Oregon State University STREAMWOOD Users Manual

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December 2004

Welcome to the OSU STREAMWOOD users manual. Mark A. Meleason, Stanley V. Gregory, and John Bolte developed the model OSU STREAMWOOD, which was designed to simulate dynamics of wood in Pacific Northwest streams. A full description of the model is provided in Meleason (2001). The goal of this user's guide is to describe how to implement the current version (1.0). We encourage feedback on the performance of the model, which will be used in its revision for version 2.0. Please direct all inquiries to Mark at streamwoodv1@hotmail.com.

Overview of Model

OSU STREAMWOOD is an individual-based stochastic model that simulates riparian forest and in-channel wood dynamics. A detailed description of this model is presented in Meleason (2001). Stream systems can be simulated from a single reach to a small basin. The model is run under a Monte Carlo procedure using an annual time step and the results are reported as average conditions per reach. The current version of OSU STREAMWOOD was developed for fifth-order and smaller streams in the coniferous forests of the Pacific Northwest. Species considered include Douglas fir (*Pseudotsuga menziesii* (Mirb.) Franco), western hemlock (*Tsuga heterophylla* (Raf.) Sarg.), western red cedar (*Thuja plicata* Donn ex D. Don), and red alder (*Alnus rubra* Bong.). OSU STREAMWOOD consists of a forest model and a wood model. The forest model simulates riparian forest dynamics under various management regimes. Output of the forest model is the input to the wood model and is a list of trees that have died in the current year. The wood model simulates recruitment of trees into the channel and subjects individual logs to in-stream processes that includes breakage, movement, and decomposition.

The forest model is a forest-gap model based largely on ZELIG (Pacific Northwest version by Dr. Steve Garman, Forest Science Laboratory, Corvallis Oregon), JABOWA (Botkin et al. 1972, Botkin 1993), and CLIMACS (Dale and Hemstrom 1984, Dale et al. 1986) and consists of a birth, growth, and mortality components. The forest model adheres closely to the original design of Botkin et al. (1972) and Shugart and West (1977), and thus shares many of their limitations (Schenk 1996). Riparian forests in the model can be up to 100 m wide and are composed of a non-harvested area (RMZ) and a harvested area (forest plantation). Harvest rotation schedules (which include thinning, clearcutting, and planting regimes) can be defined for each riparian forest. The forest model includes a soil moisture term that influences species composition and species-specific growth rates.

The wood model is also an individual-based stochastic model and operates on the population of potential tree recruits into the stream and on the population of logs associated with the channel. Potential tree recruits are either from the output of the forest model or, if the forest model was disabled, from a "tree-kill" file. Trees are

assumed conical in form and fall the year they die. Tree entry is a function of distance from the stream bank, effective tree height (height to a user-defined minimum diameter), and tree fall angle. Trees that intersect the channel undergo a randomly selected number of breakage events between zero and maximum number of breaks. The location for each break is randomly selected using a normal distribution with a user–defined mean break (and standard deviation) location. Since trees do not break with respect to the location of the channel bank, logs can be partly outside of the channel. Logs that are completely outside the channel or do not meet minimum size requirements (defined by the user) are excluded from further analysis. Total log volume is volume of all logs that are at least partly in the channel.

Following entry, all logs are subjected to the in-channel breakage, movement, and decomposition. In-channel breakage consists of two functions: chance of breakage and breakage location. Chance of log breakage is a stochastic function based on the assumptions that likelihood of a log breaking increases with decreased size and increases with residence time. Breakage occurs at half the natural logarithm of length. The log movement component includes functions for chance of movement and distance moved. Likelihood of a log moving is assumed to increase with greater annual flow and decrease with increased ratio of log length to bankfull width, proportion of the piece outside the channel, and number of key pieces in the reach. Flow is characterized as annual recurrence interval in years and is used in the function determining chance of log movement. Three flow regimes are possible: constant flow, user-defined flow, and program-generated flow using a lognormal distribution. The chance of movement function can be adjusted to the retentive properties of a given system, and the default was set conservatively to represent a relatively retentive system such as a boulder and coble-dominated streams in the Oregon Cascade Mountains. Distance a log moves is assumed to follow a negative exponential distribution where the reciprocal of the slope is the average travel distance, which can be defined by the user. Logs are decomposed using a single exponential model with species-specific decomposition rates. Decomposition rate for logs partially in the channel is a linear extrapolation between terrestrial and aquatic decay rates as a function of the proportion of the log outside the channel.

Program Installation

The easiest way to set up the program is to create folders in Windows Explorer (Figure 1). The folders required are a main folder, named OSU_StreamWood in Figure 1, which contain the species files - ALRU.ini, PSME.ini, TSHE.ini, and THPL.ini – the basin file streamwood.bsn, the executable streamwood.exe and the folder RESULTS. Within the folder RESULTS are two more folders FOREST and STREAM (Figure 1).

Initiation Files

Several files are loaded by OSU STREAMWOOD when it is initiated (i.e., streamwood.exe is double-clicked). The first file loaded is the basin file named "streamwood.bsn", which includes the names of the initial tree and log files and, along with the species files, are also loaded at this time. Modifications to any of the

initiation files must be done prior to running the model, and care must be taken to duplicate the format presented in the examples given.

Basin input file
The basin input file, streamwood.bsn, includes four sections, which are designated by section titles in the format of "[*section title*]") and include "[treeFiles]", "[logFiles]", "[sections]", and "[reaches]". Following each section title are comments, which are designated by an apostrophe ("*;*"), which are ignored by the program but explain the format used in each section (Figure 2). The first line read in each section is "count=*integer*", where the integer is the number of lines to be read in for a particular section followed by the number of lines defined for each section (e.g., in "count=*integer* for that section). The "[treeFiles]" and "[logFiles]" sections include file names for files that are associated with reaches.

A stream system is represented as a basin composed of sections, and sections are composed of reaches. Unidirectional flow through a basin is simulated at the section level. Each section is defined by the number and lengths of reaches, which are arranged linearly, and the parent section, which is the section immediately downstream. Each section can be a parent of a maximum of two sections. The "[sections]" section of the streamwood.bsn file defines the number of sections in the stream system, assigns a unique ID number to each section, and designates the parent section for each section with the parent of the most downstream section equal to an ID number of 0. Figure 3 presents some examples of how various stream systems would be represented in the "[sections]" section.

The "[reaches]" section of the streamwood.bsn file defines each reach, which includes section ID, reach width and length, and initial tree and log files (described below). For a given section, the most upstream reaches are read in first. For example, the reach section in Figure 1 is composed of a linear arrangement of three sections (Figure 3a) with the middle section composed of two reaches. Note that reach S2R2 would be upstream of S2R1 because it is read in first.

