



EXCEL GYPSY YIELD TABLE GENERATOR TOOL

USER'S MANUAL

Application Version 20100713p

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1.0 BACKGROUND

Alberta Sustainable Resource Development (ASRD) has developed a growth prediction model called GYPSY (short for Growth and Yield Projection System). Significant support for the development of GYPSY over the past few years has come from a Forest Resource Improvement Association of Alberta (FRIAA) project. As a component of this FRIAA project Richard Briand, RPF of West Fraser Mills Ltd. and Dr. Shongming Huang of ASRD requested that TECO Natural Resource Group Ltd. (TECO) develop an Excel Yield Table Generator for the provincial GYPSY model that was released on May 21, 2009.

The development of an Excel GYPSY Yield Table Generator Tool is in support of the FRIAA project HIWOOD-01-129 titled "Growth and Yield Projection System for Regenerated Stand Management".

The FRIAA project identifies Excel GYPSY as a key deliverable for the project as per the following excerpt from the FRIAA proposal:

"Understanding and application of the [project] results will be facilitated by the development of a yield table generator linked to regeneration survey parameters. The generator will operate in Microsoft Excel or equivalent environment that is readily accessible and friendly to users. A user's guide will be prepared."

2.0 SCOPE

This manual only provides details on the installation and usage of the software tool. Detailed description of the GYPSY model, coefficients and functional forms of all sub-models can be found in the following reports:

Huang, S., Meng, S.X. and Yang, Y. May 2009. *A Growth and Yield Projection System (GYPSY) for Natural and Post-harvest Stands in Alberta*. Alberta Sustainable Resource Development. Tech. Rep. Pub. No. T/216, Edmonton, Alberta. 22 p.

Huang, S., Meng, S.X. and Yang, Y. December 2009. *A Growth and Yield Projection System (GYPSY) for Natural and Post-harvest Stands in Alberta. Predicting Merchantable Density*. Alberta Sustainable Resource Development. Edmonton, Alberta. 11 p.

3.0 GENERAL PROCESS

The general overview of the Excel GYPSY Yield Table Generator is shown in Figure 1.

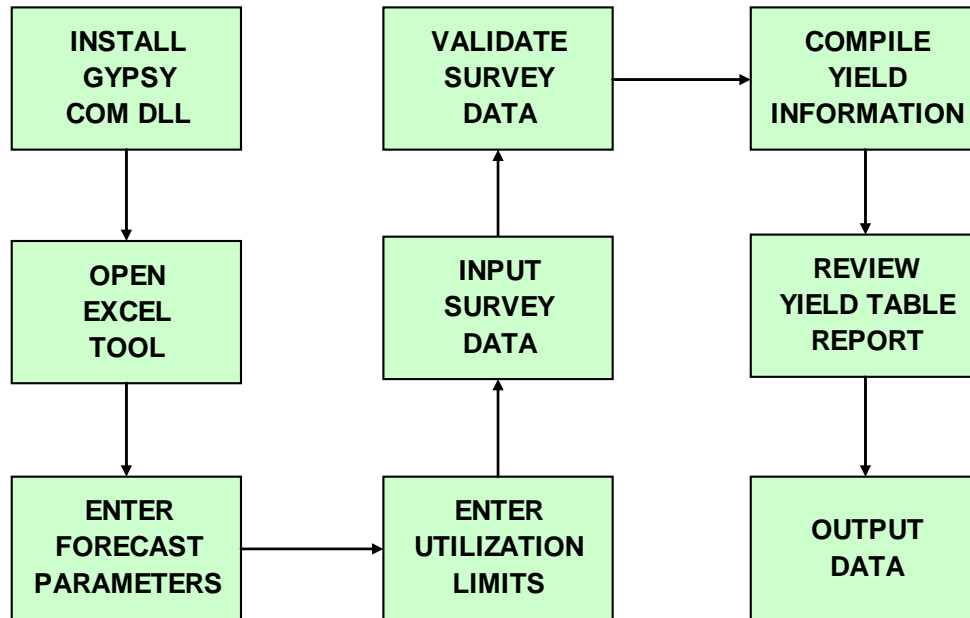


Figure 1. General overview of Excel GYPSY Yield Table Generator

4.0 INSTALLATION

IMPORTANT INFORMATION BEFORE YOU START!

The Excel GYPSY Yield Table Generator Tool requires the installation of the GYPSY 2009 COM DLL. The COM DLL is a library of the GYPSY functions in compiled computer code that can be called from other programs or programming languages.

4.1 Registering the GYPSY 2009 COM DLL

The GYPSY 2009 DLL is a Microsoft COM type DLL which means that it needs to be registered on your system. After registration, the DLL components can be freely accessed by any program without having to explicitly reference it again. The DLL can be placed in any folder of your choice on your system. Registering it differs slightly on Windows 95/2000/XP and Vista¹ operating systems.



Figure 2. Registering the DLL on Windows XP

¹ If you have Windows 7, please follow the instructions given here under Windows Vista.

Windows 95/2000/XP

1. Click the Start button located in the lower left corner of your screen.
2. Select Run as shown in Figure 2.
3. Enter `regsvr32 "path\to\your\dll\folder\GYPSY_2009.dll"`

For example if you placed the DLL into C:\Windows\System32\ then `regsvr32 "C:\Windows\System32\GYPSY_2009.dll"` will need to be entered. Make sure that you also use the double quotation marks as given.

