

FOR 3456 / 3457 – Forest Watershed & Forest Fire Management

Lab Session #3 (January 24th & 26th, 2018) – Watershed Management Tools & Methods

Using STELLA® – Understanding how to model hydrological flows, from the basic to the more complex. Modeling your lab results and relating what you find into a landscape based hydrology model.

Procedure – Exercise 1 – HYDRO TUBES MODEL:

1. Open Stella 7 using the data folder provided.
2. Open the 1st hydrology model (Hydro_Tubes.stm).
3. On the top of the screen, you have two red boxes – “Input Data Loose” and “Input Data Compact”. Input all the necessary information into the variable circles (Sand, Silt, Clay, OM, etc...) using your information from lab 1.

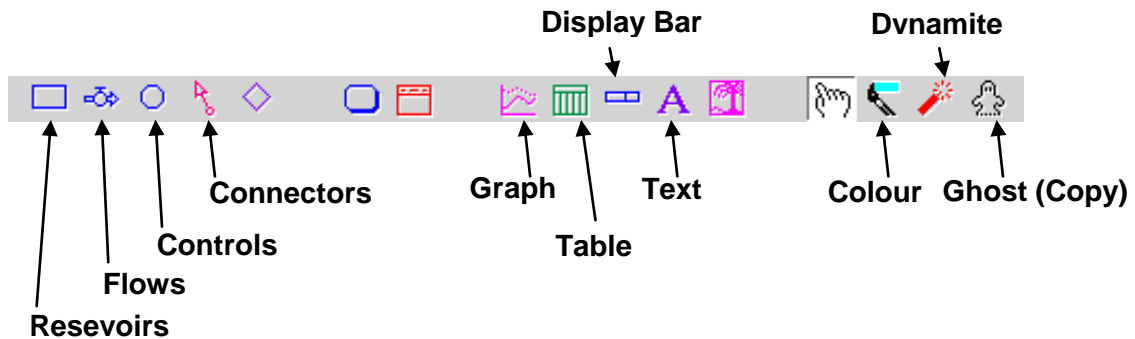


4. Double click on the black control variable “LogK” and enter the regression equation you derived through statistical analysis from last week’s report (lab 2). Use connectors to link up the input variables to the control variables (figure 1).
5. In each box there is a graphed-data circle (indicated by a circle with a squiggly line) “Loose Drain Data” and “Compact Drain Data”. Here you will enter the measured water heights (in mm, not cm – do the conversion!) over time (for each of your tubes), from the last exercise of the first lab. Simply open into the graphical window, specify the number of data points (+1), total time (on x-axis), and then enter the appropriate measurement value for each time-step.

****NOTE:** The main goal of this first modeling exercise, is to be able to predict a similar drainage curve over time for your soil sample, using the regression equations you derived from the class dataset, and then calibrate the model (using “PermK_Adj”) in order to match the curves as closely as possible. Once you have accomplished this for the loose and compact data, continue with the second exercise.

- **Keep track of all the information you generate, because it will be used to develop your second report.**

