FRIPSY

Foothills Reforestation Interactive Planning System

Users' Guide
and
Introduction to Calibrated Version

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Contents

1 INTRODUCTION 1

1.1 GENERAL 1
1.2 CALIBRATION 1
1.2.1 Background and Methods 1
1.2.2 Results and Application 2

2 SINGLE-STAND PROCESSING OF REGENERATION FORECASTS 5

2.1 INPUT 5
2.1.1 Natural Sub-Region, Soil Nutrient and Soil Moisture Classes 6
2.1.2 Harvest and Site Preparation 6
2.1.3 Planting and Tending 7
2.1.4 Establishment Survey 9
2.1.5 Performance Reporting 9
2.1.6 Input Validation 9
2.2 REPORT 10

3 BATCH PROCESSING OF REGENERATION FORECASTS 13

3.1 INPUT 13
3.1.1 Input Variables 13
3.1.2 Input Data Validation 14
3.2 PROCESSING 15
3.3 OUTPUT 16
3.4 BATCH VIEWER 17

4 GROWTH AND YIELD PROJECTION 18

4.1 REGISTERING THE GYPSY DLL 18
4.2 SINGLE-STAND PROCESSING OF GROWTH AND YIELD PROJECTIONS 20
4.3 BATCH PROCESSING OF GROWTH AND YIELD PROJECTIONS 20

APPENDIX 1. DATA DICTIONARIES 22

APPENDIX 2. GYPSY DLL REGISTRATION TROUBLE SHOOTING TIPS 27

Figures

Figure 1. Stand densities of lodgepole pine in the Sundance site preparation trial......................................3
Figure 2. Tabs for accessing FRIPSY worksheets...5
Figure 3. Input worksheet 5
Figure 4. Study area, mortality risk and associated climate variables 8
Figure 5. Validation warnings generated on Input worksheet 9
Figure 6. Report worksheet – regeneration forecast 11
Figure 7. Report worksheet – distributions...12
Figure 8. FRIPSY batch processor input screen (with examples of input data) 13
Figure 9. Example of batch input data descriptor 13
Figure 10. Examples of batch input data errors and warnings...15
Figure 11. Batch processing interface...15
Figure 12. One-stand batch viewer 17
Figure 13. Batch viewer error message...17
Figure 14. Successful registration of the GYPSY DLL..19
Figure 15. Warning when FRIPSY is opened without the registered GYPSY DLL 19
Figure 17. The new GYPSY output checkbox in the FRIPSY batch processor module 21
Figure 18. MAI projections included in the FRIPSY output file..21

1 Introduction

1.1 General

FRIPSY (Foothills Reforestation Interactive Planning System) is a predictive decision-support tool based primarily on results of the Regenerated Lodgepole Pine (RLP) trial. It is intended to be used for silvicultural and yield planning of lodgepole pine regenerated following harvesting in the Alberta Foothills. It forecasts performance as defined by the Reforestation Standard of Alberta[1] (RSA) at 12 to 14 years following cut. These forecasts are generated by the user inputting site and treatment information, and can be made with or without establishment survey data.

The regeneration model is linked directly to the Alberta government-approved Growth and Yield Projection System (GYPSY)[2] to project the impacts of alternative silvicultural prescriptions on mean annual increment (MAI). FRIPSY may be operated in either of two processing modes: single-stand or batch. In single-stand mode the user enters data manually via form controls on the input worksheet, and generates reports for one stratum or opening at a time (see Part 2 of this document). The batch processing module enables users to load and process data for multiple openings (see Part 3). The growth and yield projection features based on GYPSY are described in Part 4, which includes instructions for registering and running the integrated GYPSY components.

FRIPSY (version BP_2018b) incorporates two significant amendments: yield forecasting without basal area adjustment, and addition of operational adjustment factors.

The latest analyses and projections of the RLP trial data indicate that yield forecasts made by GYPSY from 12 to 16 years after cut show instability when basal area is included as an input, but are otherwise stable.[3] The GYPSY basal area adjustment procedure used in previous versions of FRIPSY has therefore been discontinued, and yield is predicted from age, stocking, density and top height.

A description of why and how adjustment factors have been incorporated into the system is given below.

1.2 Calibration

1.2.1 Background and Methods

The following observations made by reviewers of FRIPSY emphasized the need to test the model against external operational and experimental data.

- Prediction of planted stock performance appeared credible and reliable, but more attention was needed to forecasting ingress of natural pine regeneration.
- Operational adjustment factors (“OAF’s”) may be necessary to adjust for voids occurring at the stand or stratum level that are not reflected by sampling and modelling at the plot level.
- Site preparation treatments were not experimentally controlled in the RLP trial. As a result, the effects of mechanical site preparation are potentially confounded with site effects. The forecasting by FRIPSY of lower levels of ingress on mounded versus untreated sites was considered particularly dubious.

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[1] Alberta Environment and Sustainable Resource Development. 2015. *Reforestation standard of Alberta*. Government of Alberta Department of Environment and Sustainable Resource Development, Edmonton, Alberta.
[2] Huang, S., Meng, S., & Yang, Y. (2009). *A growth and yield projection system (GYPSY) for natural and post-harvest stands.* Alberta Sustainable Resource Development Tech. Report Pub. No. T/216.
[3] Dempster, W.R. (2018). *Regenerated lodgepole pine trial crop performance report – 16 year results*. FGrOW technical report.

- Levels of predicted ingress, stocking and density were often higher than expected, and this led to concerns that the model may indicate planting is unnecessary on some sites where practical experience suggests otherwise, and also that on dragged sites predicted reduction in yields due to overstocking may be unrealistic.
- Forecast MAI's seemed generally high relative to prior expectations based on projections made from performance surveys by the Alberta reforestation information system (ARIS). Of particular concern was the forecasting of high pine yields on rich moist sites from natural regeneration with weeding being the only silvicultural treatment – a situation where risk of reforestation failure would be considered high by most silvicultural practitioners.

Two initiatives undertaken by FGrOW have allowed the above concerns to be examined and at least partially addressed by model calibration:

1. *The Empirical Post-harvest (EPH) database*. This includes data from operational performance surveys conducted according to RSA standards, and silvicultural records for the surveyed openings. The data facilitated computation of operational adjustment factors, primarily based on 105 openings which were located in pine or pine-aspen cover-types, sampled with a total of 6778 RSA ground plots, and met the input criteria for FRIPSY. (The database contains data for a much larger number of openings, but most lacked the basic soil-site classification required by FRIPSY). The retained openings were distributed across 4 forest management areas in the Upper and Lower Foothills sub-regions.
2. *The Sundance site preparation trial*. The trial was established in 2001 to evaluate under controlled experimental conditions the effects of alternative harvesting and site preparation methods on lodgepole pine stand development.[4] Following harvest in 2000, the trial was site-prepared in 2001, planted at 2000 trees per ha in 2002, and re-measured in 2017.

1.2.2 Results and Application

Percent stocking of pine observed in the EPH data was on average 5% lower than forecast by FRIPSY for the same openings, but the bias in prediction differed significantly among site preparation treatments. Stocking adjustment factors were calculated by site preparation class for lodgepole pine ingress, on the assumption that the differences between forecast and observed values were attributable to error in the prediction of ingress (i.e. not of planted stock). The procedure adopted resulted in pine ingress stocking indices being adjusted by the proportions 0.487, 0.924 and 0.866 for non-treated, dragged and mounded openings respectively (note the major reduction indicated for openings having no mechanical site preparation).

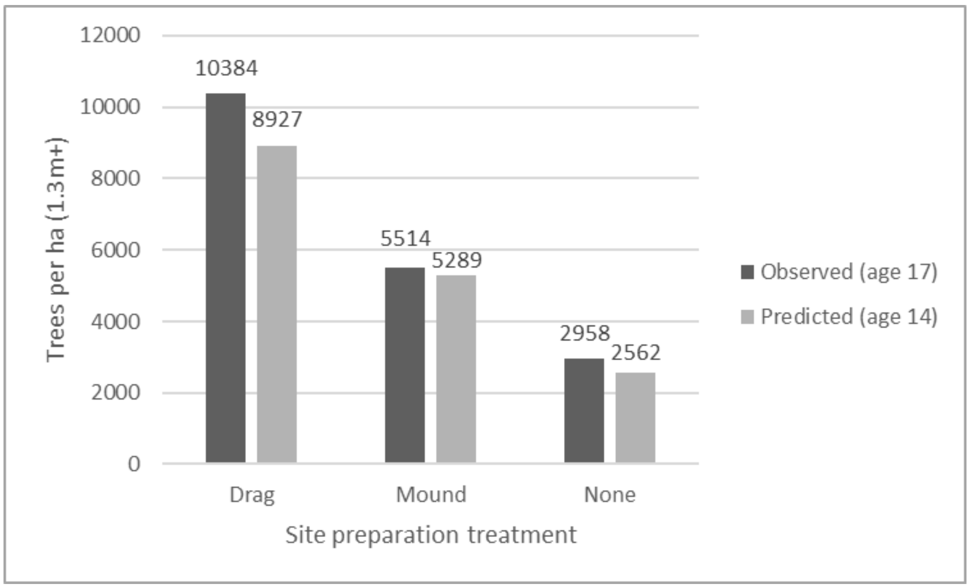
Before the above stocking adjustments were applied, average pine densities (planted stock and ingress combined) were 41% lower in the EPH data than as forecast by FRIPSY. The difference was reduced to 20% by application of the stocking adjustments. The residual differences between observed and predicted densities tended to be greater in high density dragged openings than in lower density untreated or mounded openings. This remaining "under-estimation" of pine density may be explained by procedural differences between the RLP trial and RSA performance surveys. In the former, all live trees were included in regeneration counts and the accuracy of counts was checked in quality-control audits even at very high densities. In the latter, trees with gall rust encircling the main stem were excluded from counts, and in high density plots less attention may have been paid to ensuring all eligible trees were counted. Both or either of the procedural differences could explain the observed results. Data from the 2017 Sundance site preparation trial re-measurement suggest that main-stem gall rust infection alone could

[4] Landhäusser, S. M. (2009). *Impact of slash removal, drag scarification and mounding on lodgepole pine cone distribution and seedling regeneration after cut-to-length harvesting on high elevation sites.* Forest Ecology and Management, 258: 43-49.

easily cause the discrepancy.[5] For these reasons the prediction of number of trees per stocked regeneration plot was NOT adjusted in FRIPSY.

