain_Jul=130
Rain_Aug=130
Rain_Sep=130
Rain_Oct=130
Rain_Nov=130
Rain_Dec=130
Altitude=250
N_score=2
P_score=2
Mortality_adj=100
[Trees]
t1=1/1,42.4,34.717,2.8571
t2=1/2,41.5,34.555,2.8571
t3=1/3,30.7,32.023,2.8571
t4=1/4,41.3,34.518,2.8571
t5=1/5,44.6,35.09,2.8571
t6=1/6,27.2,30.87,2.8571
t7=1/7,27.5,30.978,2.8571
t8=1/8,38.4,33.949,2.8571
t9=1/9,24.9,29.98,2.8571
t10=1/10,18,26.384,2.8571
t11=1/11,30.7,32.023,2.8571
t12=1/12,28.5,31.324,2.8571
t13=1/13,35.4,33.279,2.8571
t14=1/14,54,36.384,2.8571
.
.
.
```

MARVL V2 files

This is a text file format used by the Marvl V2 inventory system. An example of a file:

```
B "TEST.DIC" "IGM example MARVL data"
\1 75.0 25 V237 T237 B1
541 41.1
422 32.8
311 30.8
422 35.2
502 40.0
529 34.6
356 36.9
#1 0.05 19
1 424 N
14 540 N25 <120 S
      <150 S
2 415 N20 W
3 307 N
4 413 Y5 N
5 446 N
6 272 N
7 275 Y22 *
8 384 N8 S 25 *
9 249 N
10 180 S
11 307 Y10 % Y
12 285 N6 S17 W
13 354 Y10 S
15 339 N8 Y
16 397 Y20 W
17 220 W
18 304 N4 W5 S
19 568 N25 B
20 325 Y20 S25 *
21 211 *
22 311 N5 S
```