4. Click the OK button.

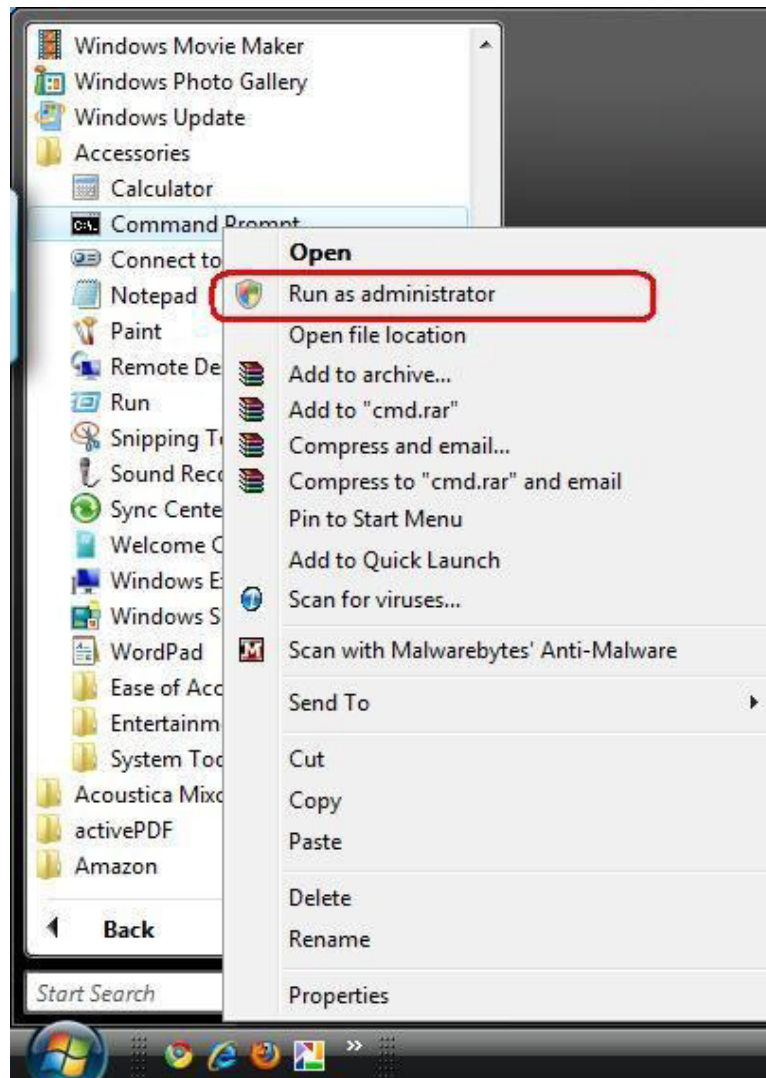


Figure 3. Registering the DLL on Windows Vista

Windows Vista

1. Click the Start button located in the lower left corner of your screen.
2. Select the Accessories folder.
3. Right click on the Command Prompt icon.
4. Select Run as administrator from the menu as shown in Figure 3.
5. Enter `regsvr32 "path\to\your\dll\folder\GYPSY_2009.dll"` at the prompt.
For example if you placed the DLL into C:\Windows\System32\ then `regsvr32 "C:\Windows\System32\GYPSY_2009.dll"` will need to be entered. Make sure that you also use the double quotation marks as given.
6. Close the Command window.

Note: You must follow these instructions on a Vista machine, even if you are logged in as Administrator!

If your registration was successful, you will see a small window pop-up with a message similar to the one shown in Figure 4.

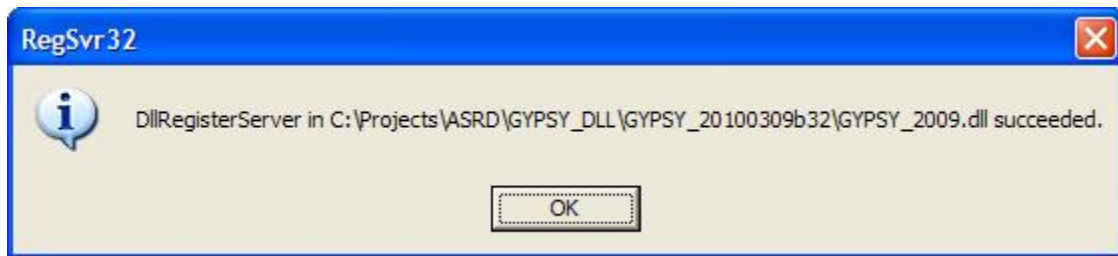


Figure 4. Successful registration of the DLL

4.2 Installing the Yield Table Generator Tool

After successfully registering the GYPSY 2009 DLL, the Yield Table Generator Tool is ready to be used. The Yield Table Generator Tool was developed and tested for Excel 2002 and newer versions, including the latest version of Excel 2007.

To determine your version of Microsoft Excel:

Follow the menu: **Help** → **About Microsoft Office Excel**

If you can't find the Help item on your menu, then you most likely have the latest version: Microsoft Excel 2007.²

The installation and usage of the Yield Table Generator Tool is identical for Excel 2003 and earlier versions. However, Microsoft Excel 2007 was a major upgrade in both interface and internal architecture, therefore whenever warranted; we provide a short section detailing the difference.

The Yield Table Generator Tool does not require any special installation in Microsoft Excel 2002-2003. Upon opening the file, make sure you Enable Macros.

Microsoft Excel 2007

Unless the file is located in one of the Microsoft Excel Trusted Locations, you will get a Security Warning upon opening the file that is very difficult to notice. The warning is located above the formula bar and looks like the image in Figure 5.

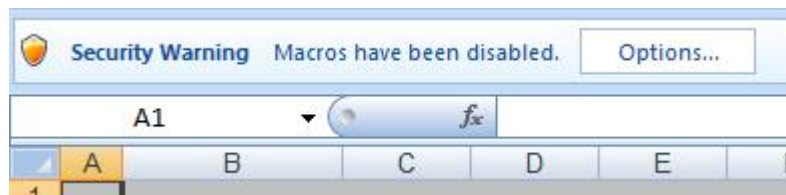


Figure 5. Security warning in Microsoft Excel 2007

Click the **Options...** button and check **Enable this content...** so that the macros will execute.



Please update your Microsoft Excel 2007 program with the Microsoft Office 2007 Service Pack 2 that has some significant bug fixes and other upgrades. The SP2 update can be found at:

<http://www.microsoft.com/downloads/details.aspx?FamilyId=B444BF18-79EA-46C6-8A81-9DB49B4AB6E5&displaylang=en>

² As an alternative, you can also open a new Microsoft Excel file and type the following formula into any blank cell: =INFO("release"). The formula returns the Microsoft Excel version number. If the version is 12.0, you have Microsoft Excel 2007.

