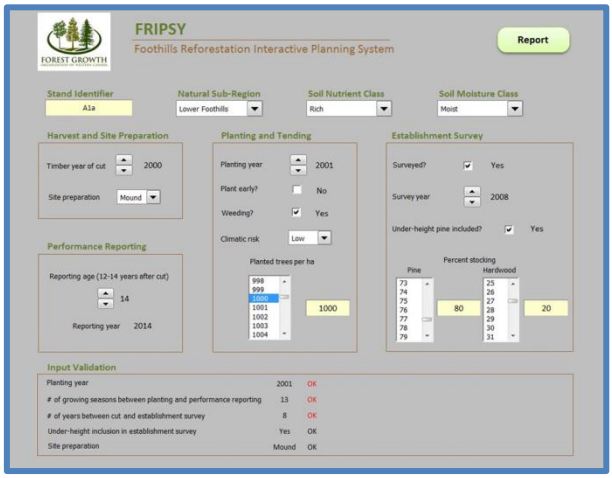
QuickNotes
the information note of fRI Research

fRI Research
Informing Land & Resource Management

FGrOW Foothills Pine Project Team Quicknote #1

July 2017: FRIPSY Project Update

Background



In 2009 the Alberta Growth and Yield Projection System (GYPSY)[1] was released and approved for linking regeneration performance to mean annual increment of timber. The FRIPSY (Foothills Reforestation Interactive Planning System) project was developed to provide an additional link between reforestation management prescriptions (site preparation, planting density and tending) and regeneration performance. It models the on-the-ground measurements of the Forest Growth Organization of Western Canada (FGrOW) Regenerated Lodgepole Pine (RLP) trial so that they can be used by forest planners and silvicultural practitioners. It is a decision-support tool that can predict regeneration of pine stands after harvest in the Alberta foothills natural sub-regions as well as integrate with other growth models from Alberta. At its core it is a regeneration model that forecasts performance as defined by the Reforestation Standard of Alberta[2] (RSA) at 12 to 14 years following cut, including responses to site preparation, planting and tending treatments.

Activities in 2016

The following progress was made between 1 April 2016 and 31 July 2017:

- The sub-model which predicts mortality of planted stock was revised to include climate risk;
- A climatic mortality risk map was produced and distributed to FGrOW members in printable and GIS formats;
- A long-term plan for the period October 2016 to September 2019 was presented, discussed, and approved at the FGrOW business meeting held 29 September 2016;
- Overall performance of the regeneration model was tested for error, goodness-of-fit and bias;[3]
- Three interim updates of the model were released to FGROW members with full documentation, the latest on 20 July 2017;[3]
- Work was completed under contract for the integration of FRIPSY with the Alberta Growth and Yield Projection System (see Application below).

[1] Huang, S., Meng, S., & Yang, Y. (2009). A growth and yield projection system (GYPSY) for natural and post-harvest stands in Alberta. Alberta Sustainable Resource Development Technical Report Pub. No. T/216.
[2] Reforestation Standard of Alberta. 2017. Alberta Agriculture and Forestry. Edmonton.
[3] FRIPSY: Foothills Reforestation Interactive Planning System - Technical Description and User's Guide, for Version FRIPSY_BP_2017, July 2017 (includes an appendix describing internal validation and testing).

For more information on this or other FGrOW Publications, please contact: Sharon Meredith, Tel.: (780) 865-45458, Email: sharon@sugarloafconsulting.ca, or visit https://fgrow.friresearch.ca/

Results of Development and Testing

Testing of the model led to the following conclusions:

- Stand density (live trees per ha) and percent stocking of planted lodgepole pine at the end of the regeneration phase can be predicted at the stand level (i.e. within individual openings created by clearcutting) from natural sub-region, soil moisture class, climatic risk, and treatment prescription or history (site preparation, time of planting, planting density, and weeding).
- Density and stocking of naturally regenerated lodgepole pine and aspen are more variable and require addition of pine and hardwood stocking indices for reliable prediction at the stand level. These indices can be estimated at the stratum level (i.e. for pine or pine-hardwood regenerated yield strata) from natural sub-region, soil moisture class, and treatments. For prediction at the stand level stocking information derived from establishment surveys conducted 5 to 8 years after harvest is required.
- Tree diameter and height distributions, and hence basal area and top height, can be forecast at the stratum level for planted and naturally regenerated pine from natural sub-region, soil moisture and nutrient classes, climatic risk, and silvicultural treatment.
- Consistently accurate forecasting of average diameter and height growth at the individual stand level would be possible only if both early height and density data were available from establishment surveys. As stratum-level estimates of these variables suffice for most planning purposes, it is unnecessary that such data be collected in routine operational establishment surveys.
- Climatic mortality risk can be estimated as a function of potential evapotranspiration (drying) rates and average spring temperatures (These variables were used to generate the climatic risk map mentioned previously).

Application

FRIPSY is programmed as an Excel spreadsheet application with embedded macros ("XLSM" format) and Virtual Basic (VBA) code. It can be used in batch mode or interactively in single stand mode. Forecasts are generated by the user inputting site and treatment information.

Past versions of FRIPSY forecast the stand variables required as input by GYPSY, but prediction of yields at rotation age required that the user made separate runs with FRIPSY and GYPSY. The completed 2017 version integrates the two models. The integrated version allows managers to quantitatively forecast the impact of alternative reforestation treatments on timber yield at rotation. It can be used at the stratum level to support strategic planning decisions made prior to harvesting and treatment (e.g. silvicultural prescriptions). For plantations, or for natural regeneration where establishment or other early stocking survey data are available, it can also be applied at the stand level after initial establishment to forecast whether stands are "on-track" to meet the reforestation standard, or whether remedial management interventions are required.

Extension to Other Tree Species

A major but necessary enhancement to FRIPSY is the inclusion of non-pine species. The system currently does not provide forecasts for species other than lodgepole pine and aspen. Users and potential users have expressed a strong interest in being able to forecast performance of mixed-species stands, particularly mixtures of pine with not only aspen, but planted or naturally regenerated black and white spruce. This work is planned to be undertaken over the next three years, and will require acquisition and analysis of data from sources additional to the RLP trial, such the Alberta Provincial Growth and Yield Initiative and the FGrOW Empirical Post-harvest Project.