

State of Oregon
Department of Environmental Quality

Memorandum

To: file

Date: 1/6/2023

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Subject: Heat Source Version 8 revision log

Current version: 8.0.8.1

Source code for Heat Source version 8 can be found on DEQ's GitHub repository:

<https://github.com/OR-Dept-Environmental-Quality/heatsource-8>

Version 8.0.0 – Version 8.0.2

Model code was ported from Heat Source version 7 VBA to python 2.5 and C. Utilizes python Win32com and Python pycso 1.63. Python pycso 1.63 is an optional installation and is not required to run Heat Source version 8. Pycso optimizes the code and improves model run times.

General updates to the user interface.

Model output is now stored in text files rather than in Excel worksheets. This requires the user to designate an output path on the model setup worksheet.

The model run period can differ from the period for which data is entered.

There is no restriction on the number of days that can be modeled.

Model has been updated for use in any global time zone. Time zone is defined by an offset from UTC rather than a specific time zone. User needs to be aware of daylight savings. Model does not make any adjustments for daylight savings.

Bottom width is required rather than bankfull width. Users may crosswalk bankfull width to bottom width using a separate macro that utilizes the methodology from version 7 (i.e. width to depth ratio and channel angle z).

Parameters governing the exchange of heat between the water and sediment are now specified by the user and can vary longitudinally. This includes sediment thermal conductivity, sediment thermal diffusivity, sediment thickness and percent hyporheic exchange. The previous methodology is outlined in the version 7 manual and relied on horizontal bed conductivity, bed particle size and embeddedness to calculate these parameters. As a reference, typical values in Heat source 7 were 13.0 W/m/°C for sediment thermal conductivity, 0.0327 cm²/sec for the sediment thermal diffusivity, 26.9% for porosity, and 0.2 – 0.75 m for the sediment thickness. Hyporheic flow was variable and reported in hydraulic output sheet. Cloudiness can now vary spatially.

Each model reach now is assigned the meteorology data for the closest continuous node location (by river km) rather than to the upstream one as in version 7.

Boundary conditions, meteorology, and input tributary data are linearly interpolated between times steps. For this to work properly an additional hour of data is required at the end of the last time step on the last model day.

Various minor bug fixes.

Version 8.0.3

I updated Heat Source to include an option that allows vegetation heights as an input rather than a vegetation code in the "TTools Data" datasheet. To activate this option, mark "True" in "LiDAR data used for veg codes" in "Heat Source Inputs". I also placed a couple of checks in the code to make sure input data is within the expected range of values. Model spits out an error if not.

Version 8.0.4

Heat Source interface updated so the routines will work in Excel 2007 (extension = .xlsm). It should also still run in Excel 2002 (extension = .xls). A couple more checks were added in the code to make sure input data is within the expected range of values. Model spits out an error if not.

Version 8.0.5 (KNOWN ERROR, see 8.0.7 regarding the C-module)

I updated the Excel interface and the python code (ExcelInterface.py) to accept user defined number of transverse samples. The previous versions only allowed 4.

Fixed a bug that causing an error message and preventing time steps less than 0.5 minutes.

Also, the code was improved in how View to Sky is calculated. This version accounts for the density of bank shade (1.0) in addition to the density of the vegetation. Older version applied the vegetation density to the bank shade. The problem was noted when topographic shade predications were changing with changes in vegetation density. The improvement produces very minor differences in shade predictions.

Version 8.0.6 (KNOWN ERROR, see 8.0.7 regarding the C-module)

View to sky calculation updated to correct a vegetation density error.

Longitude error made more descriptive.

Changed how the shade angles are compute for LiDAR. Now for LiDAR, "LC_Distance" (distance to vegetation feature) is NOT adjusted by half the distance of the transverse sample rate. Our conceptual model of what TTools is sampling when using vegetation zones and LiDAR is different. The vegetation zone sample represents the vegetation within the transverse sample and is hence adjusted to the middle of the zone. Alternatively, LiDAR is sampling a feature at a point.

Corrected a possible divide by zero error in the Build Zones LiDAR.

Version 8.0.7

Included option for 'zone' or 'point' calculation of vegetation angle. See interface, Heat Source Input sheet for description.

Included output for amount of solar radiation blocked by each vegetation zone. The consequence is that the C module no longer works. But, C-module was incorrect because it was never updated when we switched to user-defined number of vegetation zones back in version 8.0.5. The C-module had 4 vegetation zones hard coded. The C-module has been disabled and users can only run the python module from the Excel interface.

Version 8.0.8

Output corrected so "solar diffuse" header does not show up in all the files.

Fixed solar blocked output.

Included option for spatially variable LiDAR vegetation density (interface and code change).

Output name change from H20 to H2O. Zero versus oh.

Change the directory format when installing Heat Source so that the version number is included in the name of the root directory (e.g. heatsource808). Update the interface so users can pick which version of Heat Source they want to run, assuming it is installed and corrections have been made. Enter version number in cell A3 of Heat Source Inputs, without the periods, so "8.0.8" becomes 808. The model will then run "C:\Python25\Lib\site-packages\heatsource808".

If this cell is blank, then the Excel interface will run:
"C:\Python25\Lib\site-packages\heatsource"
just like it used to.

If you want to run an older version:

1. Run the old version's install routine.
2. In "C:\Python25\Lib\site-packages\" rename the "heatsource" folder to include a version number.
3. Right click on "C:\Python25\Lib\site-packages\heatsource808\Stream\StreamNode.py" and chose "Edit with IDLE".
4. Edit line 15 from so it includes your version number rename. For example, line 15 could read: "import heatsource807.HSmodule as C_HS"

Version 8.0.8 interface should be backwards compatible but older interfaces are NOT forwards compatible.

Version 8.0.8.1

Various print statements were removed. These statements significantly increased model run times.

Fixed the print message for unstable timesteps.

The writing of errors to text files in the root C directory was removed. The C directory is read only in newer versions windows. An error is caused by trying to write there and the original error message was lost.

The heat source model version is now printed on every output text file for record keeping.

Developed standalone python script (run_hs808.py) to run the model. The buttons that start the model in excel no longer work due to incompatibility between Windows version 10 + and the version of pywin32 that is compatible with python 2.5.

This is the last version of Heat Source 8.