5.0 USAGE

There are four visible worksheets in the Yield Table Generator Tool:

1. **Input**– used to enter the raw survey data, utilization limits and forecast parameters for a stand, plot or stratum. Input cells are highlighted in light yellow. **This is the ONLY worksheet that should be manipulated by the User!!!**
2. **Output_Obs** – the compiled survey information at the observed stand age is stored in a database format. The data dictionary with list of variables and names is in Appendix I.
3. **Output_Proj** – the compiled survey information projected from 1 to 250 years stand age is stored in a database format. The data dictionary with list of variables and names is in Appendix II.
4. **Report** – The Yield Table Generator Report shows the relevant information, graphs and yield tables for the surveyed stand.

5.1 Entering Data

The Input worksheet is used to enter data; all other worksheets are used to store output data and should not be manipulated³.

Utilization limits may be entered for the four major species groups of GYPSY (AW, SB, SW and PL):

Stump DOB: minimum stump diameter over bark in centimetres. The default is 15 cm, if the cell is left blank.

Top DIB: minimum top diameter inside bark in centimetres. The default is 10 cm, if the cell is left blank.

Stump Height: stump height must be entered in metres. The default is 0.3 m, if the cell is left blank.

Forecast characteristics include the following:

Stand ID: use a description for the stand, plot or stratum the survey data refers to. This cell will be used as the default file name when outputting/saving a yield table.

³ The worksheets and cells that are not supposed to be manipulated by the user are protected to ensure proper operation of the Tool. However, Users are still encouraged to limit their data entry to the light yellow highlighted cells on the Input worksheet only.

Type: use the pick list to enter Natural (fire-origin) or Regenerated (usually post-harvest managed stands) as a stand type. This information is used in certain situations to validate the survey information. This information is optional.

Age: enter the age of the stand. The default is the maximum observed total age of the surveyed species in the stand, if the cell is left blank.

Spatial: use the cell pick list or the checkbox to select YES or NO. If the spatial flag is set to YES, the GYPSY spatial models will be used and percent stocking must be provided for all species that are observed in the stand.

BA adj: adjust species yield estimates based on the observed basal area. Use the cell pick list or the checkbox to select YES or NO. If the basal area adjustment flag is set to YES, then localized basal areas will be used and a basal area must be provided for all species that are observed in the stand and reached breast height (BH) age.

The Input Data section of the worksheet is where the observed survey information needs to be entered for each of the four GYPSY species groups.

totage: observed total age of the species. This is a required attribute for each species present in the stand.

topht or si bh: enter the observed top height or the site index at BH in metres for the species. Select the proper column name from the pick list (Figure 6). This is a required attribute for each species present in the stand.

Input Data			
species	totage	topht	den
AW		si bh	2000
SB		topht	300
SW	14	2	1200
PL			

Figure 6. Pick list for input variable selection

den or n0: enter the observed density or initial planting density in stems per hectare for the species. Select the proper column name from the pick list. Density is defined as trees that are greater than or equal to 130 cm for the deciduous (AW) and 30 cm for the conifer species groups (SB, SW and PL). This is a required attribute for each species present in the stand.

ps: enter the observed percent stocking between 0 and 100 for a species. This is an optional attribute for each species present in the stand. If the spatial flag is set to YES,

percent stocking must be provided. If the spatial flag is set to NO, percent stocking is not used, even if it is provided (PSI will be calculated as zero).

ba: enter the observed basal area for a species in m²/ha. This is an optional attribute for each species present in the stand. If the basal area adjustment flag is set to YES, then localized basal areas will be used and observed basal area should be provided for all species that are observed in the stand and reached BH age. If the basal area adjustment flag is set to NO, basal area will be ignored, even if it is provided.



The description of each relevant field is embedded in the Input sheet and can also be accessed by selecting the cell with the field name. Upon entering a cell, a small label with a description will appear as shown in Figure 7.

Input Data					
species	totage	topht	den	ps	ba
AW	12	5			2
SB					
SW					
PL	14	3			3

Observed density or initial planting density (NO) in stems/ha. Aw is based on stems >= 130 cm, conifers >= 30 cm tree height

Figure 7. Accessing embedded field description information

5.2 Menu Items

Upon opening the Yield Table Generator Tool, a new menu item **GYPSY 2009** will be installed to the left of the **Help** menu item in Microsoft Excel 2002-2003.

Microsoft Excel 2007

The **GYPSY 2009** menu is located under the **Add-Ins** menu item as shown in Figure 8.

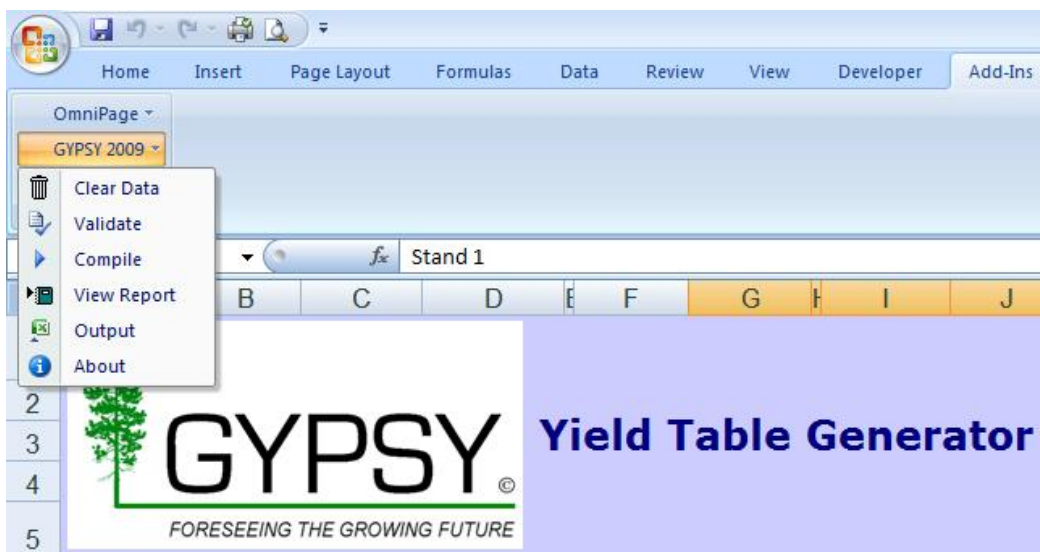


Figure 8. Location of the GYPSY 2009 menu in Excel 2007

There are six menu items that can be found on the **GYPSY 2009** menu:

1. Clear Data
2. Validate
3. Compile
4. View Report
5. Output
6. About

These menu items are described in detail in the following sections.