The last two fields that define a reach are the file numbers that correspond to the input files for trees and logs that are listed in the "[treeFiles]" and "[logFiles]" sections.

Tree input file
The tree input file has a three-letter extension of "*.TKF", which stands for "tree kill file" (Figure 4). The tree input file is an alternative to the forest model in providing recruitment of trees to the channel. The tree input files are associated with a given reach in the reach section of the basin input file (Figure 1) and are used when the forest model is disabled.

The tree input file can be generated by OSU STREAMWOOD by running the forest model within OSU STREAMWOOD in deterministic model (e.g., don't enable the the Monte Carlo model on the Run Dialog window – see below for details). A "tree kill file" will be generated for each reach and placed in the "Forest" folder within the "Results" folder. Each tree input file contains the trees that have died in the riparian forest each year (as well as species and size) for BOTH sides of the stream. The convention used to generate this file is to grow the riparian forest specified in the upstream left side and save two copies o each tree that dies – one for the upstream left

side (the original) and one for the upstream ride side (the copy). The two copies are identical in all respects (e.g., species, DBH, height, distance to the bank, distance from the top of the reach etc.) except for tree angle of fall. The tree input file can also created from the results of any forest model, just as long as it follows the formatting presented in Figure 4, the file is placed into the main StreamWood folder, and associated with a specific reach(es) in "streamwood.bsn" file.

You can create your own tree input files basing them on the results of any forest model or field data. Note however, that the riparian area populated by your tree kill file is equal to the riparian area you define for each side of the stream. For example, if your tree file is on a per hectare basis then you will need to set the area of the riparian area to equal one hectare. Alternatively, you could provide the spatial coordinates of each tree (distance from the bank and distance from the top of the reach) that is within the area the tree file represents. With the spatial coordinates of each tree defined, OSU StreaWood will exclude any tree outside of the dimensions you provide to define each riparian zone (see below for defining riparian zone areas).

Log file
Each reach can be populated with an initial standing stock of logs at time 0 using a "reach log file ", which has the three letter extension of "*.rlf" (Figure 5). The file can be generated in Excel and saved as a comma-delimitated file. To associate a given log file with a given reach, the log file name must be included in the "[logFile]" section and then referred to in the reach definition (last field) in the [reach] section.

Species file
There are four species files used in the Pacific Northwest version: of OSU StreamWood: *Psuedostuga mensesii* (PSME.ini), *Tsuga heterophylla* (TSHE.ini), *Thuja plicata* (THPL.ini), and *Alnus rubra* (ALRU.ini). These files contain all the species-specific information required to run OSU StreamWood (see Figure 6 for an example). These files can be edited within the program (see below) or edited in word processing program such as NotePad.

Flow file
The flow file, with the three letter extension of "*.flo" defines the flow regime (recurrence interval in years) used in the chance of movement function (Figure 7). The file can be generated by the program or constructed outside of the program using the appropriate format (see the Basin Environment Dialog for more details).

Running OSU StreamWood: A Sample Simulation

Provided that the program is installed as described in the previous section, double click on the file "streamwood.exe" to initiate the program and the main dialog will appear (Figure 8). The file "streamwood.bsn" is loaded just before this window is called, which intern loads all files listed in "streamwood.bsn" and the species files. This instance of OSU StreamWood contains the stream system (e.g., number of sections and reaches) defined in "streamwood.bsn".

Basin environment dialog window

Double click on the "Environment" in the initial conditions window and the "Basin Environment" dialog window will appear (Figure 9). Note that there are four boxes outlined on the "Basin Environment" dialog window. In the upper left, labelled "Primary Functions for Wood Dynamics", you can choose which inchannel wood dynamics functions to include in the present simulation (e.g., breakage, movement, and decay) and the use of the forest model built within OSU StreamWood. Note that the default configuration is to include all three inchannel wood dynamics and exclude the use of the forest model.

Clicking the box next to the "Use Forest Model" and note that the second box, "Temperature Growth Index" is enabled, allowing you to select the mean and standard deviation of the annual temperature growth index (degree-days).

The third box, "General Specifications" allows you to set the minimum size requirements for a log. The forth box, "Define Flow Regime", allows you to define the annual flow regime (in units of annual return interval of the annual peak flow) that is used in the calculation of the probability of log movement. You can let the program create a flow regime for you (based on a log normal distribution) and save the file for further use or import a flow regime constructed outside the program (Figure 7).

Species dialog window

The Species dialog windows allow you to temporarily change the values of any of the species parameters. If you wish to permanently change these values, you must change the file the values in the species file itself.

Expand the "Species" folder in the initial conditions window of the main dialog window to revel the four species names. Double click on "Douglas fir" to open Douglas fir's dialog window (Figure 10). The first four variables (aquatic and terrestrial decay rates and log break factors A and B) are used in inchannel wood dynamics functions and the remaining functions are used in the forest model. To change a value for a given simulation, set the value of the variable you wish to alter and press "Apply".

Reach dialog window

You can expand the "Sections" folder to reveal the "Reaches" and their "Environment" as defined in the streamwood.bsn file (Figure 11). Double click on the "Environment" below any of the reaches to enable the Reach Dialog window for that reach (Figure 12). The reach dialog window is composed of five boxed regions. The boxed region at the very top, labelled "Reach Definition" allows you to set reach-level properties such as length and bankfull width. Note that the Mover's K is the reciprocal of the average travel distance for a log in that reach in bankfull width units. In the initial release version, the "Load log file" and "Save log file" are disabled.

The two boxed regions below "Reach Definition" are "Upstream Left Riparian Forest Tree Fall Criterea", and "Upstream Right Riparian Forest Tree Fall Criterea" are used to specify the tree fall regime for each riparian zone. Note that each riparian zone can be divided into two tree fall zones with the zone closest to the channel assigned a directional fall regime and the outer fall zone a random fall regime. a directional fall regime is composed of a mean fall direction and standard deviation.

The remaining two boxed areas - "Upstream Left Riparian Forest Initial Conditions" and "Upstream Right Riparian Forest Initial Conditions" - allow you to define the initial conditions (buffer width) and the initial conditions and management regime of the riparian forest. If the forest model is enabled, the three buttons with labels that include "Set Forest Model Initial Conditions" will be enabled. Click on the button for the "Left Side Only..." to enable the Initial Conditions for the Riparian Forest Model dialog window (Figure 13). The purpose of this dialog window is to provide the initial conditions for the forest model (e.g., PMS, maximum biomass, maximum number of trees, and site class). The forest model is a forest gap model using 25 m by 25 m plots. These plots are arranged in up to four rows parallel to the channel for a maximum of a 100-m wide riparian zone. Note that for the initial release version, the import of a forest plot has been disabled thus all forests start from a bare plot.