The EPH data and the Sundance trial indicated similar trends of pine density with site preparation, with the highest densities occurring following dragging and the lowest on untreated sites. After stocking adjustments based on the EPH data were included in FRIPSY, model simulations of the Sundance trial indicated trends of density with site preparation similar to those observed in the trial re-measurement (see Figure 1). These results suggest that the differences in densities observed between site preparation treatments in the EPH data used for calibrating FRIPSY are the result of real treatment (rather than site) effects.

Figure 1. Stand densities of lodgepole pine in the Sundance site preparation trial



Average biases in the forecasting of pine age, top height and site index by FRIPSY relative to EPH values were low. Age showed no significant bias. Top height and site index showed small but statistically significant over-estimates, which were rectified by applying an operational adjustment factor of 0.940 to top height as calculated by FRIPSY.

The trends shown by aspen in the EPH data were highly variable and somewhat anomalous. Aspen densities were on average much higher in weeded stands than in those that had not been tended, suggesting either site differences between the two, or stimulation of suckering by tending. According to ARIS records, initiation of herbicide treatments in the EPH openings was frequently delayed beyond the window permitted in the RLP trial and FRIPSY.[6] In tended stands FRIPSY, according to the EPH data, greatly underestimates aspen density and MAI. Without suitable additional trial data, it is not possible to determine whether this is the result of late tending, predictive error, and / or unidentified site factors. In the non-tended stands FRIPSY on average tends to over-estimate aspen density and top height (by 13% and 9% respectively), but slightly underestimate aspen MAI (by 9%). No adjustment to FRIPSY have

[5] Dempster, W.R. (2018). Sundance site preparation trial – preliminary technical report. FGrOW report prepared for Edson and Hinton Woodlands, West Fraser Mills Ltd.

[6] Weeding must be completed before the earliest of: the 8th timber year since harvest or the 7th growing season since planting (see Section 2.1.3).

been made on the basis of these results. Pending further investigation, users are advised against inputting stands as weeded where tending has occurred later than specified in Section 2.1.3 of this manual, and instead to input the stand as non-weeded.

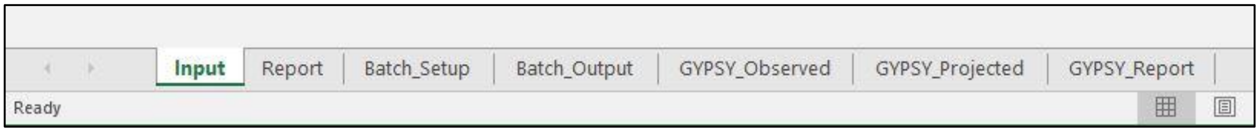
After adjustment of FRIPSY for stocking and top height, ARIS-based predictions of stand coniferous MAI averaged 10% lower than those made by FRIPSY. Simulations with the model indicate that this could result from the competitive influence of hardwoods being under-estimated in tended stands. It should also be noted that in FRIPSY the coniferous stand component is assumed to be solely lodgepole pine, and the implications of this limitation for yield forecasts have not yet been quantified. MAI predictions should be interpreted with caution, and may be improved by the development of a multi-species FRIPSY version and further investigation into competitive effects.

2 Single-stand Processing of Regeneration Forecasts

2.1 Input

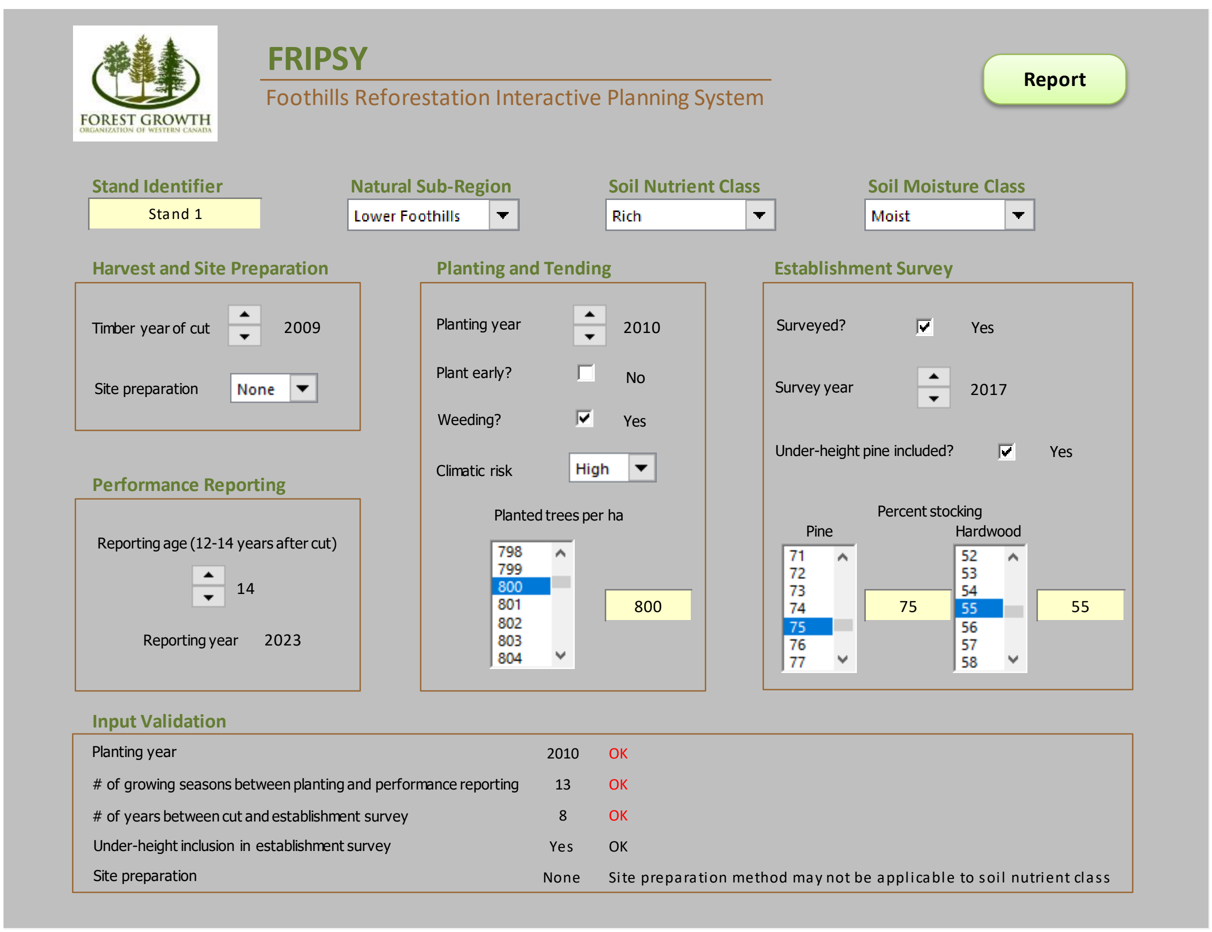
The single-stand module is accessed by clicking on the *Input* tab located at the bottom left corner of the screen (see Figure 2).

Figure 2. Tabs for accessing FRIPSY worksheets



The *Input* worksheet is illustrated in Figure 3. Information may be entered directly in the yellow-shaded fields. (Be sure to press the *Enter* key on your computer after you type information into these fields!) Otherwise, select input values from the form controls highlighted in white. A code or name can be entered to identify the run in the *stand identifier* box. Review any warnings that appear in the *input validation* box at the bottom of the window and revise inputs if necessary. To run the model, click on the **[Report]** button at the top-right of the window or on the *Report* worksheet tab,. The *Report* worksheet will be displayed, showing the output generated by the model. Instructions and descriptions for each of the inputs are described below.

Figure 3. Input worksheet



2.1.1 Natural Sub-Region, Soil Nutrient and Soil Moisture Classes

- Use the pull-down lists near the top of the input window to select the combination of *natural sub-region*, *soil nutrient class* and *soil moisture class* that best matches the site of interest. These ecological strata are based on the field guides to ecosites of west-central and southwestern Alberta.[7] Table 1 shows the relationship between the soil nutrient / moisture classes recognized in FRIPSY and ecosite names (ecosites for southwestern Alberta are shown in parentheses). The system utilizes the "edatopic" (soil moisture / nutrient) grid common to all three guides. FRIPSY differentiates between two natural sub-regions (*Upper Foothills* and *Lower Foothills*), three soil nutrient classes (r*ich*, *medium* and *poor*) and two soil moisture classes (*dry/mesic* and *moist*).

Table 1. Soil moisture and nutrient classes and associated ecosites

Moisture		**Nutrient Class**		
Class	**Regime**	Poor B	Medium C	Rich D
Dry / Mesic	Subxeric 3	No data	a/c (a/b)	No data
	Submesic 4	b/d (b)	c (b)	No data
	Mesic 5	d (c)	e (c/d)	f (e)
Moist	Subhygric 6	d/h (f)	e/i (d)	f/j (e)
	Hygric 7	h (f)	i/j (g)	No data

2.1.2 Harvest and Site Preparation

- Select a *timber year of cut*. The listed years refer to the calendar year in which the timber year commences e.g. *2005* refers to the period May 1, 2005 to April 30, 2006.
- Three broad site preparation treatment groups are recognized:
  1. No site preparation, or hand scalping only *("None"*);
  2. Scarification primarily for mineral soil exposure and soil mixing *("Drag"*);
  3. Mechanical site preparation primarily for microsite elevation *("Mound"*).

  Table 2 lists the various site preparation methods included in each
- Select *none*, *drag* or *mound* in the *site preparation* box. Site preparation is assumed to be prompt. If you select a site preparation method that may be not be applicable to the soil nutrient class, the run will be processed but a warning will appear in the *Input Validation* section.

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[7] - Archibald, J. H., Klappstein, G. D., & Corns, I. G. (1996). *Field guide to ecosites of southwestern Alberta.* Special Report 8, Canadian Forest Service, Northwest Region, Northern Forestry Centre, Edmonton, Alberta.
- Beckingham, J. D., Corns, I. G., & Archibald, J. H. (1996). *Field guide to ecosites of west-central Alberta.* Special Report 9. Canadian Forest Service, Northwest Region, Northern Forestry Centre, Edmonton, Alberta.
- Corns, I. G., Downing, D. J., & Little, T.I. (2005). *Field guide to ecosites of west-central Alberta: supplement for managed forest stands up to 40 years of age.* Special Report 15, Canadian Forest Service, Northwest Region, Northern Forestry Centre, Edmonton, Alberta.