5.2.1 Clear Data

This menu item is used to clear out the data from the Input worksheet and all other output worksheets.



Always use **Clear Data** BEFORE you start entering a new survey! This will ensure that you start the yield table generation process with a clean slate.

5.2.2 Validate

This menu item is used to validate the forecast and utilization parameters and raw input data entered by the user. The validation identifies two different types of problems: warnings and errors.

Warnings are data problems that appear suspect; however the compilation may proceed. For example, if the given top height is greater than 35 m the program will warn the user about the suspect data, but it will not prevent compilation. Cells with warnings are highlighted in yellow with a comment placed in the cell as shown in Figure 9.

Input Data					
species	totage	topht	den	ps	ba
AW	45	24	456		
SB					
SW	78	37			
PL					

Warning: Top height appears to be too high (>35 m).

Figure 9. Validation warning example

Errors are serious data problems that must be corrected before compilation can proceed. For example, if basic input data (such as total age) is missing, the compilation cannot go ahead until the issue is fixed. Cells with errors are highlighted in orange with a comment placed in the cell as shown in Figure 10.

Input Data					
species	totage	topht	den	ps	ba
AW		24	456		
SB					
SW	78	23			
PL					

Error: age, top height or site index, and density or n0 must be all provided for a species!

Figure 10. Validation error example

The validation rules that are applied on the Input worksheet are summarized in Table 1.

Table 1. Excel GYPSY validation rules

Variable	Type	Rule Description
Age	Error	Stand age should be between 10 and 240 years
Basal area	Warning	Should be given if basal area flag is YES and total age \geq years to BH
Basal area	Error	Must not be given if total age $<$ years to BH
Basal area	Error	Must not be provided if basic input data are missing (e.g., total age)
Density/N0	Warning	Should be between 50 and 100,000 stems/ha
Density/N0	Error	Must be greater than 30 stems/ha to avoid run-time error
Density/N0	Error	Total age and top height (or SI) must be given if density > 0
Percent stocking	Warning	Should be greater than 1, otherwise it is likely given as a proportion
Percent stocking	Error	Must be \leq density/10 for densities below 1000 stems/ha
Percent stocking	Error	Must be between 0 and 100 percent
Percent stocking	Error	Must be given if spatial flag is set to YES
Percent stocking	Error	Must not be provided if density is missing
Site index BH	Warning	Should be between 5 and 30 m
Site index BH	Error	Total age and density (or N0) must be given if site index > 0
Stump DOB	Error	Must be a numeric value
Stump DOB	Error	Must be greater than the Top DIB value
Stump height	Error	Must be given in meters and should be between 0.1 and 0.3 m
Top DIB	Error	Must be a numeric value
Top height	Warning	Should be less than 35 metres
Top height	Error	Must be ≥ 0.3 m if species is SB, SW or PL
Top height	Error	Must be ≥ 1.3 m if species is AW
Top height	Error	Total age and density (or N0) must be given if top height > 0
Total age	Error	AW total age must be \geq years to BH
Total age	Error	Must be ≥ 7.5 years if species is AW or PL and is to calculate a SI
Total age	Error	Must be ≥ 9.5 years if species is SB or SW and is to calculate a SI
Total age	Error	Top height (or SI) and density (or N0) must be given if total age > 0

5.2.3 Compile

This menu item is used to compile the growth and yield information and generate yield tables for the input stand. The Yield Table Generator Tool is built in a step-wise fashion which means that even if validation was not carried out, the compiler will first revalidate the data. If errors are found, the compilation process will stop and the user must fix the errors in the input data before proceeding.

Upon the successful completion of the compilation step, the user has a number of options to review the compiled data. The Yield Table Generator Tool provides a quick

snapshot of the growth and yield information right on the Input worksheet as shown in Figure 11.