Click on the button labelled "Define a Riparian Management Regime" to enable the Riparian Forest Management Regime dialog window (Figure 14). In OSU StreamWood, the riparian forest can be divided into a riparian management area (RMA), which consists of a no-cut and partial-cut region, and a and a the region outside of the RMA, which can be subjected to clear-cutting.

Running the Model
Before running the model, you can set the print interval for your results by selecting "Results" then "Set Results" from the menu bar at the top of the main window (Figure 15). To run the model, select "Run" then "Model" from the menu bar to enable the Simulation Setup dialog window (Figure 16). Set the number of years per iteration and if you wish to have more than one iteration, check the box "Use Monte Carlo" and set the number of iterations. Note that the "Name" of the simulation is currently disabled.

To run the simulation, press the button labelled "RUN". During the simulation, the curser will be in the shape of a hourglass and when the simulation is complete, the curser will return to its original shape and the time of the simulation will be displaced in the lower window of the main dialog window.

Results

Results can be displayed graphically in the main window (Figure 17) and are also printed to file in the results folder. The graphical display allows a quick peak at the results (e.g., number and volume of logs) for each reach. The results printed to file are summarized by reach for both the wood in the channel and for the forest model. Please consult the documentation within the results files for more details.

Figure 1. Folder arrangement required for the operation of OSU STREAMWOOD on your computer. A "Result" folder containing a "Forest" and a "Stream" folder is required. The files listed in the right side of the window are all in the main folder "OSU_StreamWood" and include the required files "StreamWood.exe", which is the executable that you click on to start the program, "streamwood.bsn", which defines the stream environment, and the four species initiation files ("*.ini"), which are required to initialise species-specific calculations in the model. Additional files include the flow file ("*.flo") and the tree kill file (".tkf"), which can be generated by the program, and the reach log file (".rlf") which is used to populate a given reach with logs at the beginning of the simulation (optional).
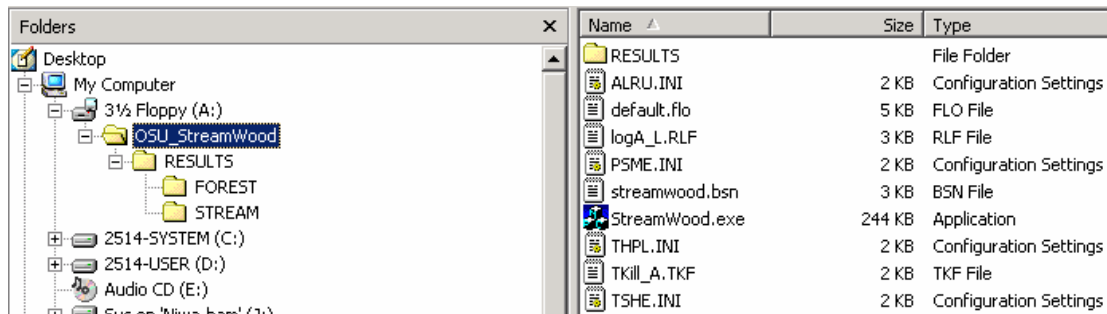
Figure 2. STREAMWOOD.bsn input file.

```
[treeFiles]
;Tree input files (Tree Kill Files with extension TKF) that replaces the forest model
;Count is the number of input files loaded into the current run
;first number (left of =) is the ID number for that TKF file used below
count=3
1=ALRU80y250m_ran.TKF
2=PSME200y250m_ran.TKF
3=PSME400y250m_ran.TKF

[logFiles]
;Log input files (Reach Log File with extension RLF) initial logs in a reach
;Count is the number of input files loaded into the current run
;first number (left of =) is the ID number for that TKF file used below
count=2
1=logA_L.RLF
2=logB_L.RLF

[sections]
; a section consists of the following 3 fields:
; first number (left of =) is the count of the number of sections
; int    m_SectionID;        // section ID
; int    m_ParentSection; // Parent section ID (section immediately downstream
;of this section and use 0 (NULL) for parent section of most downstream section)
count=3
1=1,0
2=2,1
3=3,2

[reaches]
; a reach consists of the following....10 fields total;
; first number (left of =) is the count of the number of reaches;
; int       m_SectionID;    //section ID listed above
; CString  m_Reachid;       //a unique number for the reach
; double   m_ReachLength; // in meters
; double   m_ReachWidth;   // in meters
; double   m_ReachWidthSD; // in meters - currently not in use
; int       m_SiteClass;  // passed to spp for tree entry case, cal tree ht
; int       m_Elevation;  // in meters, passed to spp for tree entry case, cal tree ht
; int       m_TreeFile    //list at the top of this file - 0 means no trees initially
; int       m_LogFile    //list at the top of the file - 0 means no logs initially
;Section S1 is the most downstream and S3 the most upstream section.
;The most upstream reach in sections with multiple reaches is listed first.
;For a three section reach with the middle section composed of 2 reaches
;the upstream to downstream reach order is: S3R1, S2R2, S2R1, S1R1.

count=4
1=1,S1R1, 250, 12.0, 3, 1, 500, 0, 0
2=2,S2R2, 250, 12.0, 3, 1, 500, 0, 0
3=2,S2R1, 250, 12.0, 3, 1, 500, 0, 0
4=3,S3R1, 250, 12.0, 3, 1, 500, 0, 0
```

Figure 3. Various stream systems represented diagrammatically and their corresponding notation in the basin file, streamwood.bsn. The most downstream section in each stream system is S1. Each section is composed of one or more reaches, which are aligned linearly within a section. Notation for stream system includes count, which is the number of sections, followed by the description for each of the sections. For example, in the first line in configuration A, "count=3", defines a system with three sections. The second line, "1=1,0", the "1" to the left of the equals sign is the section count and the "1" to the right of the equals sign is the section ID, followed by the adjacent downstream section (0 if at the bottom of the stream system).