Table 2. Grouping of site preparation methods

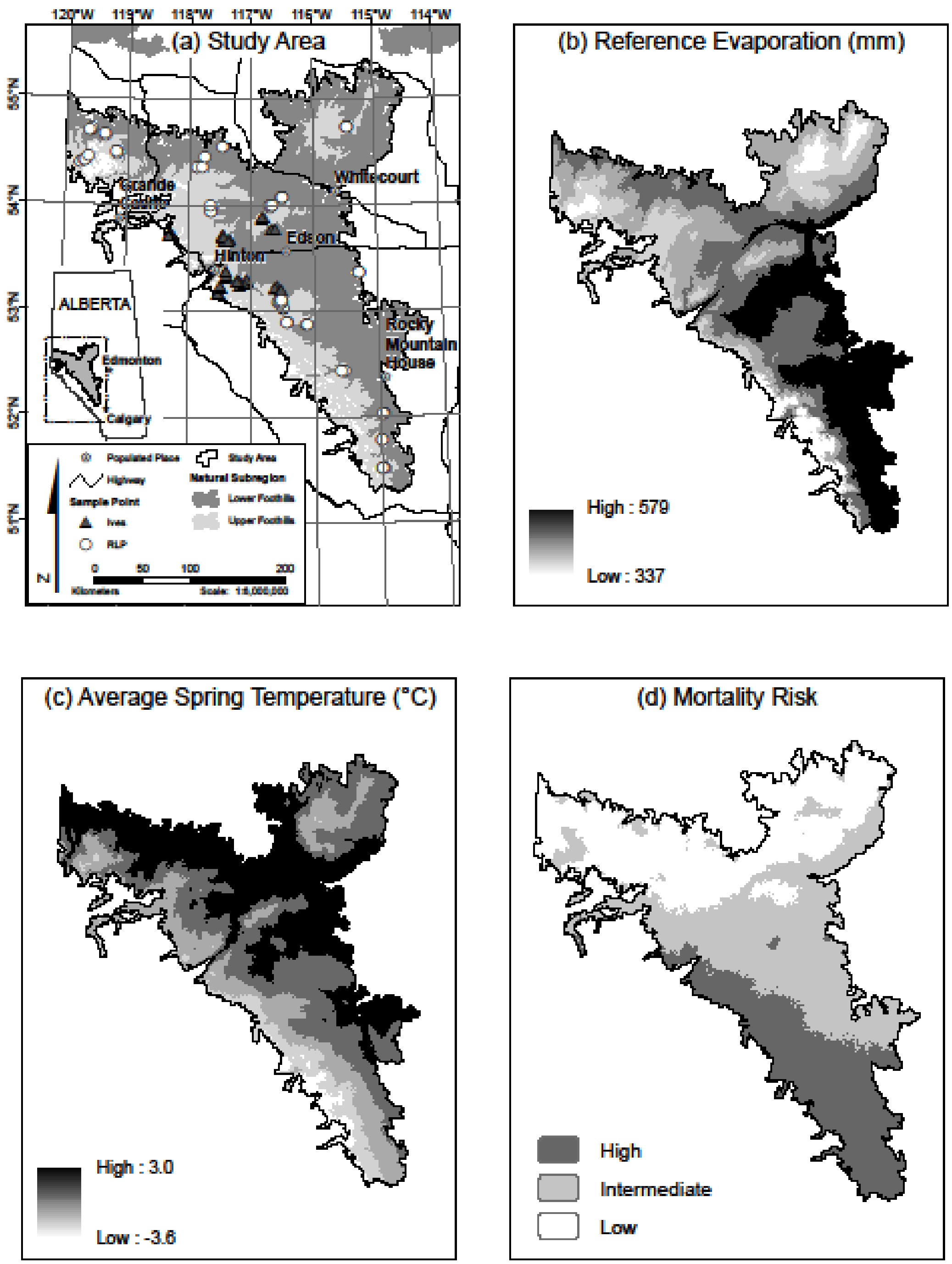
Group	Name	Site Preparation Methods
1	None	No site preparation performed
		Hand scalped
2	Drag	Drag
		Drag - heavy
		Drag - shark fin barrels
		Disk - passive trencher
		Blade - shear
3	Mound	Mounder - Donaren mounder
		Mounder - excavator hoe bucket
		C&S plough

2.1.3 Planting and Tending

- Identify the planting density by selecting or entering the number of *planted trees per ha* (0 to 4500).
- Select zero if the stand is to be "left for natural" regeneration. If you choose a number greater than zero, select a *planting year* (i.e. the timber year during which planting is undertaken).
- If you are confident that spring planting was or will be soon enough for the stock to flush at the beginning of the same year's growing season, check *yes* in the "*plant early?*" box, otherwise leave the box unchecked.
- If the stand was or will be weeded to control hardwoods, check the "*weeding?"* box to indicate *yes*. Weeding must take place before the earliest of: the 8th timber year since harvest, the 7th growing season since planting, or the collection date of the establishment survey data used in the projection (see below). If this is not case, leave the box unchecked.
- FRIPSY also uses a climatic risk classification for estimating mortality of planted stock. Three risk zones are recognized according to mean annual mortality of stock planted with no mechanical site preparation: High (mortality > 3%), Low (mortality < 2%) and Intermediate. Figure 4 shows climatic risk zones (Map d) in relation to related climate variables (Maps b and c) and the study area (Map a).[8]
- Identify the climatic risk as *high* or *low* by reference to the map in Figure 4d or the equivalent raster file which will be made available to users on request. If the planting location falls within the intermediate zone, select the risk as *high* if you are aware of or suspect high levels of *Armillaria*, *Hylobius* or other pathogens in the vicinity of the opening; otherwise select *low*.

[8] For a full description see: Dempster, W.R. (2017). *Impact of climate on juvenile mortality and Armillaria root disease in lodgepole pine,* For. Chron. 93(2): 148-160, https://doi.org/10.5558/tfc2017-021

Figure 4. Study area, mortality risk and associated climate variables



2.1.4 Establishment Survey

- If you indicate *no* in the "*surveyed?*" checkbox there is no need to enter further inputs, and any other data in the *establishment survey* cluster on the right-hand side of the input window will be ignored by the model. If you have establishment survey data for the stand collected 5 to 8 years after cut, check the box to indicate *yes*, and complete the remaining data entries listed below.
- Select a *survey year* (i.e. the timber year during which the establishment survey was undertaken).
- Check the "*under-height pine included?*" box to indicate whether seedlings under 30cm in height were included in the assessment of pine stocking.[9]
- Select or enter *percent stocking* values (0 to 100%) for both *pine* and *hardwoods*
- Note that hardwood stocking should be entered based on a minimum height of 1.3m. Hardwood stocking computed to lower thresholds may result in the model over-estimating the effects of hardwood competition on pine growth.

2.1.5 Performance Reporting

- Select a *reporting age* of 12, 13 or 14 years since cut.

2.1.6 Input Validation

The data input window includes an *input validation* box (see Figure 5) which displays up to 5 warnings if data do not meet the following required or recommended specifications:

1. Planting year (planting cannot occur before cut);
2. The number of growing seasons between planting and performance projection (cannot be less than 9 or more than 13 because of restrictions on modelling imposed by the RLP trial data);
3. The number of years between cut and establishment survey (must be from 5 to 8);
4. Inclusion of under-height pine in the establishment survey (exclusion may result in under-projection of stocking);
5. Site preparation (the site preparation method may not be applicable to the soil nutrient class because of limitations in the RLP trial data).

Figure 5. Validation warnings generated on Input worksheet

Input Validation

Planting year	2004	Invalid: planting cannot occur before cut
# of growing seasons between planting and performance reporting	15	Invalid: planting too early or too late for projection
# of years between cut and establishment survey	3	Invalid: outside interval permitted for establishment survey
Under-height inclusion in establishment survey	No	Exclusion of u/h may result in under-projection of stocking
Site preparation	Drag	Site preparation method may not be applicable to soil nutrient class

If any of the first three warnings (shown in red) indicate an invalid value, the output report will not be completed and if you view the report you will be advised to go back to the input window. If under-height trees are excluded from the establishment survey a warning is given as a reminder that stocking may be under-estimated, but the report is completed. Similarly, if the chosen site preparation method might not be applicable to the soil nutrient class, a warning is given but the report is completed.

[9] Inclusion in the establishment survey of under-height pine to a minimum height of 15cm, or preferably 10cm, provides a better basis for projecting stocking and density at 12 years than does establishment stocking measured to the 30cm threshold. Ignoring under-height pine in the establishment survey may result in under-estimation of stocking and density at performance reporting age, since FRIPSY conservatively treats the establishment stocking input as though it includes under-height trees.

2.2 Report

The output report is displayed in the *Report* worksheet and consists of a tabular *Regeneration Forecast* (see Figure 6) and a series of charts showing *Density, Height and Diameter Distributions* for lodgepole pine (see Figure 7). A PDF (portable document format) file can be generated by clicking on the red **[PDF]** button located at the top right of the first report page. The PDF includes the input parameters as well as the *Regeneration Forecast* itself. The default file name of the PDF will be based on the input *stand identifier*; however, this can be changed by the user.

Percent stocking of pine and hardwoods at establishment (8 years after cut) is included in the *Regeneration Forecast*. Note that if establishment survey data are used in the run, and under-height pine is not included, FRIPSY does not estimate any increase in stocking resulting from under-height seedlings. If less than 7 years has elapsed between planting and the establishment survey, total stocking of planted pine including under-height is shown, but FRIPSY is unable to estimate the portion that has reached a minimum height of 30cm.

The remaining part of the *Regeneration Forecast* table contains statistics for planted and naturally regenerated lodgepole pine and naturally regenerated aspen projected to the performance reporting age requested by the user.

- *Total age* is defined as the average age in years since germination of the 100 largest-diameter trees per ha. Note however that the model assumes the use of "1+0" stock for planting, and no other adjustment is made for the age of planted stock at the time of planting.
- *Percent stocking* for lodgepole pine is the percentage of $10m^2$ regeneration plots containing at least one live tree. It is forecast with and without the inclusion of under-height trees. The under-height value is calculated based on the minimum height threshold of 10cm used in the RLP trial.
- *Percent stocking* for aspen is forecast only to a minimum height of 1.3m.
- *Number of trees per ha* is calculated for all lodgepole pine trees, and for lodgepole pine trees to minimum height thresholds of 30cm and 1.3m. It is calculated for aspen to a minimum height threshold of 1.3m.
- *Average diameter*: arithmetic average diameter over-bark is calculated at ground level and at breast-height (1.3m) for lodgepole pine.
- *Basal area per ha* is also calculated at ground level and at breast height (1.3m) for lodgepole pine.
- *Average height*: arithmetic average height of lodgepole pine is calculated for all trees, for trees 30cm+ in height and for trees 1.3m+ in height.
- *Top height – per ha basis*: is the average height of the 100 largest-diameter lodgepole pine trees per ha.
- *Top height – per $100m^2$ plot basis (RSA)*: is top height as defined in the RSA performance survey protocol. It is forecast for lodgepole pine and aspen.