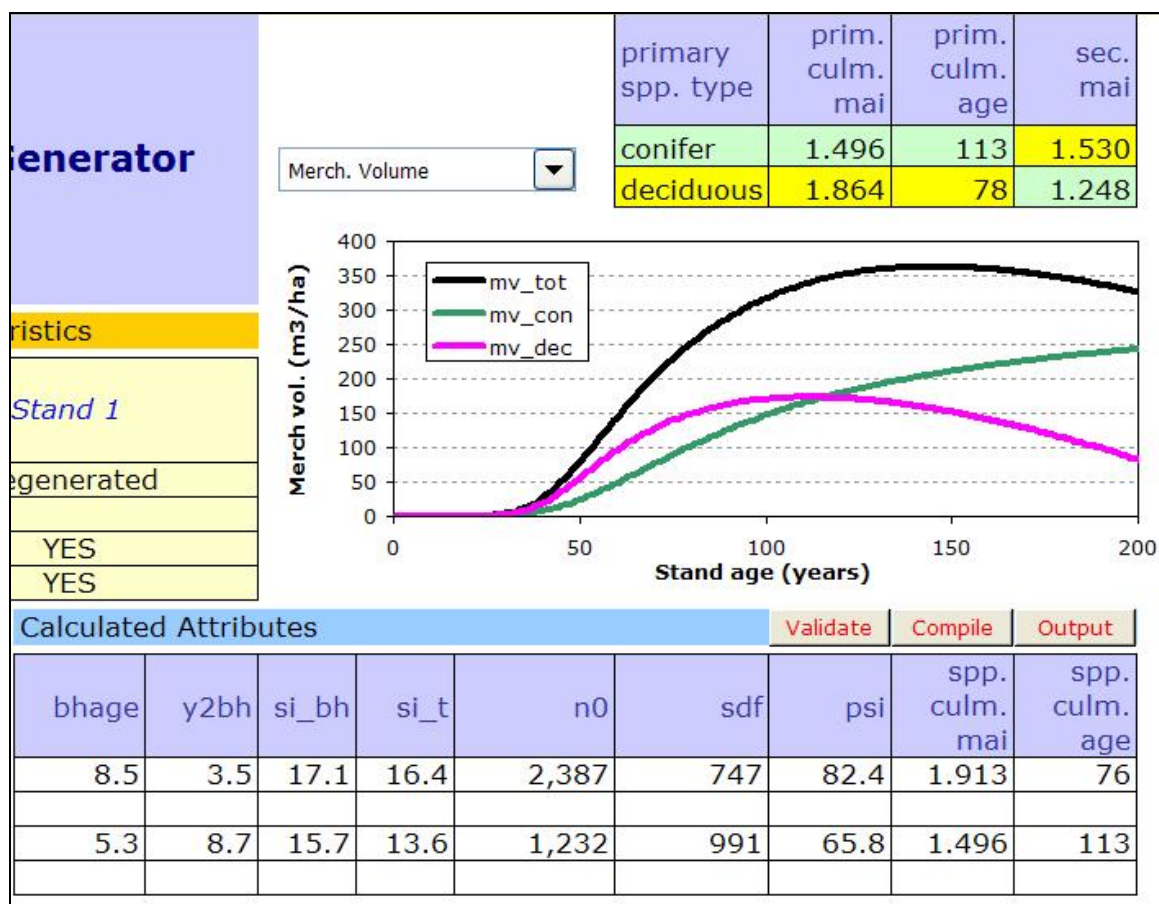


Figure 11. Quick review of the compiled information

The calculated attributes at the observed age are given for each species at the lower right section of the Input screen. In the upper right corner the mean annual increments are provided for the conifer and deciduous stand component at the respective culmination ages. There is also an embedded chart utility that enables the user the quick review of data trends for all major growth and yield attributes over time.

Note: Any changes to the input or forecast parameters will change the font appearance of the output data cells. The data must be recompiled upon completion of the changes. This ensures that the reported growth and yield information is always up-to-date.



As shown in the above figure, command buttons for validation, compilation and data output are embedded right on the interface so the user does not need to access the **GYPSY 2009** menu on the top of the screen.

5.2.4 View Report

This menu item provides access to the Yield Table Generator Report which is a “canned” report with all relevant growth and yield data for the given input stand. The report includes the forecast parameters, input data, mean annual increments, yield tables and embedded charts. A sample report is presented in Appendix III.

5.2.5 Output

This menu item enables the user to save the growth and yield information for a given stand in a stand-alone Microsoft Excel file. The output file will use the Stand ID information to offer a default name that can be changed by the user and the file can be saved in any folder selected by the user. The output file will contain the observed and projected growth and yield database for the stand including the input data, forecast parameters and various flags, as well as the canned report.

5.2.6 About

This menu item shows the information window presented in Figure 12.



Figure 12. Yield Table Generator Tool information page

APPENDIX I
DATA DICTIONARY – OUTPUT_OBS WORKSHEET

Table I -1. Data dictionary – observed and index attributes


Variable	Description	Variable	Description
gypsy_model_id	GYPSY model identifier	den03_sw	Density \geq 0.3 m - SW
stand_id	Stand description	ps_sw	Percent stocking - SW
standtype	Stand type (natural/regen)	ba_sw	Basal area - SW
standage	Stand age	tage_pl	Total age - PL
spatial	Spatial flag	bage_pl	BH age - PL
ba_known	Basal area adjustment flag	topht_pl	Top height in m - PL
sdob_aw	Stump DOB in cm - AW	den03_pl	Density \geq 0.3 m - PL
tdib_aw	Top DIB in cm - AW	ps_pl	Percent stocking - PL
stht_aw	Stump height in m - AW	ba_pl	Basal area - PL
sdob_sb	Stump DOB in cm - SB	SI_bh_aw	Site index BH - AW
tdib_sb	Top DIB in cm - SB	SI_t_aw	Site index Total Age - AW
stht_sb	Stump height in m - SB	y2bh_aw	Years to BH - AW
sdob_sw	Stump DOB in cm - SW	SDF_aw	Stand density factor - AW
tdib_sw	Top DIB in cm - SW	N0_aw	Initial density - AW
stht_sw	Stump height in m - SW	PSI_aw	Percent stocking index - AW
sdob_pl	Stump DOB in cm - PL	SI_bh_sb	Site index BH - SB
tdib_pl	Top DIB in cm - PL	SI_t_sb	Site index Total Age - SB
stht_pl	Stump height in m - PL	y2bh_sb	Years to BH - SB
tage_aw	Total age - AW	SDF_sb	Stand density factor - SB
bage_aw	BH age - AW	N0_sb	Initial density - SB
topht_aw	Top height in m - AW	PSI_sb	Percent stocking index - SB
den13_aw	Density \geq 1.3 m - AW	SI_bh_sw	Site index BH - SW
ps_aw	Percent stocking - AW	SI_t_sw	Site index Total Age - SW
ba_aw	Basal area - AW	y2bh_sw	Years to BH - SW
tage_sb	Total age - SB	SDF_sw	Stand density factor - SW
bage_sb	BH age - SB	N0_sw	Initial density - SW
topht_sb	Top height in m - SB	PSI_sw	Percent stocking index - SW
den03_sb	Density \geq 0.3 m - SB	SI_bh_pl	Site index BH - PL
ps_sb	Percent stocking - SB	SI_t_pl	Site index Total Age - PL
ba_sb	Basal area - SB	y2bh_pl	Years to BH - PL
tage_sw	Total age - SW	SDF_pl	Stand density factor - PL
bage_sw	BH age - SW	N0_pl	Initial density - PL
topht_sw	Top height in m - SW	PSI_pl	Percent stocking index - PL