Diagrammatic Representation   Notation for basin file

A. Linear configuration
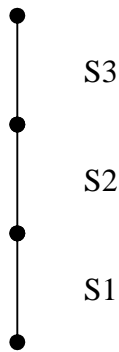
[sections]

count=3
1=1,0
2=2,1
3=3,2

B. Simple branching configuration
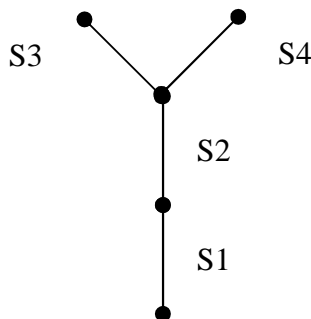
[sections]

count=4
1=1,0
2=2,1
3=3,2
4=4,2

C. Multiple branching configuration
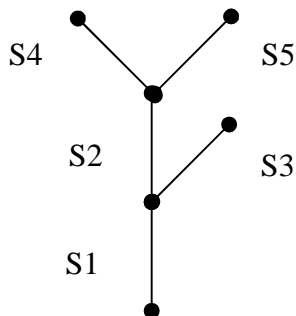
[sections]

count=5
1=1,0
2=2,1
3=3,1
4=4,2
5=5,2

Figure 4. Example of a tree input file.

```
;[trees]
;TreeInputFile.TKF is a Tree Kill File, which is used in place of the forest model as the source
;of trees which fall in the riparian zone.
;A Tree Kill File is made for each reach when the program is run without the Monte Carlo
method  enabled (run dialog box).

; A tree looks like the following.... 10 fields total
;0.  int tree number =: simply the order of the tree in the list
;1.  CString species:      Acronym with first two letters of genus and species
;2.  int RipZone:          Riparian side with 1 = upstream left and 2 = upstream right
;3.  float m_DBH:          DBH in cm
;4.  float TreeYrDied:     Year tree dies relative to year 0 ( can be negative).
;5.  float m_Height:       Height in m, if 0, program calculates it
;6.  float m_DistToBank:Distance to bank in m, if 0, program calculates it
;7.  int m_TreeCount:     Number of identical trees - program will calculate position, fall angle
;8.  int m_YrTreeFell:    Yr tree falls – currently disabled.
;9.  int m_TreeFallAngle: Angle tree falls, if -1 then program randomly selects angle of fall
; where 180 directly towards channel, 90 directly upstream, and 270 directly downstream
;10. float m_DistDownStream : dist from top of reach, 0 if program selects it

count=30
1=ALRU, 2, 12.4, 80, 14.8, 23.3, 1, -1, 111.8, 243.6
2=PSME,2, 27.2, 80, 23.0, 31.1, 1, -1, 238.0, 21.4
3=TSHE, 2, 22.4, 80, 20.8, 28.7, 1, -1, 137.693, 18.0633
4=THPL, 2, 15.5809, 80, 17.0216, 45.4026, 1, -1, 329.169, 46.7563
5=ALRU, 2, 21.2317, 80, 20.2614, 37.7996, 1, -1, 67.3903, 86.2348
6=ALRU, 2, 42.464, 80, 28.1214, 44.6812, 1, -1, 238.314, 106.943
7=ALRU, 2, 20.8464, 80, 20.0611, 43.3716, 1, -1, 70.0988, 137.005
8=ALRU, 2, 13.6124, 80, 15.7196, 49.1581, 1, -1, 84.6025, 128.173
9=ALRU, 2, 26.1603, 80, 22.6015, 34.2376, 1, -1, 78.0025, 185.214
10=ALRU, 2, 24.1155, 80, 21.6784, 48.9793, 1, -1, 299, 224.123
11=ALRU, 2, 23.0476, 80, 21.1702, 32.5167, 1, -1, 19.6361, 211.273
12=PSME, 1, 114.311, 190, 63.0496, 7.86893, 1, -1, 121.106, 243.599
13=PSME, 2, 99.8954, 190, 59.0593, 20.9542, 1, -1, 302.887, 152.848
14=PSME, 1, 96.6203, 191, 58.0595, 74.7315, 1, -1, 136.534, 119.421
15=PSME, 2, 97.0921, 191, 58.2058, 26.7674, 1, -1, 138.367, 125.162
16=PSME, 2, 49.7718, 191, 38.8256, 47.9168, 1, -1, 249.597, 149.161
17=PSME, 2, 93.1059, 191, 56.9449, 29.3538, 1, -1, 187.625, 210.947
18=PSME, 1, 79.6348, 192, 52.2393, 32.8075, 1, -1, 317.5, 16.0444
19=PSME, 1, 46.4143, 192, 37.0047, 61.9544, 1, -1, 29.3383, 70.5709
20=PSME, 1, 48.4496, 192, 38.1171, 53.3456, 1, -1, 341.788, 199.21
21=PSME, 2, 49.4942, 192, 38.6777, 14.1634, 1, -1, 188.368, 156.564
22=PSME, 2, 46.944, 192, 37.2968, 30.0401, 1, -1, 83.0349, 109.542
23=PSME, 1, 50.9359, 11, 12.2851, 13.8862, 1, -1, 159.932, 66.7344
24=PSME, 1, 20.1080, 11, 11.5511, 40.3637, 1, -1, 22.5698, 173.077
25=PSME, 2, 10.0311, 11, 11.4823, 18.2870, 1, -1, 170.278, 11.1529
26=PSME, 2, 10.9871, 11, 12.3302, 41.6480, 1, -1, 312.037, 24.298
27=PSME, 2, 10.7325, 11, 12.1057, 41.3054, 1, -1, 156.104, 20.5046
28=PSME, 2, 10.7368, 11, 12.1095, 68.2092, 1, -1, 338.167, 69.1908
29=PSME, 1, 10.7384, 12, 12.1109, 3.76195, 1, -1, 195.124, 35.3028
30=PSME, 1, 11.0989, 12, 12.4284, 21.4853, 1, -1, 35.9319, 163.571
```

Figure 5. An example of a Reach Log File (*.rlf).

;[logs]
;logA_L.RLF = Reach Log File used to initialize a reach with logs
; a log looks like the following: 11 fields
; note: first number (left of =) is the count
; CString m_LogSpecies; // an object of type string that is the 4 letter acronym
; float   m_LogLength; // log length in meters
; float   m_Z4LengthButt; //length of bole (m) in zone 4 from the base end
; float   m_Z4LengthTop; //length of bole (m) in zone 4 from the top end
; float   m_LogTopD; // log's top diameter in cm
; float   m_LogBotD; // log's bottom diameter in cm
; int   m_LogResTime; // number of years log has been in stream
; float   m_LogDensity; // density of log (disabled)
; float   m_LogReachPosition; // position within a reach in meters, with 0 top reach
; float   m_LogMoveTotal; // cumulative distance log moved, in meters, at this length
; bool   m_isLogSuspend;   // 1 if log suspended above channel, 0 if not (disabled)
;spp,lgth,z4butt,z4top,dtop,dbot,rest,den,pos,movet,susp