Variables for input to GYPSY, for predicting yields at rotation age, are highlighted in yellow. A space underneath the regeneration forecast table is reserved for notifications of limitations or inconsistencies in the forecast.

Figure 6. Report worksheet – regeneration forecast

PDF

Regeneration Forecast

Foothills Reforestation Interactive Planning System

FOREST GROWTH ORGANIZATION OF WESTERN CANADA

Stand Identifier

Stand 1

Establishment (8 Years after Cut)	Planted stock	Pine ingress	Pine total	Hardwood
Percent stocking (including underheight)	57	41	75	
Percent stocking (min. height 30cm for Pl, 1.3m for hwds)	57	29	70	55

Performance (14 Years after Cut)	Planted stock	Pine Ingress	Pine total	Aspen
Total age (years)	14.0	13.0	14.0	14.0
Percent stocking (including underheight)	48	50	74	
Percent stocking (min. height 30cm for Pl, 1.3m for Aw)	48	45	71	64
Number of trees per ha (total)	521	1841	2363	
Number of trees per ha (minimum height 30cm)	521	1838	2359	
Number of trees per ha (minimum height 1.3m)	521	1642	2164	2296
Average basal diameter (cm at ground)	10.7	4.7	6.0	
Average diameter breast-height (cm at 1.3m)	7.5	2.9	4.0	
Total basal area per ha (m^2 at ground)	4.9	3.9	8.8	
Breast-height basal area per ha (m^2 at 1.3m)	2.5	1.4	3.9	
Average height (cm) - all trees	529	262	321	
Average height (cm) - trees 30cm+	529	263	322	
Average height (cm) - trees 1.3m+	529	283	342	
Top height (cm) - per ha basis	621	461	621	
Top height (cm) - per $100m^2$ plot basis (RSA)	557	385	557	638

CAUTION: ASPEN DEVELOPMENT IRREGULAR FOLLOWING WEEDING

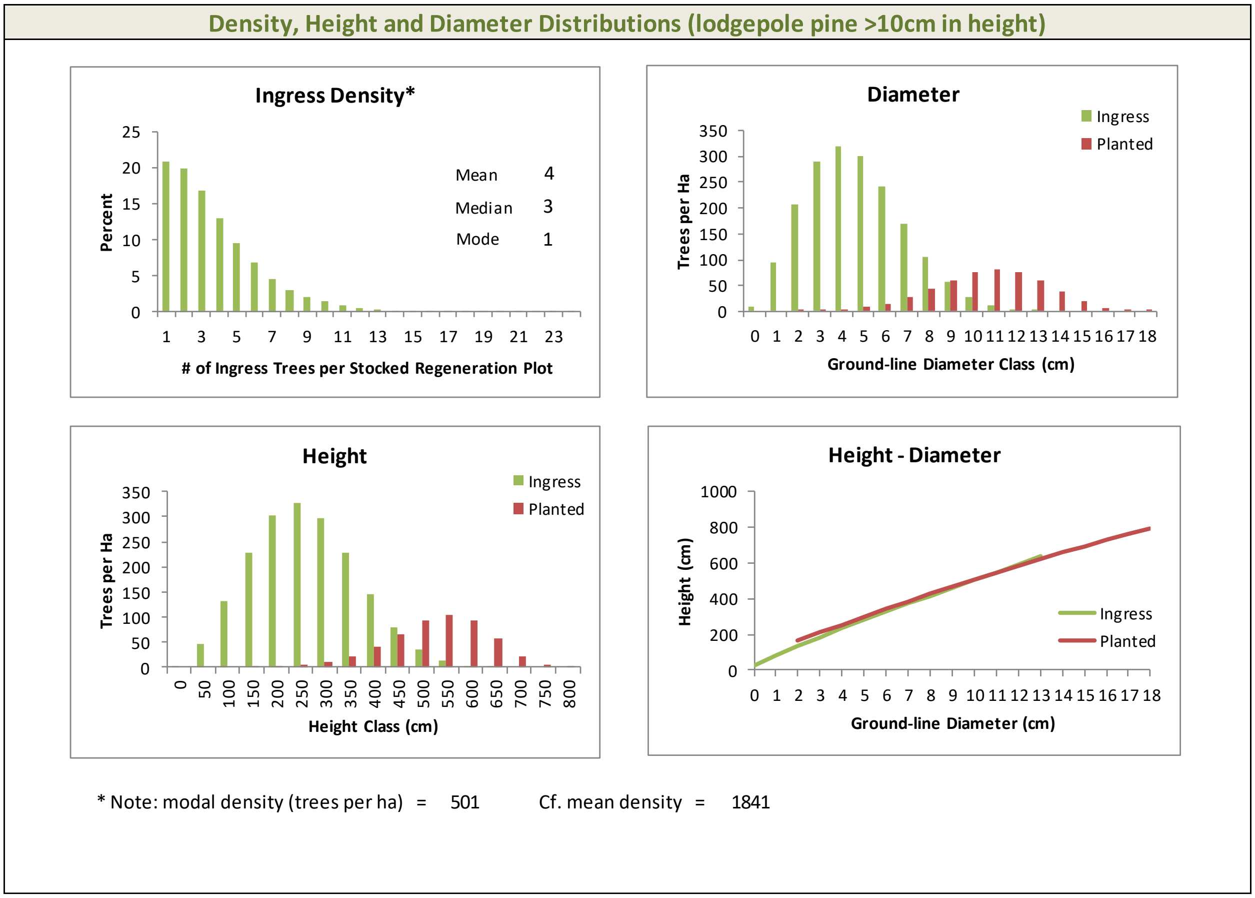
GYPSY INPUT

The tabular forecast report and notifications are followed by charts showing density, height and diameter distributions of lodgepole pine at performance reporting age (see Figure 7).

- The *ingress density* chart shows the distribution, mean, median and mode of the number of naturally regenerated trees per stocked plot.
- The *diameter* and *height* charts indicate the relative size and density status of planted stock and ingress.
- The *height-diameter* chart shows the height-diameter relationship used to predict tree height, and indicates differences in stem taper between planted stock and ingress.

A footnote to the ingress density chart compares modal ingress density (trees per ha based on the modal number of trees per stocked regeneration plot) with mean density (average number of trees per ha).

Figure 7. Report worksheet – distributions



3 Batch Processing of Regeneration Forecasts

3.1 Input

The batch processor input screen can be accessed by clicking on the *Batch_Setup* worksheet tab (see Figure 2). You can input data for multiple openings under the appropriate headings as shown in Figure 8, either directly on screen or by pasting external data already compiled to this format.[10] Each row of data represents one opening/stand with a unique identifier (*StandID*) that must be provided in column A. Enter stand data starting in row 2. Stands should be entered continuously with no blank rows between data records.

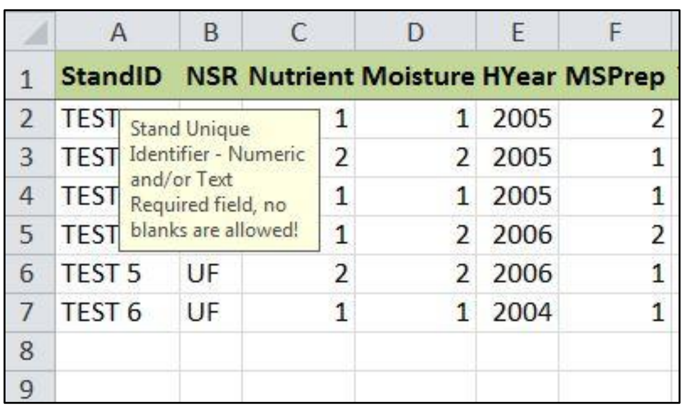
Figure 8. FRIPSY batch processor input screen (with examples of input data)

1	StandID	NSR	Nutrient	Moisture	HYear	MSPrep	YSHpa	PSph	PYear	PSeason	Weed	Risk	ES	ESYear	ESUh	ESPctPl	ESPctHw	Status	Validate	Batch
2	SS1	UF	3	1	2005	2	13	0			No	2	Yes	2012	Yes	90	10	OK		
3	SS2	UF	1	2	2005	3	13	1224	2005	No	No	2	Yes	2013	Yes	75	5	OK		
4	SS3	UF	2	1	2005	2	14	1000	2006	No	No	2	No					OK		
5	SS4	LF	3	1	2005	2	13	0			Yes	1	Yes	2012	Yes	80	10	OK		
6	SS5	LF	1	2	2005	3	13	2000	2005	No	Yes	1	Yes	2013	Yes	75	20	OK		
7	SS6	LF	2	2	2005	2	14	1000	2006	No	Yes	1	No					OK		

3.1.1 Input Variables

The batch input data variables are identical to those required for single-stand processing. A short description of the expected data, the acceptable values and their types (text, numeric or logical) and the default values assumed if missing are embedded in the header row as illustrated in Figure 9. The input descriptor is triggered simply by clicking on a heading.

Figure 9. Example of batch input data descriptor



	A	B	C	D	E	F
1	StandID	NSR	Nutrient	Moisture	HYear	MSPrep
2	TEST		1	1	2005	2
3	TEST		2	2	2005	1
4	TEST		1	1	2005	1
5	TEST		1	2	2006	2
6	TEST 5	UF	2	2	2006	1
7	TEST 6	UF	1	1	2004	1
8						
9						

The following batch input data need to be provided for every row:

StandID: Stand unique identifier; numeric and/or text; **no blanks are allowed**.

***NSR*:** Natural sub-region; 2-letter text code; LF - Lower Foothills; UF - Upper Foothills; default value is LF if missing.

[10] The application as supplied to you will contain a small test set of data already entered, validated and processed. Simply delete or overwrite these data when you are ready to enter your own.

***Nutrient*:** Soil nutrient class; numeric; 1 - rich; 2 - medium; 3 - poor; default value is 2 (medium) if missing.

***Moisture*:** Soil moisture class; numeric; 1 - dry/mesic; 2 - moist; default value is 1 (dry/mesic) if missing.

***HYear*:** Harvest year; numeric; 1995-2020; refers to the calendar year in which the timber year commences, e.g. 2005 refers to the period May 1, 2005 to April 30, 2006; must have a valid year.