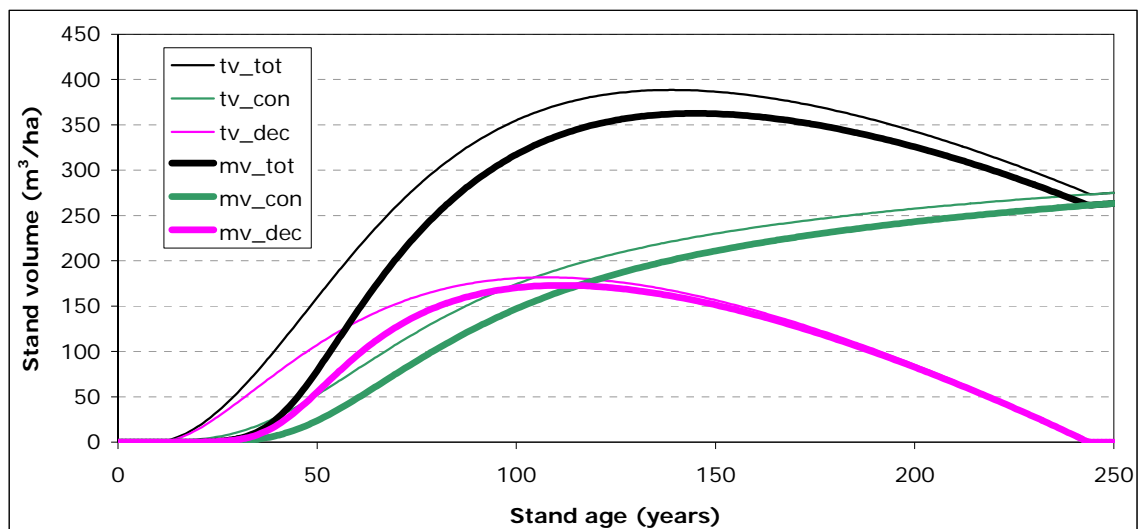
APPENDIX II
DATA DICTIONARY – OUTPUT_PROJ WORKSHEET

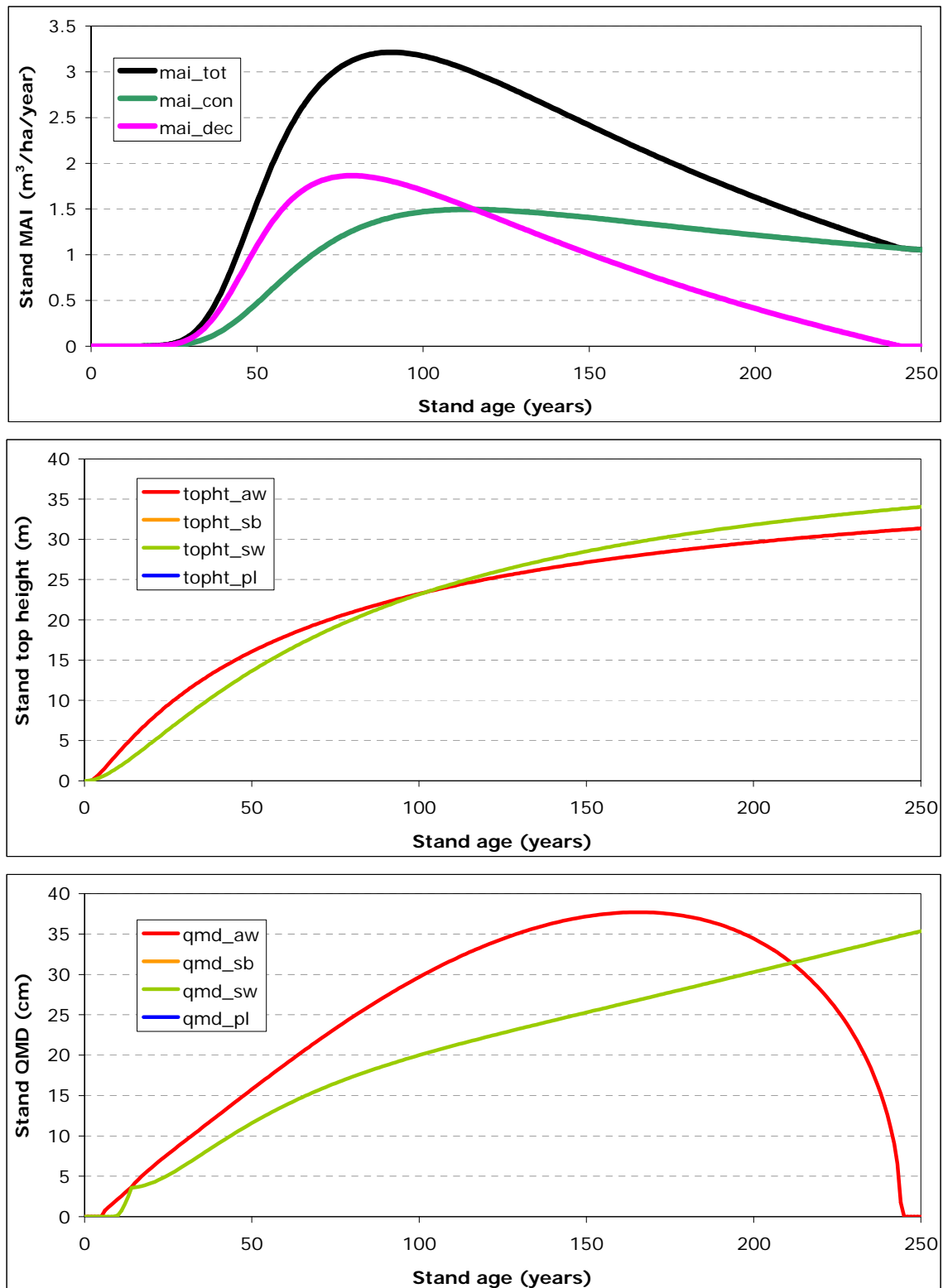
Table II -1. Data dictionary – projected attributes