count=15
1=PSME, 15.10, 0.0, 0.0, 32.10, 47.11, 0, 680, 0, 0, 0
2=PSME, 10.20, 0.0, 0.0, 32.20, 42.70, 0, 680, 0, 0, 0
3=PSME, 10.30, 0.0, 0.0, 32.30, 47.11, 0, 680, 0, 0, 0
4=PSME, 1.400, 0.0, 0.0, 13.40, 14.70, 0, 680, 0, 0, 0
5=PSME, 15.10, 0.0, 0.0, 32.10, 47.11, 0, 680, 0, 0, 0
6=PSME, 15.10, 0.0, 0.0, 32.10, 47.11, 0, 680, 0, 0, 0
7=PSME, 15.10, 0.0, 0.0, 32.10, 47.11, 0, 680, 0, 0, 0
8=PSME, 15.10, 0.0, 0.0, 32.10, 47.11, 0, 680, 0, 0, 0
9=PSME, 15.10, 0.0, 0.0, 32.10, 47.11, 0, 680, 0, 0, 0
10=PSME, 15.1, 0.0, 0.0, 32.10, 47.11, 0, 680, 0, 0, 0
11=PSME, 15.1, 0.0, 0.0, 32.10, 47.11, 0, 680, 0, 0, 0
12=PSME, 15.1, 0.0, 0.0, 32.10, 47.11, 0, 680, 0, 0, 0
13=PSME, 15.1, 0.0, 0.0, 32.10, 47.11, 0, 680, 0, 0, 0
14=PSME, 15.1, 0.0, 0.0, 32.10, 47.11, 0, 680, 0, 0, 0
15=PSME, 15.1, 0.0, 0.0, 32.10, 47.11, 0, 680, 0, 0, 0

Figure 6. Species initiation file for Douglas fir

Acronym PSME
ScientificName Pseudotsuga_menziesii
CommonName Douglas_Fir
SpeciesNumber 1
DecompRate 0.004
TerDecompRate 0.008
LogBreakA 0.05000
LogBreakB 2.000000
DBHMax 300
AgeMax 1200
G 1400
DDMin 441
DDMax 2461
ShadeToleranceIndex 2
SaplingMax 10
SapLagTime 10
FoliageBiomassC 17.44
FoliageType 2.5
WMIN 25
Water_a -10
Water_b 5
Shade_a 1.25977
Shade_b 1.78588
Shade_c .12
SuccessionalStatus 1
WoodBio_a -3.0396
WoodBio_b 2.5951
GeoRegionArray<1,1>
ElevationMin 0
ElevationMax 1000
LSR 0.47
LA_1 1637.7
LA_2 0.019
 <0, 0, 0> <84.92352, -0.010853, 0.936797>
 <0, 0, 1> <76.85529, -0.011561, 0.928818>
 <0, 0, 2> <61.63578, -0.014693, 0.927064>
 <0, 1, 0> <85.60765, -0.010226, 0.934949>
 <0, 1, 1> <76.47562, -0.010872, 0.915672>
 <0, 1, 2> <70.32194, -0.009887, 0.853661>
 <1, 0, 0> <80.91850, -0.012198, 1.085999>
 <1, 0, 1> <67.51043, -0.015671, 1.128344>
 <1, 0, 2> <56.87761, -0.016381, 1.068793>
 <1, 1, 0> <85.60765, -0.010226, 0.934949>
 <1, 1, 1> <76.47562, -0.010872, 0.915672>
 <1, 1, 2> <70.32194, -0.009887, 0.853661>

Figure 7. Flow file

count=50
Year 1, 6.807549
Year 2, 5.046690
Year 3, 1.069169
Year 4, 10.555392
Year 5, 1.498377
Year 6, 1.502527
Year 7, 1.158470
Year 8, 2.070212
Year 9, 2.657946
Year 10, 2.986099
Year 11, 2.384395
Year 12, 1.547456
Year 13, 4.500131
Year 14, 6.809203
Year 15, 2.053055
Year 16, 1.667777
Year 17, 1.142190
Year 18, 1.984101
Year 19, 60.933029
Year 20, 2.424841
Year 21, 2.115192
Year 22, 1.476945
Year 23, 12.355909
Year 24, 1.354487
Year 25, 10.261421
Year 26, 3.145746
Year 27, 4.301293
Year 28, 1.821821
Year 29, 1.344927
Year 30, 1.527411
Year 31, 1.714148
Year 32, 2.704222
Year 33, 38.443073
Year 34, 6.228128
Year 35, 1.183676
Year 36, 2.179204
Year 37, 1.955822
Year 38, 4.132769
Year 39, 1.783917
Year 40, 2.427663
Year 41, 1.338660
Year 42, 1.012162
Year 43, 5.681443
Year 44, 2.232195
Year 45, 7.641081
Year 46, 16.706591
Year 47, 5.093775
Year 48, 3.559682
Year 49, 2.309997
Year 50, 2.133366

