SWAT Output Viewer

User Manual

Practical guidance for setting up projects, running simulations, exploring results, comparing scenarios, and evaluating model performance.

Introduction

SWAT Output Viewer is a Windows application quickly extract data from SWAT outputs and display them on thematic map or/and in time series graph. The main features includes:

- Thematic map for subbasins and reaches to show spatial distribution;
- Time series graph with ability to compare to observed data;
- Quick performance statistics against observed data;
- Quick comparison to observed data and/or outputs from other model engine and scenario;
- Selecting SWAT components on map;
- Ability to work with ArcSWAT and QSWAT projects;
- Help functions to run simulation and check model files.

Installation

SWAT Output Viewer is a traditional Windows desktop application. To install it, double-click on the installation file and follow the instructions. By default, the program is installed in C:\Program Files (x86)\SWATOutputViewer.

SWAT Project

A SWAT project is a folder with the structure as shown in Figure 3-1. The model input files are in txtinout folder and the watershed shapefiles are in shapes folder. The folder names shouldn't be changed except the scenario name folder. A scenario is a folder in scenarios folder and has sub-folder txtinout holding all model input files. Multiple scenarios could be created in scenarios folder.

This structure is compatible with both ArcSWAT project and QSWAT project. In cases where ArcSWAT and QSWAT is not used, users need to create the folder structure manually. For more details, please watch Youtube video Folder Strcuture of SWAT Project and Manually Create SWAT Project to use SWAT Viewer.

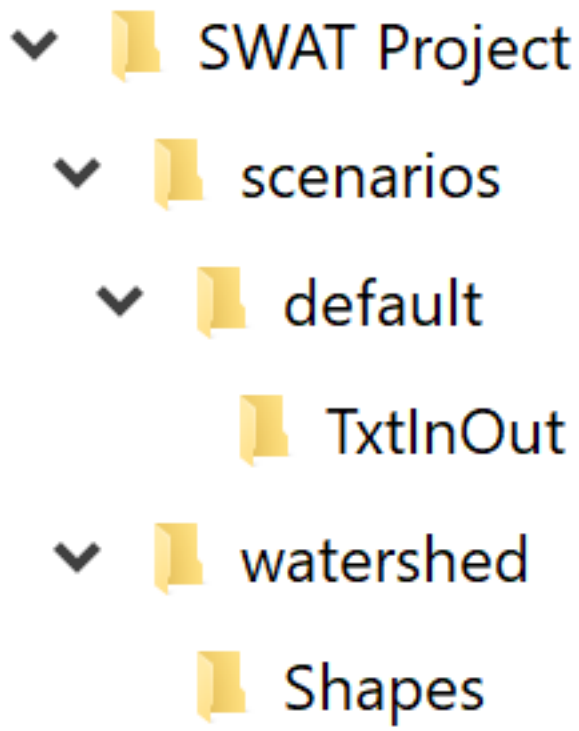


Figure 3-1 Folder Structure of a SWAT Project

Layout

The main interface is shown in Figure 4-1.