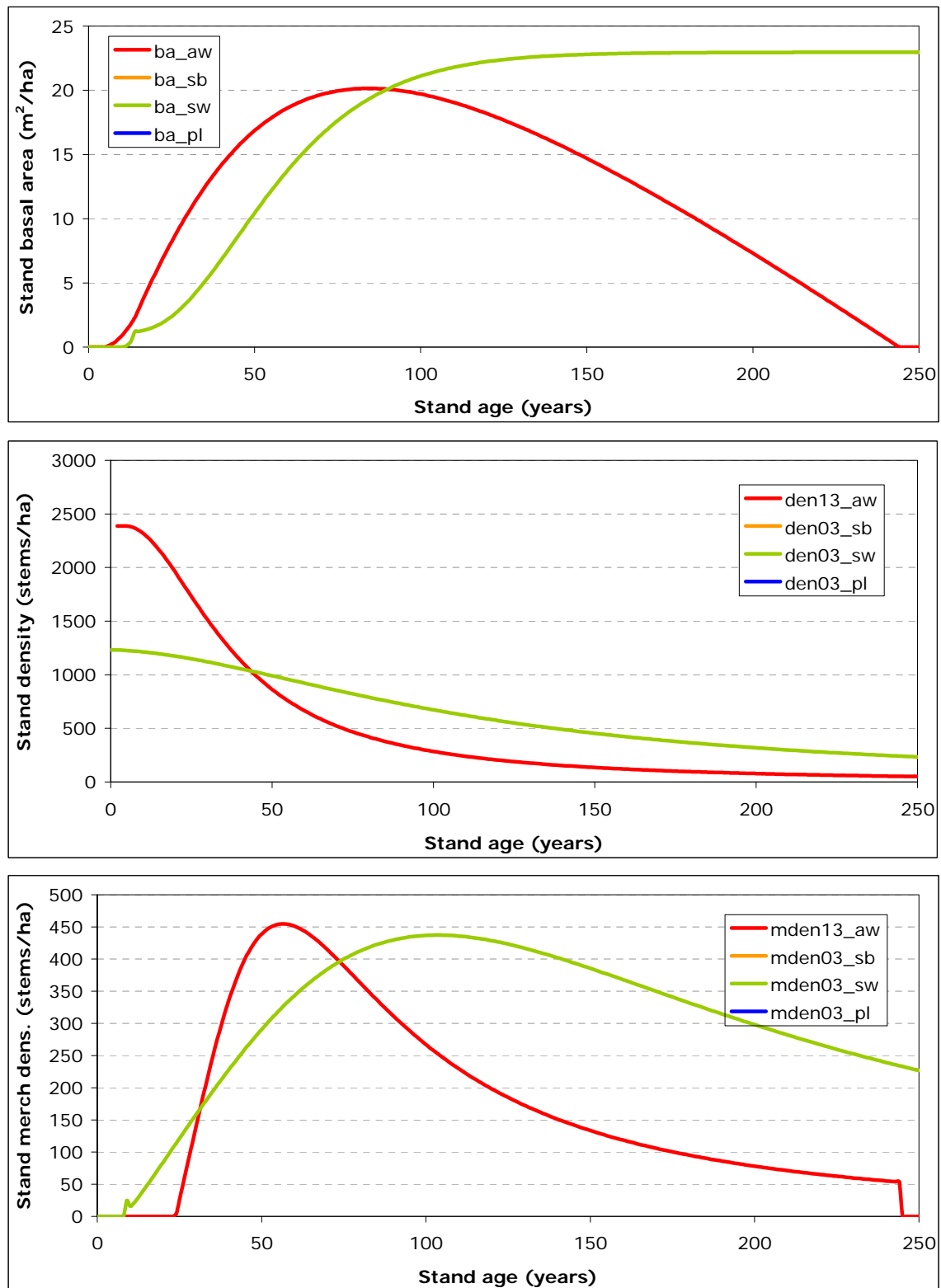
Variable	Description	Variable	Description
gypsy_model_id	GYPSY model identifier	tage_pl	Total age - PL
stand_id	Stand description	bage_pl	BH age - PL
standage_p	Projected stand age	ba_pl	Basal area - PL
tage_aw	Total age - AW	ps_pl	Percent stocking - PL
bage_aw	BH age - AW	den03_pl	Density > 0.3 m - PL
ba_aw	Basal area - AW	mden03_pl	Merchantable density - PL
ps_aw	Percent stocking - AW	sc_pl	Species composition - PL
den13_aw	Density > 1.3 m - AW	topht_pl	Top height - PL
mden13_aw	Merchantable density - AW	qmd_pl	Quadratic mean DBH - PL
sc_aw	Species composition - AW	tv_aw	Total volume - AW
topht_aw	Top height - AW	mv_aw	Merchantable volume - AW
qmd_aw	Quadratic mean DBH - AW	mai_aw	MAI – AW – species tage based
tage_sb	Total age - SB	tv_sb	Total volume - SB
bage_sb	BH age - SB	mv_sb	Merchantable volume - SB
ba_sb	Basal area - SB	mai_sb	MAI – SB – species tage based
ps_sb	Percent stocking - SB	tv_sw	Total volume - SW
den03_sb	Density > 0.3 m - SB	mv_sw	Merchantable volume - SW
mden03_sb	Merchantable density - SB	mai_sw	MAI – SW – species tage based
sc_sb	Species composition - SB	tv_pl	Total volume - PL
topht_sb	Top height - SB	mv_pl	Merchantable volume - PL
qmd_sb	Quadratic mean DBH - SB	mai_pl	MAI – PL – species tage based
tage_sw	Total age - SW	tv_con	Total volume - Conifer
bage_sw	BH age - SW	mv_con	Merchantable volume - Conifer
ba_sw	Basal area - SW	mai_con	MAI – Conifer – stand age based
ps_sw	Percent stocking - SW	tv_dec	Total volume - Deciduous
den03_sw	Density > 0.3 m - SW	mv_dec	Merchantable volume - Deciduous
mden03_sw	Merchantable density - SW	mai_dec	MAI – Deciduous – stand age based
sc_sw	Species composition - SW	tv_tot	Total volume - Total
topht_sw	Top height - SW	mv_tot	Merchantable volume - Total
qmd_sw	Quadratic mean DBH - SW	mai_tot	MAI – Total – stand age based