Figure 8. The main menu of OSU StreamWood that appears when "streamwood.exe" is double clicked. The file "streamwood.bsn" is loaded just before this window is called, which intern initiates the loading of all files listed in "streamwood.bsn" and the species files. The three window regions are the initial conditions window (left window), the results window (upper right), and the message window (lower right).
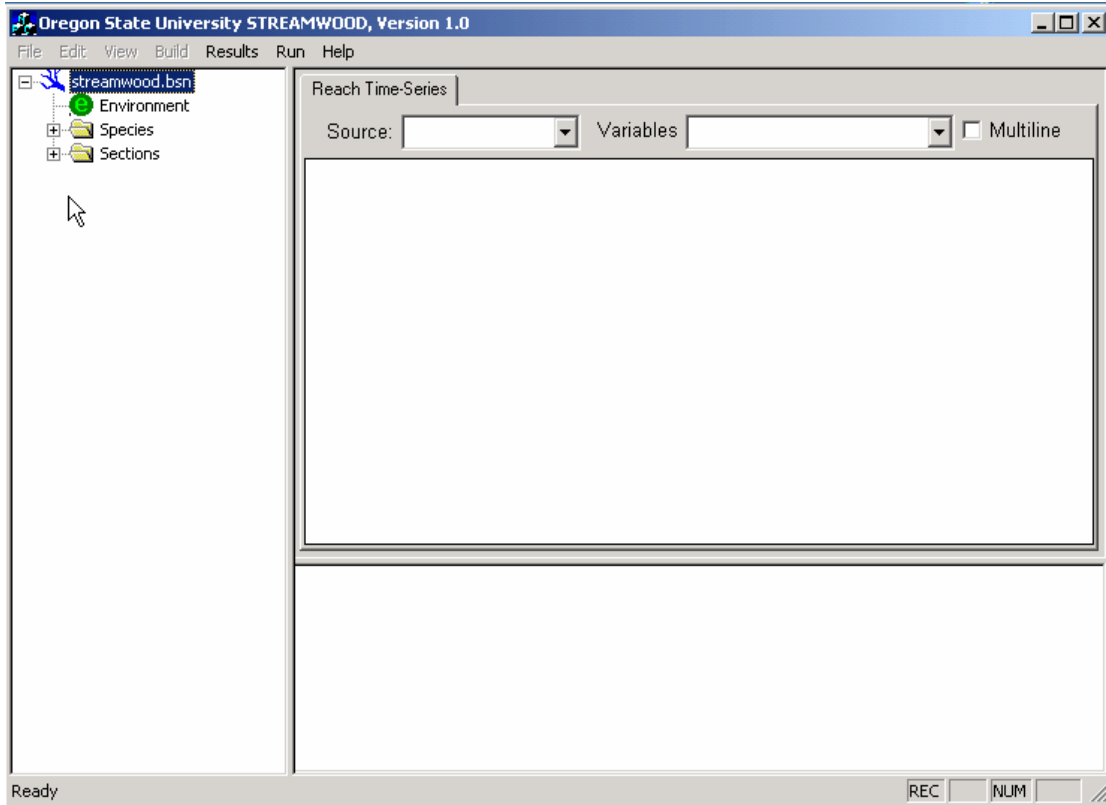
Figure 9. The Basin Environment dialog box, which is accessed by double clicking on "Environment" in the Main Dialog Window, allows you to set basin-level properties. To use the forest model within OSU StreamWood, you must select the "Use Forest Model" box in the "Primary Functions for Wood Dynamics", which enables the "Temperature Growth Index" box.
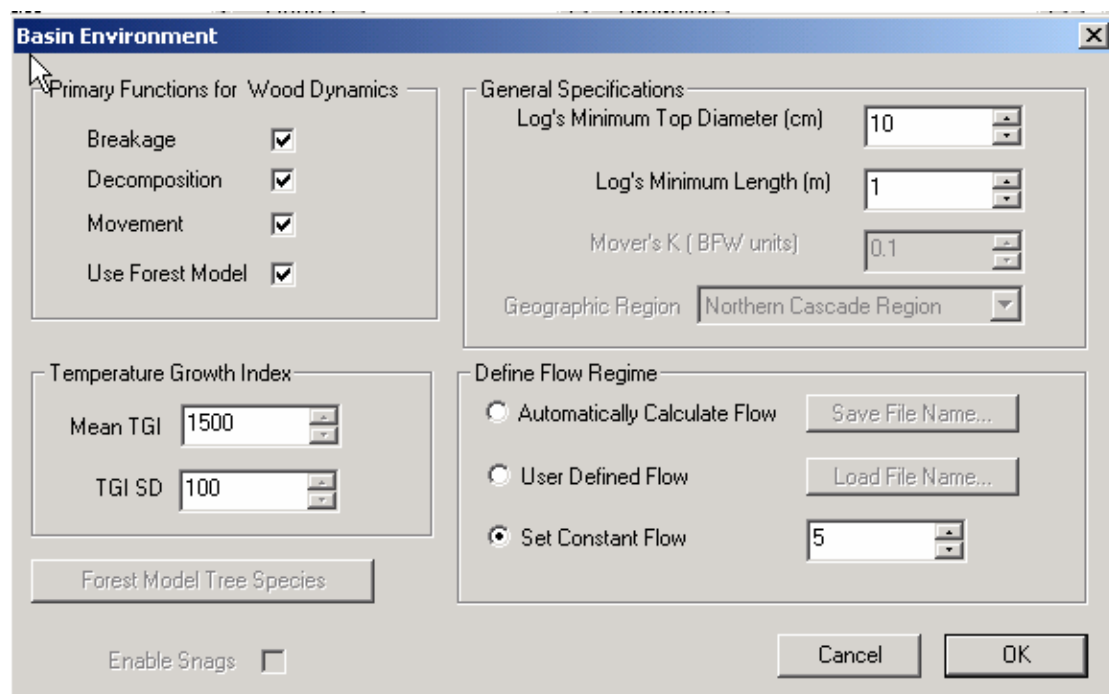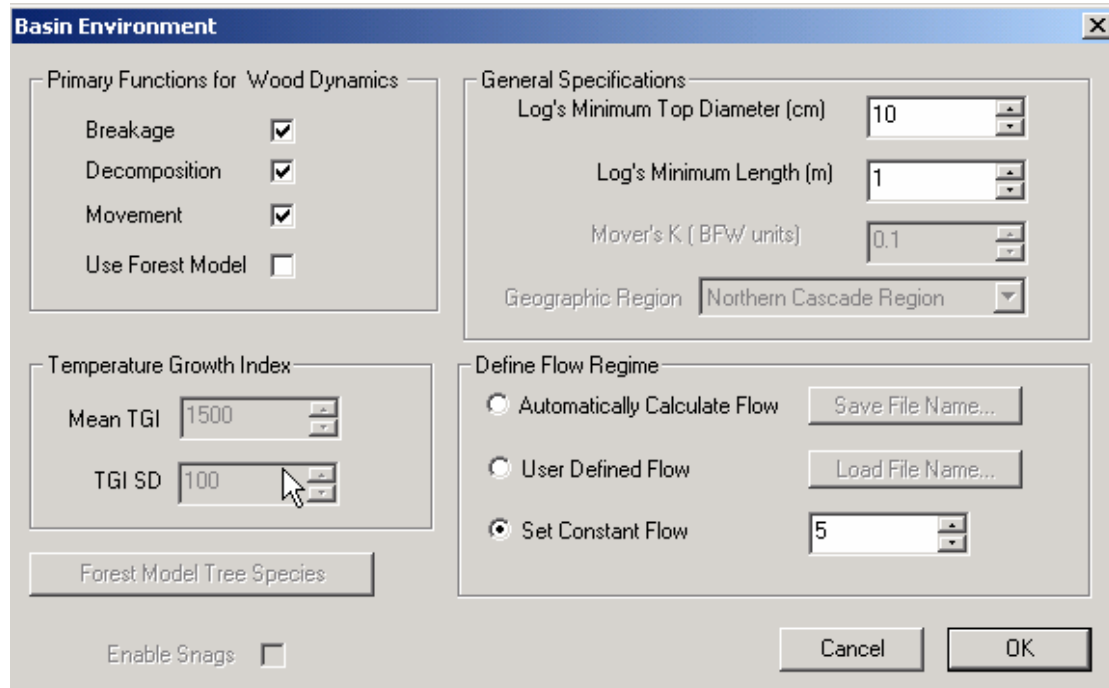
Figure 10. The species dialog window for Douglas fir.