***MSPrep*:** Site preparation method; numeric; indicates category of site preparation applied following harvest; 1 - none; 2 - drag; 3 - mound; default value is 1 (none) if missing.

***YSHpa*:** Years since harvest at performance assessment; numeric; 12 to 14; default value is 14 if missing.

***PSph*:** Planted stems per ha; numeric; 0 to 4500; enter zero if the stand is to be "left for natural"; if you use a number greater than 0, you must also enter a planting year; default value is 0, if missing.

***PYear*:** Planting year; numeric; 1996-2021; refers to the timber year during which planting is undertaken; must be filled out if PSph>0.

***PSeason*:** Plant early? Logical; Yes or No; if you are confident that spring planting was or will be soon enough for the stock to flush at the beginning of the same year's growing season, enter Yes; default value is No if missing.

***Weed*:** Weeding? Logical; Yes or No; if the stand was or will be weeded to control hardwoods, shrub and herbaceous vegetation, enter Yes; default value is No if missing.

Risk: Climatic risk; numeric; 1 – high; 2 – low. No default value set.

***ES*:** Establishment surveyed? Logical; Yes or No; if you have establishment survey data for the stand collected 5 to 8 years after cut, enter Yes, and complete the remaining data entries listed to the right; default is No if missing.

***ESYear*:** Establishment survey year; numeric; 2000-2025; refers to the timber year during which the establishment survey was undertaken; must be filled out if ES=Yes.

***ESUh*:** Under-height pine included? Logical; Yes or No; indicate whether seedlings under 30cm in height were included in the assessment of pine stocking; default value is No if missing.

***ESPctPl*:** Percent stocking values for pine obtained from the establishment survey; numeric; 0 to 100; default value is 0 if missing.

***ESPctHw*:** Percent stocking values for hardwoods obtained from the establishment survey; numeric; 0 to 100; default value is 0 if missing.

3.1.2 Input Data Validation

The batch process input data can be validated for errors and warnings by clicking the **[Validate]** button in the upper right corner of the data range.

Errors include any data issues that would result in an invalid run that cannot be processed by the base model. Errors are identified by a light red cell color and an embedded cell comment that explains the nature of the error (see Figure 10).

Any data entry that is outside the allowable values for the data column will result in an error. For example, 4800 stems/ha for *PSph* (allowable range: 0-4500) or 120 for *PSPctPl* (allowable range: 0-100) would both be invalid values for their respective data columns.

The validation will also identify logical errors in the data. Examples are:

- *ES=No* and the user provides establishment survey related data (*ESYear*, *ESUh*, *ESPctPl* and *ESPctHw*);

- *PSph=0* (left for natural regeneration) and the user provides *PYear* and *PSeason*.

Warnings are data problems that will not result in an invalid run but may not have been intended by the user, or may reflect limitations of the input data. Situations generating warnings include all missing/blank entries for *Yes/No* values, where a default value of *No* is used for missing entries. Warnings are identified by a light blue cell color and an embedded cell comment that explains the nature of the data issue (see Figure 10).

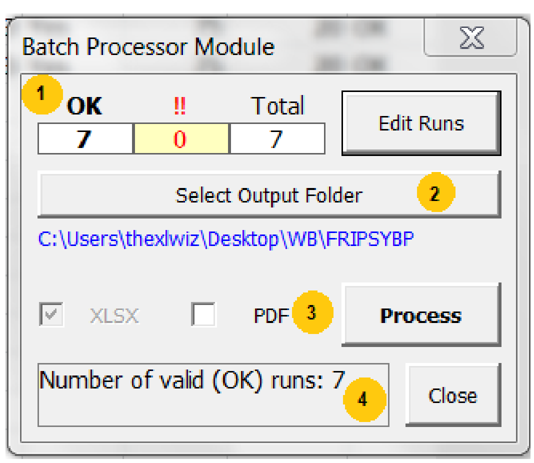
For each stand, the validation records the status of the run by placing OK for stands with valid input or !! for stands with invalid input into the Status (column Q).

Figure 10. Examples of batch input data errors and warnings

3.2 Processing

Once the input data are entered and validated, the batch process can be run by clicking the **[Batch]** button in the upper right corner of the data range. On clicking the button you will be presented with the batch module interface that has 4 main sections as indicated by the numbered orange circles in Figure 11. Clicking the **[Batch]** button will always trigger a re-validation of the batch input. This ensures that the input data are checked for errors even if you forget to validate.

Figure 11. Batch processing interface



Section 1 provides information about the number of valid (OK) and invalid (!!) runs and presents you with an opportunity to correct inputs before processing by clicking the **[Edit Runs]** button.

Section 2 enables you to select a folder for the batch output. The default folder location is the folder from where the main FRIPSY program (XLSM file) is launched.

Section 3 provides output options for the batch processing. The program will always attempt to create a Microsoft Excel output file. The default file name will be "FRIPSY_OUTPUT.xlsx"; but you can change this at the end of the batch process. If the Excel output file already exists with the same name in the selected folder location, you will be presented with the options of overwriting the existing file, selecting a new name for the file, or canceling the output file creation altogether. In addition, you may opt to create PDF files by clicking the PDF check box. The program will create a separate PDF file for every valid (*OK*) run and the files will be named based on the *StandID* column. The PDF files will be saved in the selected output folder. The batch runs can be completed by clicking on the **[Process]** button.

Warning: The program will overwrite any previously created PDF files with the same name in the selected folder during the batch processing if the PDF option is checked.

Section 4 shows messages for the batch process. For example, selecting the PDF output option may take a while for over 30 runs, and this will be communicated via the message window.

Once the runs are completed, the batch processing window can be closed by clicking the **[Close]** button.

3.3 Output

The output is organized into 5 main sections:

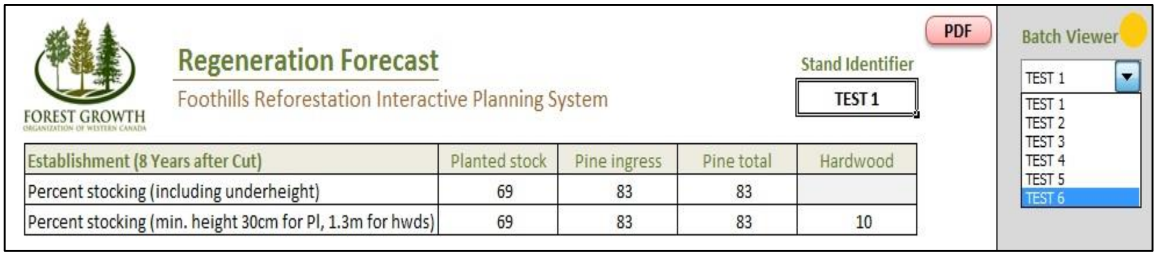
1. ***Input Data***: identical to the information provided by the user in the batch input (the *Batch_Setup* worksheet).
2. ***Input Validation***: provides up to the same 5 error messages and warnings generated by input validation during single stand processing (see Section 5.1.6). The batch run status is also output for every run.
3. ***Percent Stocking at Establishment (8 years after cut)***: contains information on percent stocking of planted stock and ingress for pine and hardwood at establishment age. The same information is calculated during single stand processing in the FRIPSY base model as shown at the top portion of the *Report* worksheet.
4. ***Lodgepole Pine Performance Forecast***: includes the projections of pine planted stock and ingress to the specified performance survey age. The same information is calculated during single stand processing in the FRIPSY base model as shown in the middle portion of the *Report* worksheet.
5. ***Hardwood Performance Forecast***: includes the projections of aspen to the specified performance survey age. The same information is calculated during single stand processing in the FRIPSY base model as shown in the right column of the middle portion of the *Report* worksheet.

Descriptive titles (field descriptions) of the output data columns are shown in row 2 of the output window. Row 3 contains short field names that can be used by the user to read the data into other database programs for further processing. Titles and field names of variables that may be used as input to GYPSY are highlighted in yellow. A data dictionary for the batch output can be found in Appendix 1.

3.4 Batch Viewer

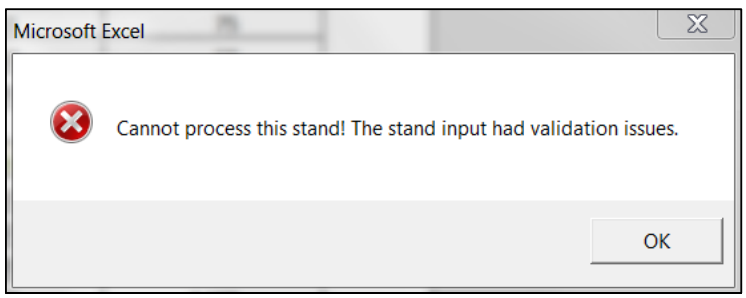
A convenient feature of the batch processing module is the one-stand batch viewer located on the upper right side of the *Report* worksheet (see Figure 12). The batch viewer is a dropdown list that contains a list of stands input in the *Batch_Setup* worksheet. (The list will be empty if no batch runs are set up.) Upon selection of a stand from the dropdown list, the input for that stand will be processed and the results are instantly shown in the *Report* worksheet.

Figure 12. One-stand batch viewer



Validation of the selected stand will be run 'on-the-fly'. A message box will pop-up in case of erroneous batch input (see Figure 13), and the stand will not be processed.

Figure 13. Batch viewer error message



You can generate a PDF file by clicking on the red **[PDF]** button at the top right-hand corner of the *Report* worksheet (see Figure 12). The default file name will be based on the selected *StandID*; however this can be changed by the user. If the PDF file already exists with the same name in the selected folder location, you will be presented with the option of overwriting the existing file, selecting a new name for the file, or canceling the PDF file creation altogether.

4 Growth and Yield Projection

4.1 Registering the GYPSY DLL

The GYPSY model functions are available in the GYPSY 2009 dynamic link library (DLL). The GYPSY DLL has been used in several tools, such as the Excel GYPSY Yield Table Generator, the Reforestation Standard of Alberta (RSA) Compiler and the Performance Age Silviculture Scenario (PASS) Tool. The integration of GYPSY with the FRIPSY Excel application is also based on the GYPSY DLL which means that the GYPSY DLL must be registered on the user's system in order to have access to the GYPSY outputs and reports within FRIPSY. Users of FRIPSY will probably already have the DLL registered on their system, if they use any of the above-mentioned tools.[11]

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.