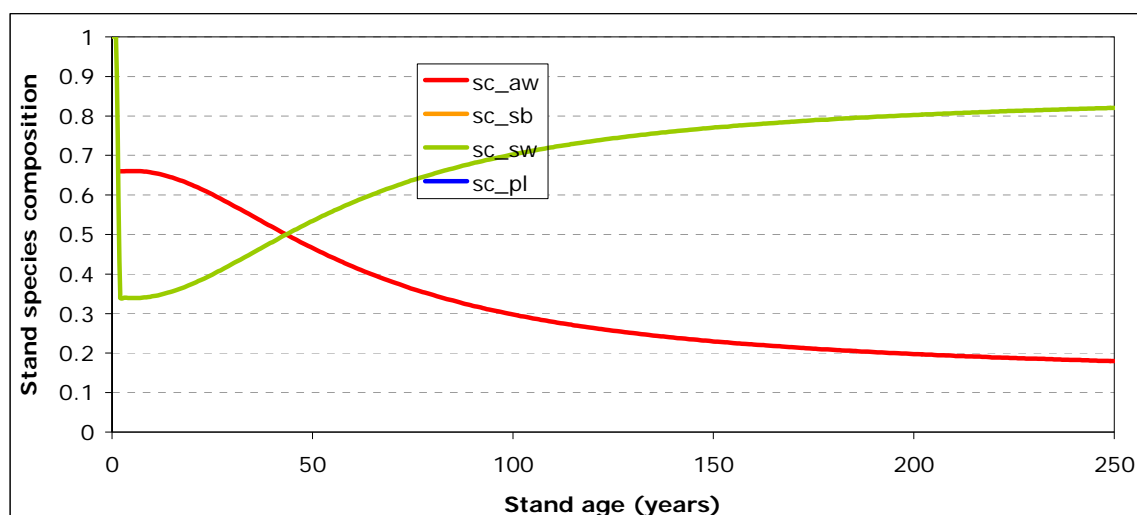
APPENDIX III
SAMPLE YIELD TABLE GENERATOR REPORT


		<h1>Yield Table Generator Report</h1>					
Forecast Values		Compiler Engine Information					
Stand ID:	Stand 1	GYPSY Model:	2009-May-21				
Stand Type:	Regenerated	Application:	20100526p2				
Stand Age:	14 years	COM DLL:	20100329b35				
Spatial:	YES						
BA adjusted:	YES						
Input Data							
Species	totage	topht	den	ps	ba	utilization	
AW	12.0	5.20	2200	85	2.3	15/10/30	
SB						15/10/30	
SW	14.0	2.80	1200	67	1.2	15/10/30	
PL						15/10/30	
Calculated Attributes							
Species	bhage	y2bh	si_bh	si_t	n0	sdf	psi
AW	8.5	3.5	17.1	16.4	2,387	747	82.4
SB							
SW	5.3	8.7	15.7	13.6	1,232	991	65.8
PL							
Volume & Yield Information							
species group	spp. culm. mai	spp. culm. Age	prim. spp. type	prim. culm. mai	prim. culm. age	sec. culm. mai	
AW	1.913	76	conifer	1.496	113	1.530	
SB			decid	1.864	78	1.248	
SW	1.496	113					
PL							









 Yield table for Stand 1								
Stand Age	Conifer			Deciduous			Total	
	mvol	mai	pc. size	mvol	mai	pc. size	mvol	mai
years	m ³ /ha	m ³ /ha/yr	trees/m ³	m ³ /ha	m ³ /ha/yr	trees/m ³	m ³ /ha	m ³ /ha/yr
10	0.0	0.000	0.0	0.0	0.000	0.0	0.0	0.000
20	0.1	0.003	1451.2	0.1	0.003	0.0	0.1	0.006
30	1.1	0.035	149.4	2.6	0.086	53.4	3.6	0.122
40	7.4	0.184	31.0	18.9	0.471	17.8	26.2	0.655
50	23.7	0.473	12.3	55.1	1.102	8.0	78.8	1.576
60	48.2	0.803	7.1	95.5	1.592	4.7	143.7	2.395
70	75.8	1.083	5.1	127.3	1.818	3.3	203.1	2.901
80	102.5	1.282	4.0	149.0	1.863	2.4	251.6	3.145
90	126.5	1.405	3.4	162.7	1.808	1.9	289.2	3.213
100	147.0	1.470	3.0	170.2	1.702	1.6	317.2	3.172
110	164.4	1.494	2.7	172.9	1.572	1.3	337.2	3.066
120	178.9	1.491	2.4	171.7	1.431	1.2	350.6	2.922
130	191.3	1.471	2.2	167.3	1.287	1.0	358.6	2.758
140	201.8	1.441	2.0	160.4	1.146	0.9	362.2	2.587
150	210.9	1.406	1.8	151.3	1.009	0.9	362.2	2.415
160	218.8	1.368	1.7	140.4	0.878	0.8	359.3	2.245
170	225.9	1.329	1.5	127.9	0.752	0.8	353.8	2.081
180	232.2	1.290	1.4	114.0	0.633	0.8	346.2	1.924
190	237.9	1.252	1.3	98.9	0.520	0.9	336.8	1.773
200	243.1	1.216	1.2	82.6	0.413	0.9	325.7	1.629
210	247.8	1.180	1.1	65.3	0.311	1.1	313.2	1.491
220	252.2	1.146	1.1	47.1	0.214	1.4	299.3	1.360
230	256.2	1.114	1.0	27.9	0.121	2.1	284.1	1.235
240	259.9	1.083	0.9	7.6	0.032	7.2	267.6	1.115
250	263.4	1.053	0.9	0.0	0.000	0.0	263.4	1.053