Figure 11. The "Sections" tree can be expanded to reveal the "Environment" for each reach.
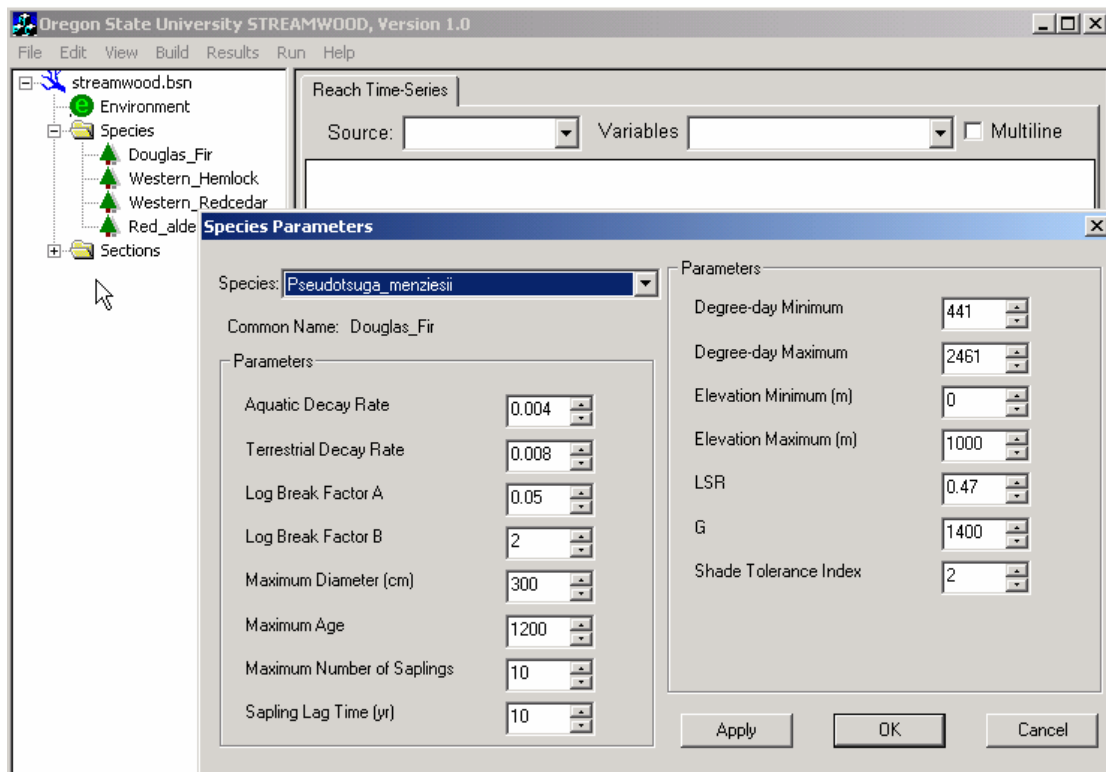
Figure 12. Click on the "Environment" under a given reach in the section tree to open the "Reach Environment" dialog window for that reach.