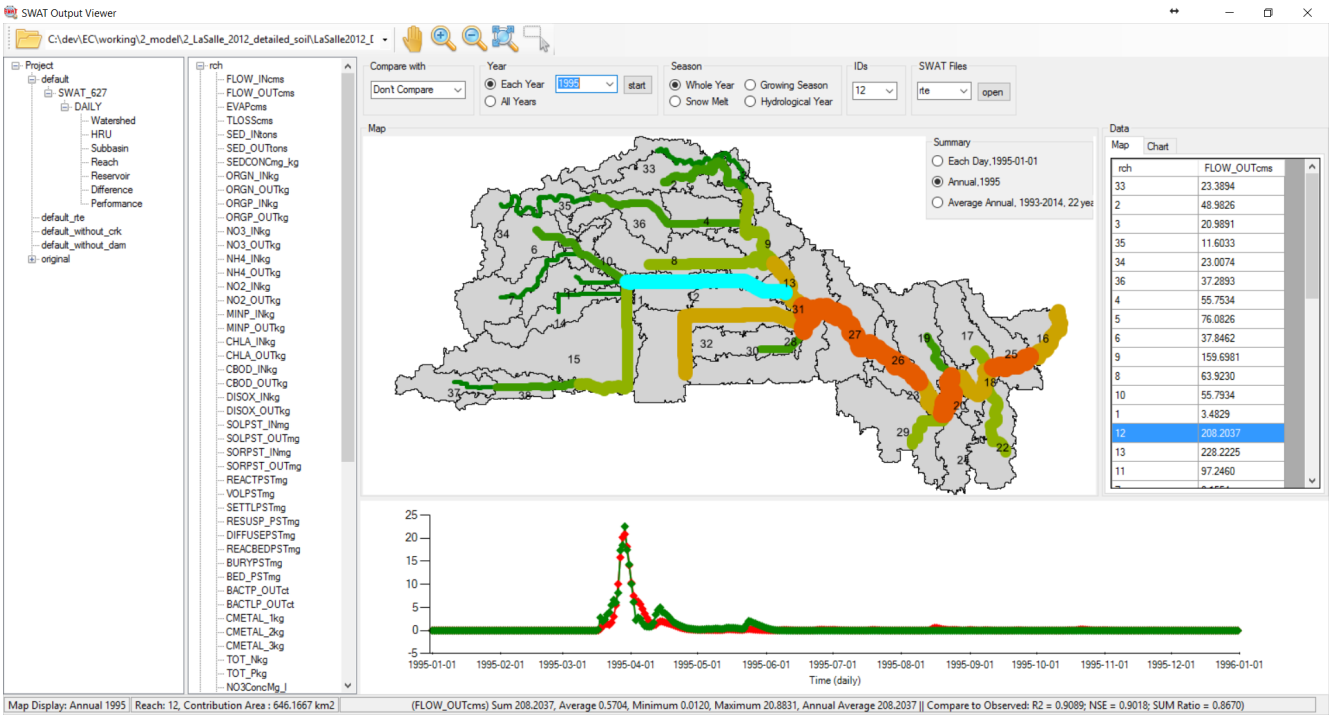


Figure 4-1. Layout of SWAT Output Viewer

The interface is comprised of four components.

- Tool Bar – Function buttons to open project and select features from map;
- Project Explorer – A tree view show available scenario and outputs;
- Main View – Where the data is defined and displayed in graph and/or on map;
- Status Bar – Information of select SWAT component and statistical information.

Tool Bar

The bool bar is located at top of the window. It's used to open a SWAT project, explore map and select features.

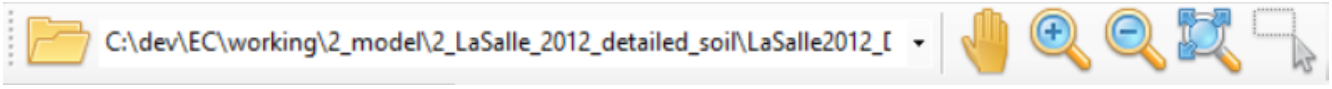


Figure 4-2. Tool Bar

Once the project is opened, it will be added to the recent project list and could be selected from the drop-down list.

The Pan, Zoom in, Zoom out, Zoom Extent and Select button are applied to the map. If there is no map in current view, they will be disabled.

Project Explorer

Project Explorer is a tree structure showing all available outputs in current project. There are five levels as shown in Figure 4-3.

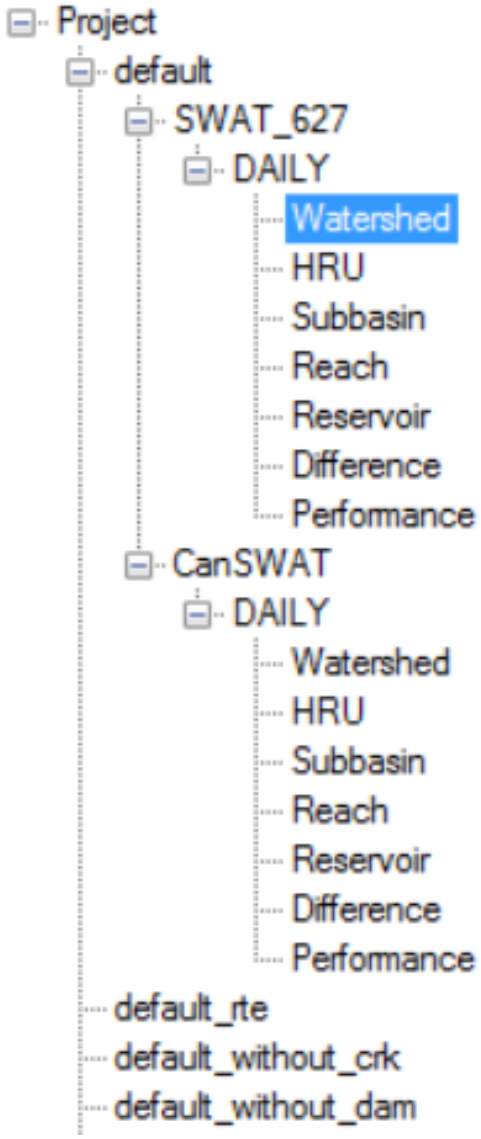


Figure 4-3. Project Explorer

The first level is Project. It’s used to set data for the whole project, i.e. the observed data.