The following steps should be followed for the GYPSY DLL registration on **Windows 7** systems:

1. Click the Windows *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. Note that you may be asked by the system to allow this. Click *Yes* if the prompt appears.
5. Enter *regsvr32 "path\to\your\dll\folder\GYPSY_2009.dll"* at the prompt.

   For example, if you placed the GYPSY DLL into C:\Windows\SysWOW64\ then *regsvr32 "C:\Windows\SysWOW64\GYPSY_2009.dll"* will need to be entered. Make sure that you also use the double quotation marks as shown.

The following steps should be followed for the GYPSY DLL registration on **Windows 8 and 10** systems:

1. Start typing the word *Command* in the search bar on the lower left of your screen.
2. The black *Command Prompt* icon will show in the resulting search list.
3. Right-click on the *Command Prompt* icon.
4. Select *Run as administrator* from the menu. Note that you may be asked by the system to allow this. Click *Yes* if the prompt appears.
5. Enter *regsvr32 "path\to\your\dll\folder\GYPSY_2009.dll"* at the prompt.

For example, if you placed the GYPSY DLL into C:\Windows\SysWOW64\ then *regsvr32 "C:\Windows\SysWOW64\GYPSY_2009.dll"* will need to be entered. Make sure that you also use the double quotation marks as shown.

If the registration process is completed, you will see a window pop up similar to that shown in Figure 14. Upon opening FRIPSY, Excel checks if the GYPSY DLL is successfully registered on the User's system. If the DLL is not registered or is not compatible with your version of Excel, you will be informed that the DLL is not registered and GYPSY outputs will not be available (see Figure 15).

[11] If not, the DLL may be downloaded from the Alberta government by pasting the following link in your browser: http://www.agric.gov.ab.ca/app21/forestrypage?cat1=Forest%20Management&cat2=Growth%20%26%20Yield&cat3=Growth%20%26%20Yield%20Projection%20System

You may encounter the following problems in registering or running the DLL:

1. The registration may be unsuccessful due to missing components on newer Windows systems. Some trouble-shooting tips that may help the DLL registration are included in Appendix 2.
2. Your registration may appear to have completed successfully, but GYPSY outputs are still not generated. The most likely explanation for this is that you are using a 64-bit version of Excel, in which case when you open FRIPSY you will see a warning stating that your Excel version is 64-bit and GYPSY output will not be available. Currently the only solution to this problem is to install the 32-bit version of Excel, which is available for all versions of Microsoft Office.

Figure 14. Successful registration of the GYPSY DLL

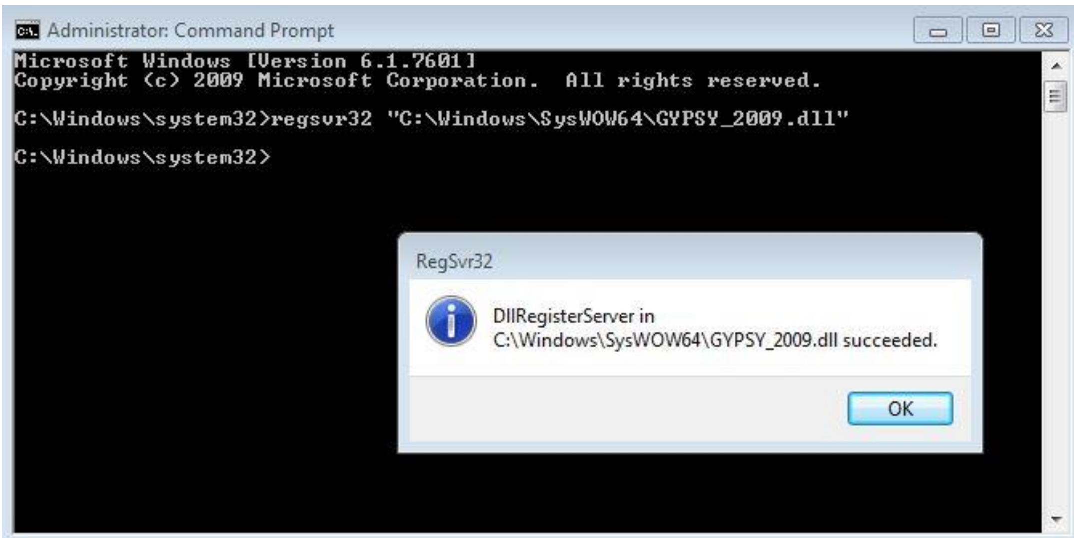
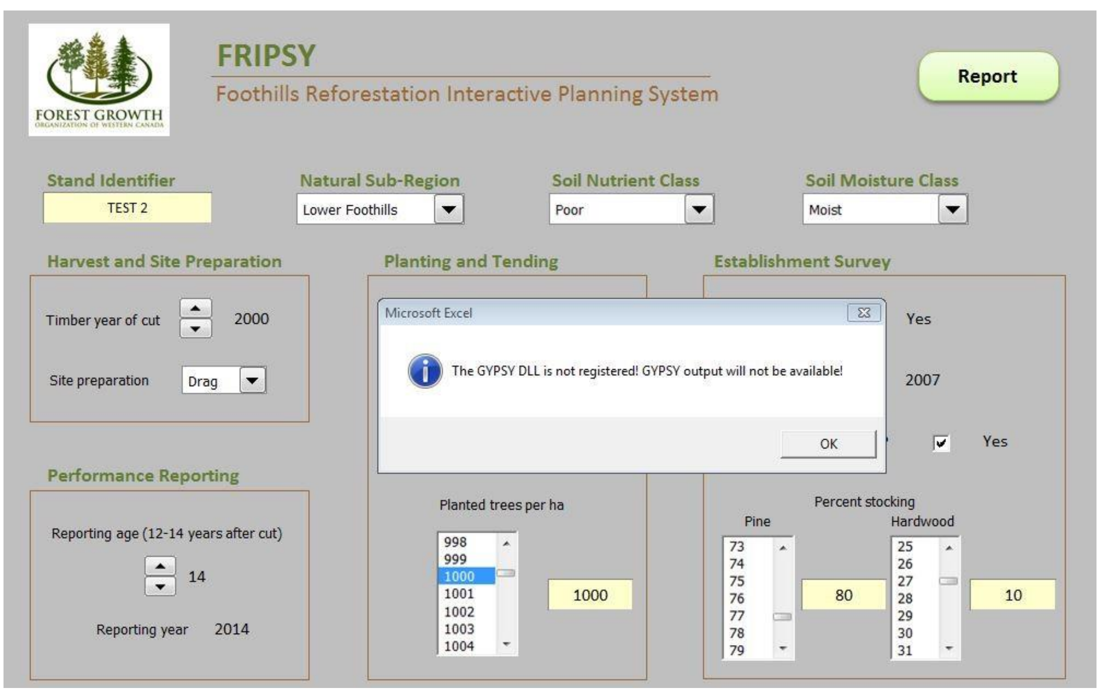


Figure 15. Warning when FRIPSY is opened without the registered GYPSY DLL



Note that if the DLL is not successfully registered on the system, the GYPSY outputs and reports will be unavailable. However, FRIPSY will otherwise operate correctly and you will still have access to all FRIPSY regeneration performance output. Only the GYPSY outputs will be omitted.

4.2 Single-stand Processing of Growth and Yield Projections

Setting up and running a single stand is undertaken using the FRIPSY *Input* worksheet by clicking the [**Report]** button, or by clicking on the *Report* worksheet tab. The report identifies the GYPSY input variables in yellow highlights as shown in Figure 6.

The GYPSY output is organized in three worksheets similarly to the Excel GYPSY Yield Table Generator Tool. (The worksheets will be blank if you do not have the registered DLL.)

1. ***GYPSY_Observed* worksheet**: includes the GYPSY stand attributes at the time of the stand performance age as generated by the FRIPSY report. Additional stand attributes such as site index, Percent Stocking Index (PSI) and breast height (BH) age for pine and aspen are also generated. A full list of the variables is provided in Table 8 of Appendix 1.
2. ***GYPSY_Projected* worksheet**: includes GYPSY model projections from the stand performance age to 250 years in 1-year increments. A full list of the variables is provided in Table 9 of Appendix 1.
3. ***GYPSY_Report* worksheet**: provides all relevant GYPSY model outputs in a concise 4-page summary report which shows observed and projected stand attributes in graphical and tabular format, including a yield table.

All GYPSY compilations are based on the RSA Utilization Standard of 15 cm minimum stump diameter outside bark, 10 cm top diameter inside bark and 30 cm stump height, and projections are based on a 3.66m minimum merchantable length.

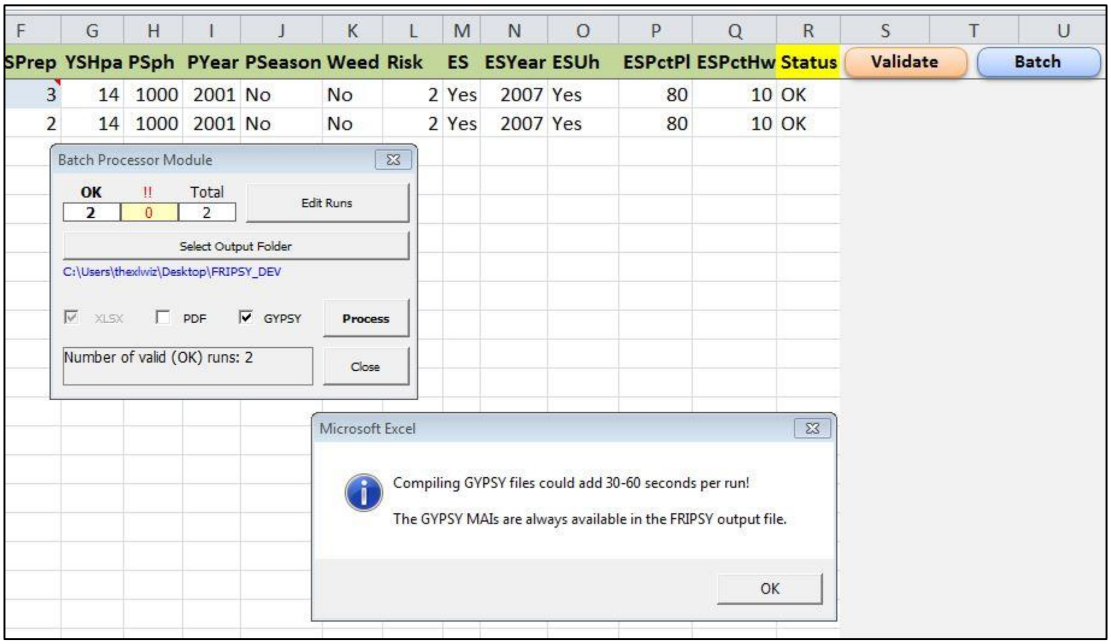
GYPSY inputs are validated before projections are made. Since FRIPSY is also a model and therefore its outputs (used as GYPSY inputs) are constrained, there are generally no validation issues or missing values that would cancel GYPSY outputs and reporting. However, there is one rare instance that may occur where the aspen stand age is lower than 7.5 years. GYPSY requires 7.5 years as a minimum for the aspen component to be projected accurately. In the rare instance that the aspen total age is below 7.5 years, it is internally rounded to 7.5 years for the GYPSY projections, the aspen age in FRIPSY is not changed, and the GYPSY report will include a message to this effect.