Figure 13. Click on the "Set Forest Model Initial Conditions…" on the "Reach Environment" dialog box to open the "Initial Conditions For the Riparian Forest Model" dialog window.
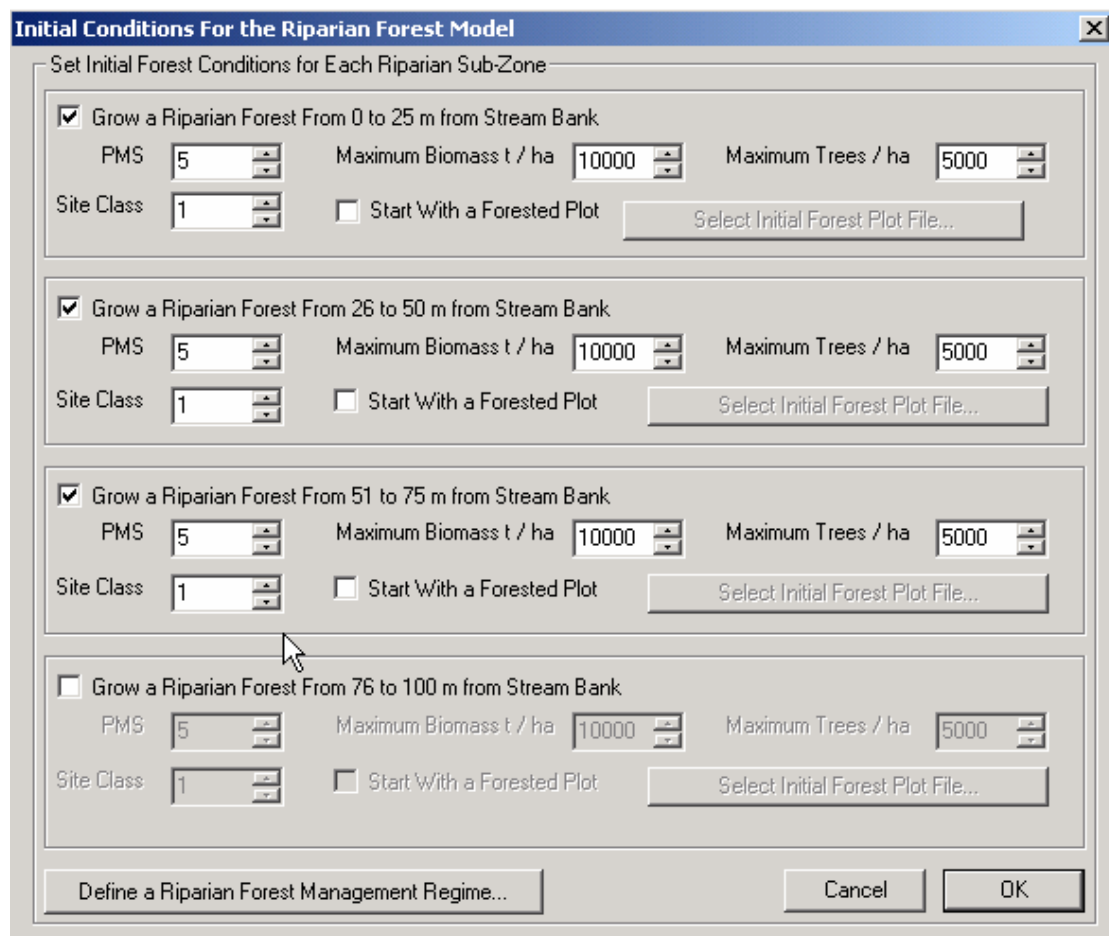
Figure 14. Click on the "Define a Riparian Forest Management Regime" button on the "Initial Conditions For the Riparian Forest Model" dialog window to open the "Riparian forest management regime dialog window.
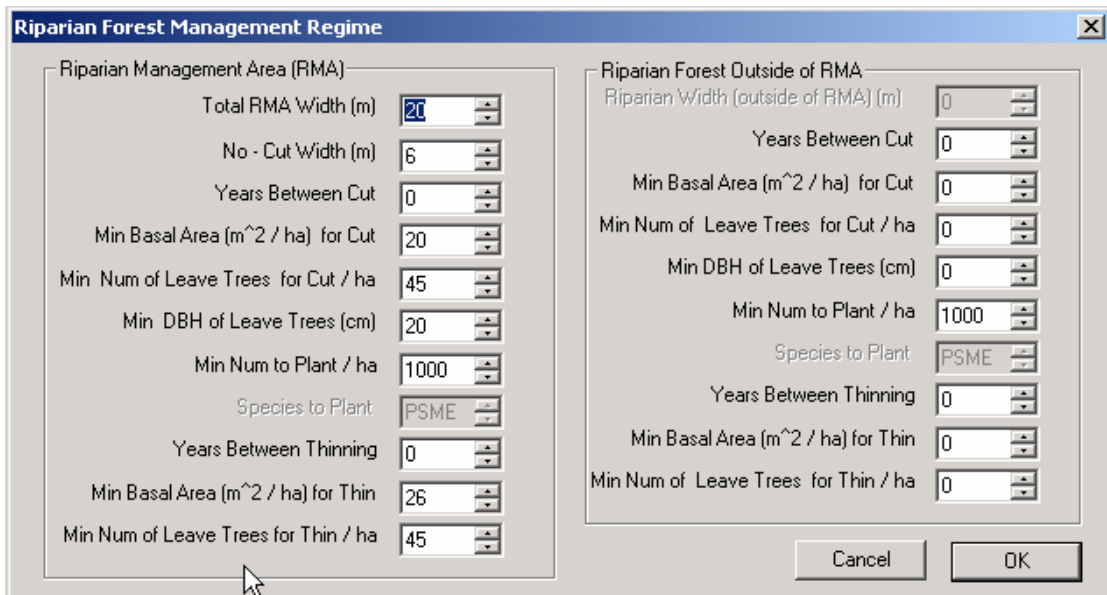
Figure 15. Select the print interval that you would like to use for the simulation results.
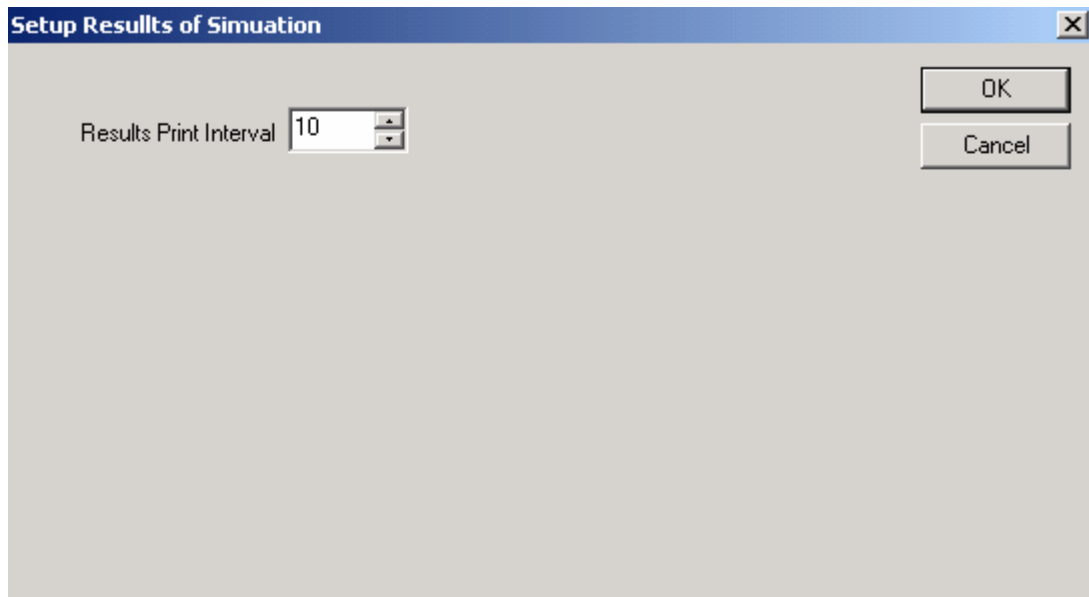
Figure 16. The Simulation Setup dialog window accessed through the main menu bar and used to run the program.
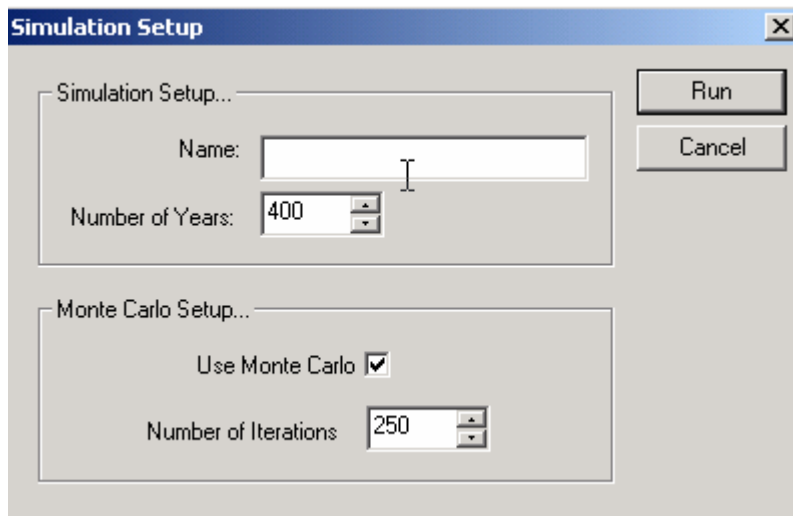
Figure 17. The results graph window. In this example, the number logs completely within the channel is displayed for four reaches aligned linearly. Note that clicking on the "Multiline" box allows multiple graphs to be displayed at once.