Figure 1 - Modeling feature bar within Stella



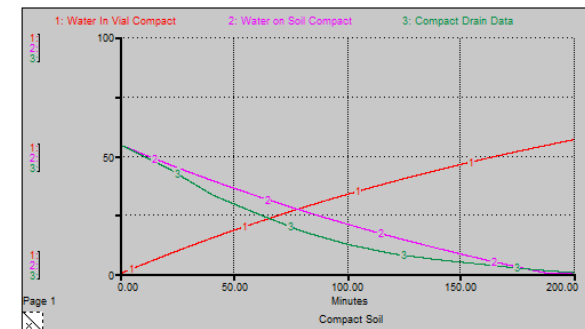
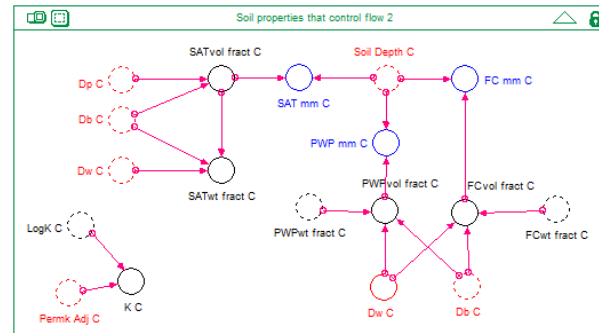
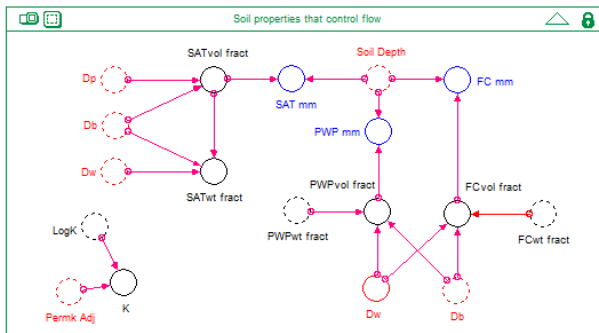
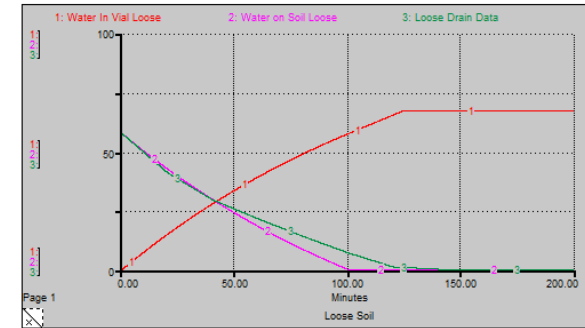
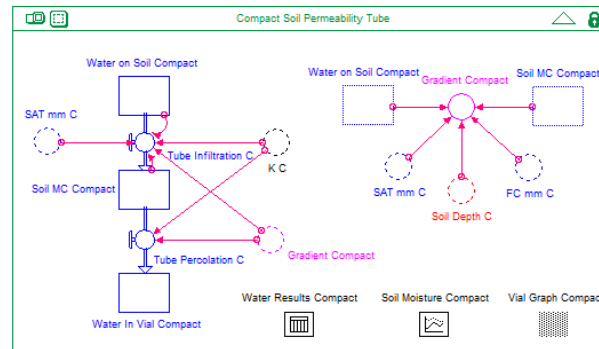
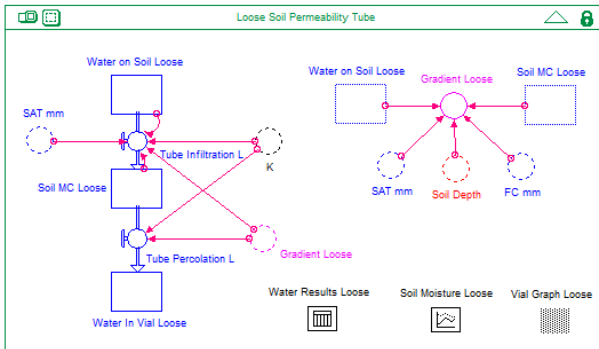
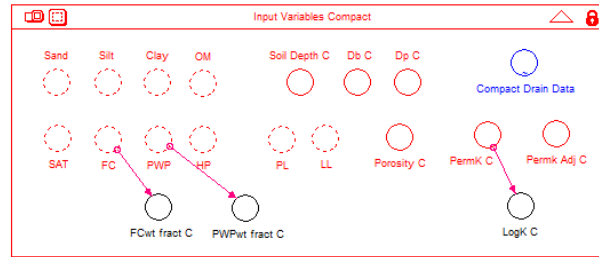
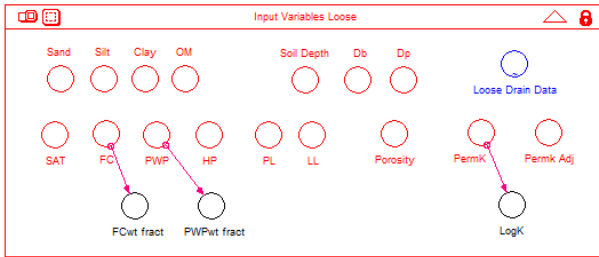
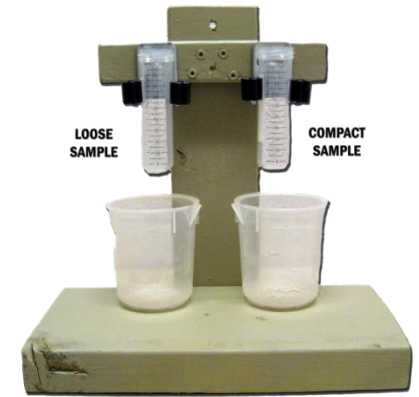
Once you have completed the first model (as best as possible), then you can move into the more complex model (Save/close the Hydro_Tube.stm and open Hydro_Watershed.stm). This second model uses your knowledge from the first, and incorporates actual weather data (precipitation and temperature) from Fredericton, from 2012 – 2016 (four years). There are many new variables including evapotranspiration functions, harvesting simulation / overstory removal, net-primary-production, cumulative level monitoring, and soil moisture warnings (trafficability and mass-flow).

Procedure – Exercise 2 – HYDRO WATERSHED / MACHINE MODEL:

1. Reestablish your connections and establish the same type of connections for plastic limit and liquid limit (PLwt fract / LLwt fract) in the second model, based on the controls Sand, Silt, Clay, and OM (found in the “Input Data Loose” box).

Now...the rest is basically up to you for the second report. You have to experiment with the second model, and create “scenarios”...whereby you can simulate different harvesting conditions, look at the effects of machinery use / impacts on soil compaction and rutting, which in turn directly affect the amount of soil moisture uptake / movement through the soil, and the degree of potential soil degradation by soil slumping and mass-flow movement.

HYDRO TUBES MODEL – PERMEAMETER TUBE SIMULATIONS



HYDRO TUBES MODEL – SIMULATED PERMEABILITY CALIBRATION