4.3 Batch Processing of Growth and Yield Projections

The batch processor can be initiated by clicking the **[Batch]** button on the *Batch_Setup* worksheet. There is a new GYPSY checkbox in the *Batch Processor Module* window which is initialized as un-checked (i.e. no GYPSY output is generated). The User may opt to generate GYPSY output by checking the box. A warning message is displayed indicating that generating all GYPSY outputs will add 30-60 seconds to each run (see Figure 17).

The GYPSY output includes one Excel file per stand with the naming convention of [Standid]*_gypsy.xlsx*. Each Excel file contains the *GYPSY_Observed*, *GYPSY_Projected* and *GYPSY_Report* worksheets for the batch run. If the User does not have the registered DLL, the GYPSY checkbox is unchecked and disabled (greyed out) and no GYPSY output Excel files can be generated.

Figure 16. The new GYPSY output checkbox in the FRIPSY batch processor module



The GYPSY MAI information is included in the FRIPSY output Excel file, even if the User does not generate the full GYPSY output Excel files. The following information is always included:

- **GYPSY_MAI_Pl**: pine culmination MAI (m^3/ha/year)
- **GYPSY_CulmAge_Pl**: pine culmination age (years)
- **GYPSY_SecMAI_Hw**: hardwood MAI at the pine culmination age (m^3/ha/year)

The GYPSY output is located on the right side of the FRIPSY output table as shown in Figure 36.

Figure 17. MAI projections included in the FRIPSY output file

	HARDWOOD PERFORMANCE FORECAST				GYPSY OUTPUT		
RSA t.ht. total (cm)	Age total (years)	% stocked total (1.3m+)	Trees/ha total (1.3m+)	RSA t.ht. total (cm)	Pine MAI (m3/ha/yr)	Pine Culm. Age (years)	Hardwood Sec. MAI (m3/ha/yr)
PS_TopHtRSA_T	PS_Tage_Hw	PS_PctBh_Hw	PS_TphBh_Hw	PS_TopHtRSA_Hw	GYPSY_MAI_Pl	GYPSY_CulmAge_Pl	GYPSY_SecMAI_Hw
422	10.0	10	315	287	3.393	86	0.123
418	9.3	10	431	368	3.217	99	0.228

Appendix 1. Data Dictionaries

Table 3. Batch input data

Field Name	Field Description
StandID	Unique stand identifier
NSR	Natural sub-region
Nutrient	Soil nutrient class
Moisture	Soil moisture class
HYear	Timber year of cut
MSPrep	Mechanical site preparation method
YSHpa	Years since harvest at performance assessment
PSph	Planted trees per ha
PYear	Planting year
PSeason	Plant early?
Weed	Weed?
ES	Establishment survey?
Risk	Climatic risk
ESYear	Establishment survey year
ESUh	Under-height pine included?
ESPctPl	% stocked at establishment survey pine
ESPctHw	% stocked at establishment survey hardwood
Status	Input data status
PYearWarning	Planting year warning
GSSP	# of growing seasons to performance assessment
ESInterval	Years to establishment survey
UhInclude	Under-height warning
SPrepWarning	Site preparation warning

Table 4. Percent stocking at establishment

Field Name	Field Description
ES_PctPl_P	% stocking pine planted (including under-height)
ES_PctPl_N	% stocking pine ingress (including under-height)
ES_PctPl_T	% stocking pine total (including under-height)
ES_PctPlSh_P	% stocking pine planted (30cm+)
ES_PctPlSh_N	% stocking pine ingress (30cm+)
ES_PctPlSh_T	% stocking pine total (30cm+)
ES_PctHw_N	% stocking hardwood (1.3m+)

Table 5. Lodgepole pine regeneration performance forecast

Field Name	Field Description
PS_Year	Timber year
PS_Tage_P	Age planted (years)
PS_Tage_N	Age ingress (years)
PS_Tage_T	Age total (years)
PS_PctPl_P	% stocked planted (including under-height)
PS_PctPl_N	% stocked ingress (including under-height)
PS_PctPl_T	% stocked total (including under-height)
PS_PctPlSh_P	% stocked planted (30cm+)
PS_PctPlSh_N	% stocked ingress (30cm+)
PS_PctPlSh_T	% stocked total (30cm+)
PS_Tph_P	Trees/ha planted (including under-height)
PS_Tph_N	Trees/ha ingress (including under-height)
PS_Tph_Nmod	Modal trees/ha ingress (including under-height)
PS_Tph_T	Trees/ha total (including under-height)
PS_TphSh_P	Trees/ha planted (30cm+)
PS_TphSh_N	Trees/ha ingress (30cm+)
PS_TphSh_T	Trees/ha total (30cm+)
PS_TphBh_P	Trees/ha planted (1.3m+)
PS_TphBh_N	Trees/ha ingress (1.3m+)
PS_TphBh_T	Trees/ha total (1.3m+)
PS_AvDgl_P	Average ground level diameter planted (cm)
PS_AvDgl_N	Average ground level diameter ingress (cm)
PS_AvDgl_T	Average ground level diameter total (cm)
PS_AvDbh_P	Average DBH planted (cm)
PS_AvDbh_N	Average DBH ingress (cm)
PS_AvDbh_T	Average DBH total (cm)
PS_BAgl_P	Ground level basal area planted (m^2/ha)
PS_BAgl_N	Ground level basal area ingress (m^2/ha)
PS_BAgl_T	Ground level basal area total (m^2/ha)
PS_BAbh_P	Basal area planted (m^2/ha)
PS_BAbh_N	Basal area ingress (m^2/ha)
PS_BAbh_T	Basal area total (m^2/ha)
PS_AvHt_P	Average height planted (cm all)
PS_AvHt_N	Average height ingress (cm all)
PS_AvHt_T	Average height total (cm all)
PS_AvHtSh_P	Average height planted (30cm+)
PS_AvHtSh_N	Average height ingress (30cm+)
PS_AvHtSh_T	Average height total (30cm+)
PS_AvHtBh_P	Average height planted (1.3m+)
PS_AvHtBh_N	Average height ingress (1.3m+)

Field Name	Field Description
PS_AvHtBh_T	Average height total (1.3m+)
PS_TopHt_P	Top height planted (cm)
PS_TopHt_N	Top height ingress (cm)
PS_TopHt_T	Top height total (cm)
PS_TopHtRSA_P	RSA top height planted (cm)
PS_TopHtRSA_N	RSA top height ingress (cm)
PS_TopHtRSA_T	RSA top height total (cm)

Table 6. Hardwood regeneration performance forecast

Field Name	Field Description
PS_Tage_Hw	Age total (years) - hardwood
PS_PctBh_Hw	% stocked total (1.3m+) - hardwood
PS_TphBh_Hw	Trees/ha total (1.3m+) - hardwood
PS_TopHtRSA_Hw	RSA top height total (cm) - hardwood

Table 8. GYPSY_Observed Worksheet

Variable	Description
gypsy_model_id	GYPSY model identifier
stand_id	Stand description
standtype	Stand type (natural/regen)
standage	Stand age
spatial	Spatial flag
ba_known	Basal area adjustment flag
sdob_aw	Stump DOB in cm - AW
tdib_aw	Top DIB in cm - AW
stht_aw	Stump height in m - AW
sdob_sb	Stump DOB in cm - SB
tdib_sb	Top DIB in cm - SB
stht_sb	Stump height in m - SB
sdob_sw	Stump DOB in cm - SW
tdib_sw	Top DIB in cm - SW
stht_sw	Stump height in m - SW
sdob_pl	Stump DOB in cm - PL
tdib_pl	Top DIB in cm - PL
stht_pl	Stump height in m - PL
tage_aw	Total age - AW
bage_aw	BH age - AW
topht_aw	Top height in m - AW
den13_aw	Density >= 1.3 m - AW
ps_aw	Percent stocking - AW
ba_aw	Basal area - AW
tage_sb	Total age - SB
bage_sb	BH age - SB
topht_sb	Top height in m - SB
den03_sb	Density >= 0.3 m - SB
ps_sb	Percent stocking - SB
ba_sb	Basal area - SB
tage_sw	Total age - SW
bage_sw	BH age - SW
topht_sw	Top height in m - SW

Variable	Description
den03_sw	Density >= 0.3 m - SW
ps_sw	Percent stocking - SW
ba_sw	Basal area - SW
tage_pl	Total age - PL
bage_pl	BH age - PL
topht_pl	Top height in m - PL
den03_pl	Density >= 0.3 m - PL
ps_pl	Percent stocking - PL
ba_pl	Basal area - PL
SI_bh_aw	Site index BH - AW
SI_t_aw	Site index Total Age - AW
y2bh_aw	Years to BH - AW
SDF_aw	Stand density factor - AW
N0_aw	Initial density - AW
PSI_aw	Percent stocking index - AW
SI_bh_sb	Site index BH - SB
SI_t_sb	Site index Total Age - SB
y2bh_sb	Years to BH - SB
SDF_sb	Stand density factor - SB
N0_sb	Initial density - SB
PSI_sb	Percent stocking index - SB
SI_bh_sw	Site index BH - SW
SI_t_sw	Site index Total Age - SW
y2bh_sw	Years to BH - SW
SDF_sw	Stand density factor - SW
N0_sw	Initial density - SW
PSI_sw	Percent stocking index - SW
SI_bh_pl	Site index BH - PL
SI_t_pl	Site index Total Age - PL
y2bh_pl	Years to BH - PL
SDF_pl	Stand density factor - PL
N0_pl	Initial density - PL
PSI_pl	Percent stocking index - PL

Table 9. GYPSY_Projected worksheet

Variable	Description
gypsy_model_id	GYPSY model identifier
stand_id	Stand description
standage_p	Projected stand age
tage_aw	Total age - AW
bage_aw	BH age - AW
ba_aw	Basal area - AW
ps_aw	Percent stocking - AW
den13_aw	Density > 1.3 m - AW
mden13_aw	Merchantable density - AW
sc_aw	Species composition - AW
topht_aw	Top height - AW
qmd_aw	Quadratic mean DBH - AW
tage_sb	Total age - SB
bage_sb	BH age - SB
ba_sb	Basal area - SB
ps_sb	Percent stocking - SB
den03_sb	Density > 0.3 m - SB
mden03_sb	Merchantable density - SB
sc_sb	Species composition - SB
topht_sb	Top height - SB
qmd_sb	Quadratic mean DBH - SB
tage_sw	Total age - SW
bage_sw	BH age - SW
ba_sw	Basal area - SW
ps_sw	Percent stocking - SW
den03_sw	Density > 0.3 m - SW
mden03_sw	Merchantable density - SW
sc_sw	Species composition - SW
topht_sw	Top height - SW
qmd_sw	Quadratic mean DBH - SW

Variable	Description
tage_pl	Total age - PL
bage_pl	BH age - PL
ba_pl	Basal area - PL
ps_pl	Percent stocking - PL
den03_pl	Density > 0.3 m - PL
mden03_pl	Merchantable density - PL
sc_pl	Species composition - PL
topht_pl	Top height - PL
qmd_pl	Quadratic mean DBH - PL
tv_aw	Total volume - AW
mv_aw	Merchantable volume - AW
mai_aw	MAI - AW – species tage based
tv_sb	Total volume - SB
mv_sb	Merchantable volume - SB
mai_sb	MAI - SB – species tage based
tv_sw	Total volume - SW
mv_sw	Merchantable volume - SW
mai_sw	MAI - SW – species tage based
tv_pl	Total volume - PL
mv_pl	Merchantable volume - PL
mai_pl	MAI - PL – species tage based
tv_con	Total volume - Conifer
mv_con	Merchantable volume - Conifer
mai_con	MAI - Conifer - stand age based
tv_dec	Total volume - Deciduous
mv_dec	Merchantable volume - Deciduous
mai_dec	MAI - Deciduous - stand age based
tv_tot	Total volume - Total
mv_tot	Merchantable volume - Total
mai_tot	MAI - Total - stand age based

APPENDIX 2. GYPSY DLL Registration Trouble Shooting Tips

Overview

Some users experience issues with registering the GYPSY 2009 DLL on the recently released Windows 64-bit operating systems (Windows 8, 8.1, 10). This short memo provides GYPSY DLL Users with some trouble shooting tips that may help resolving these registration issues with the GYPSY DLL.

Background

The GYPSY 2009 DLL is a Microsoft COM type DLL which means that it needs to be registered on the user's system. The DLL installation instructions can be found in the document "GYPSY_2009_DLL_Manual.pdf" included in the GYPSY DLL software package.

At the time of the development of the GYPSY DLL it was compiled and tested on Windows XP and the latest version of Windows Vista. With the release of Windows 64-bit systems, some users may experience an error message at the time of the GYPSY DLL registration (Figure 1):

“The module “C:\path_to_your_DLL\GYPSY_2009.dll” failed to load. Make sure the binary is stored at the specified path or debug it to check for problems with the binary or dependent .DLL files. The specified module could not be found.”

What is the Issue?

The GYPSY 2009 DLL was compiled on 32-bit Windows systems and it is relying on a number of standard 32-bit Windows components to run properly. The Windows 64-bit operating systems have these 32-bit components embedded, however some of the component files are not used by the 64-bit Windows and thus are "tucked away" in some folders that are not automatically searched by the system.

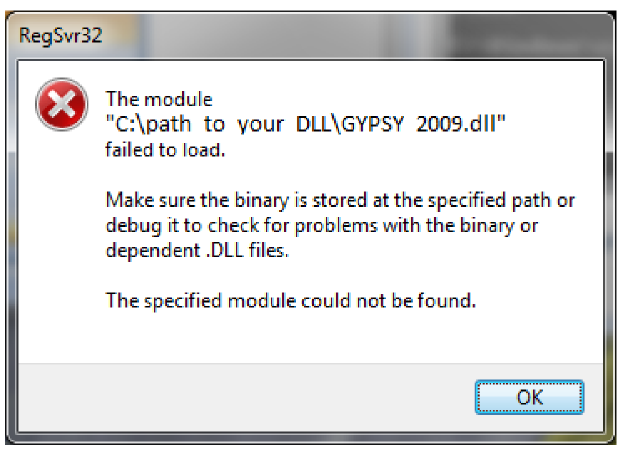


Figure 1. DLL Registration Error

The challenge is to 1) find out which 32-bit component file is "missing", 2) find the file on your Windows system and 3) copy the file into a folder that is automatically searched by Windows 7 (e.g., C:\Windows\SysWOW64).

95% of users who experience registration issues, it is generally one file (MSVCR71.DLL) that will need to be copied into the system folder.

Steps to Resolve the GYPSY DLL Registration Error

STEP 1. The very first step is to double-check the ***regsvr32*** statement that was typed into the run command. Specifically, checking that the path to the location of the GYPSY 2009 DLL is referenced correctly.

Windows 64-bit system users must follow the DLL installation instructions given for Windows Vista and run the Command Prompt as administrators.

If everything is confirmed to be typed correctly and the error still occurs, proceed to step 2.

STEP 2. Check for the potentially missing **MSVCR71.DLL** 32-bit component file.

Ninety-five percent of users who experience the GYPSY DLL registration error will be missing the MSVCR71.DLL. It is very likely on their system, in most cases with multiple copies. The files however are located in folders that are not normally searched by Windows during DLL registration[12].

In order to find the missing MSVCR71.DLL[13] we need to search the computer's hard drive:

1. Open Windows Explorer;
2. Select the C drive in the left (folder panel); and
3. Type "msvcr71.dll" in the search box (upper right corner).

Figure 2 shows the search results in our example.

[12] Windows only searches for files in folders that are included in the default system paths.
[13] Please note that the missing component can be any file. The example msvcr71.dll is only one example that 95% of people with this DLL registration issue encounter.

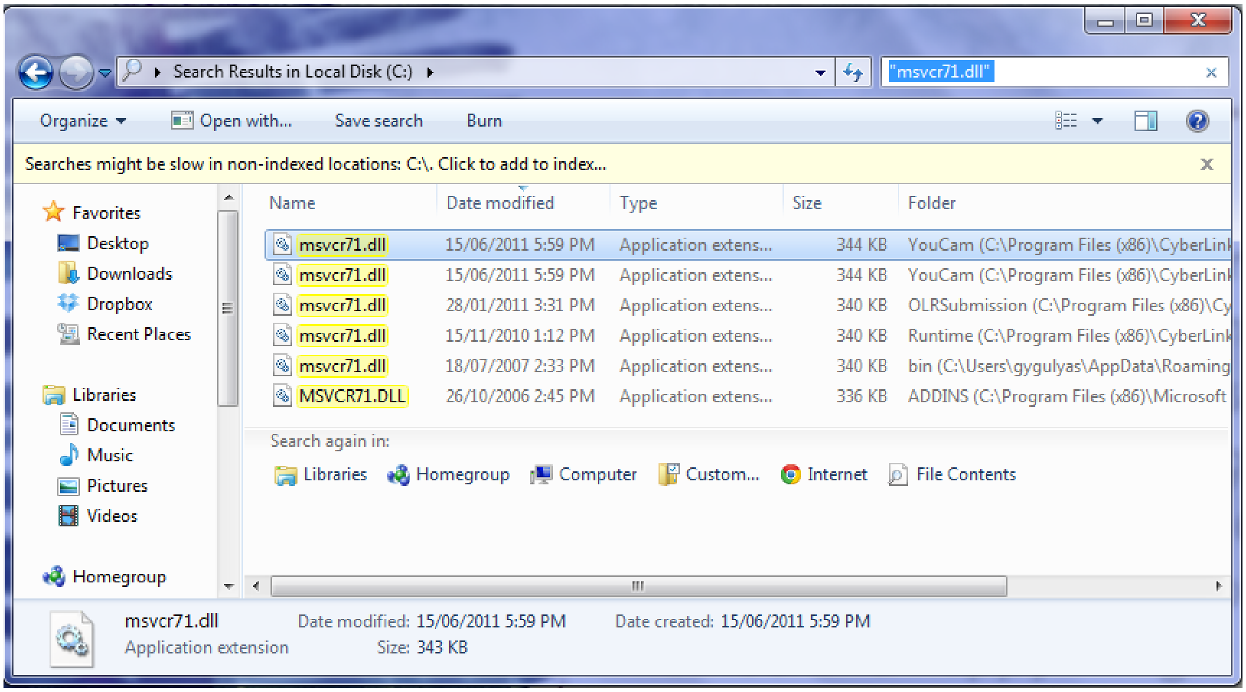


Figure 2. Searching for Missing Files in Windows Explorer

Generally there are several copies of the missing file can be found that are used by various applications installed on the user's system. Sort the list by clicking on the list header "Date modified" and pick the most recent version of the file.

Copy the selected file into the C:\Windows\SysWOW64 folder. The user must have administrative rights on their computer to carry out this task.

VERY IMPORTANT: In the rare case that the "missing" file already exists in C:\Windows\SysWOW64, **DO NOT REPLACE/OVER-WRITE** the existing file in C:\Windows\SysWOW64 with the one you copied! Contact the developer for further debugging and advice.

If the "missing" MSVCR71.DLL file cannot be found on your system, please also contact developer for further advice.

After recovering the missing DLL component and copying it into C:\Windows\SysWOW64, the user should be able to register the GYPSY 2009 DLL as per the original instructions (Figure 3).

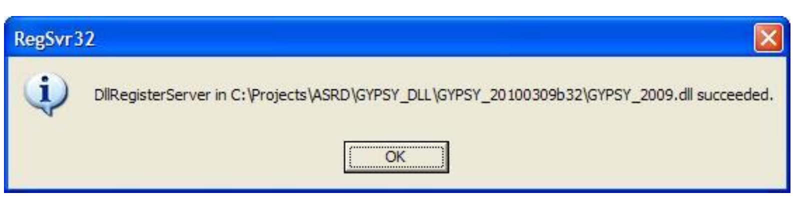


Figure 3. Successful Registration of the GYPSY 2009 DLL