The second level, scenario, represents a model in the Scenarios folder. The scenario is only valid when the textinout filder has all the model files.

Next is the model engine level. As different model engine could run on same model files, a scenario would have more than one output dataset.

With different output settings, same model engine may generate daily, monthly or yearly outputs. This is the fourth level.

The last the level is the Outputs level, which is used to guide through outputs of different type.

Main View

Main View is where the outputs are displayed. Different views are triggered by selecting different nodes in Project Explorer. In current version, nine types of Main View are supported. The first two views are not for outputs but necessary for importing observed data and running the model. The other seven views are for outputs of different SWAT components.

- Project View – A map with all subbasins, reaches and reservoirs to allow import observed data. The observed data will be used to be shown in time series graphs besides the simulation values. It's also used to calculate the performance statistics.

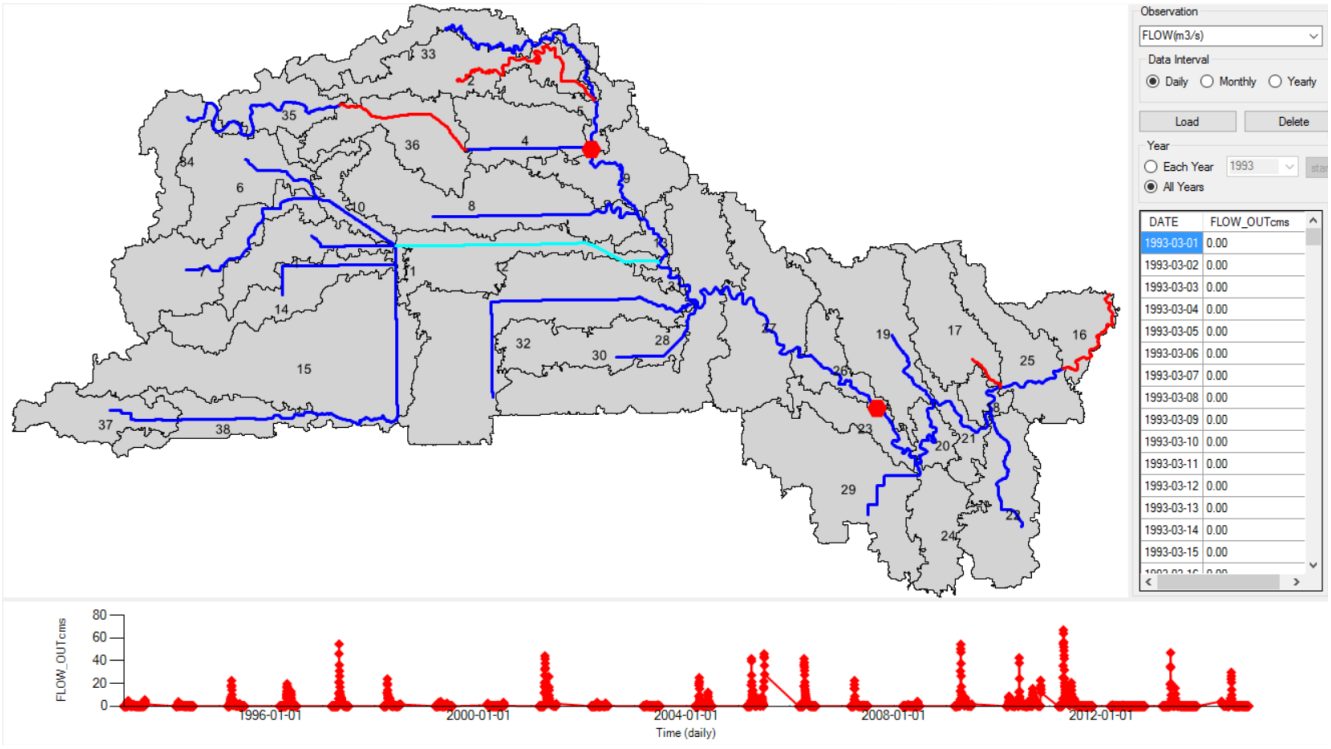


Figure 4-4. Project View

- Scenario View – A view to allow run simulation, open and edit several key parameter files (file.cio, basin.bsn and fig.fig), open the model folder and copy the txtinout folder to SWAT_CUP backup folder. If

working on a modified version of SWAT, you could also select different version of SWAT to run.

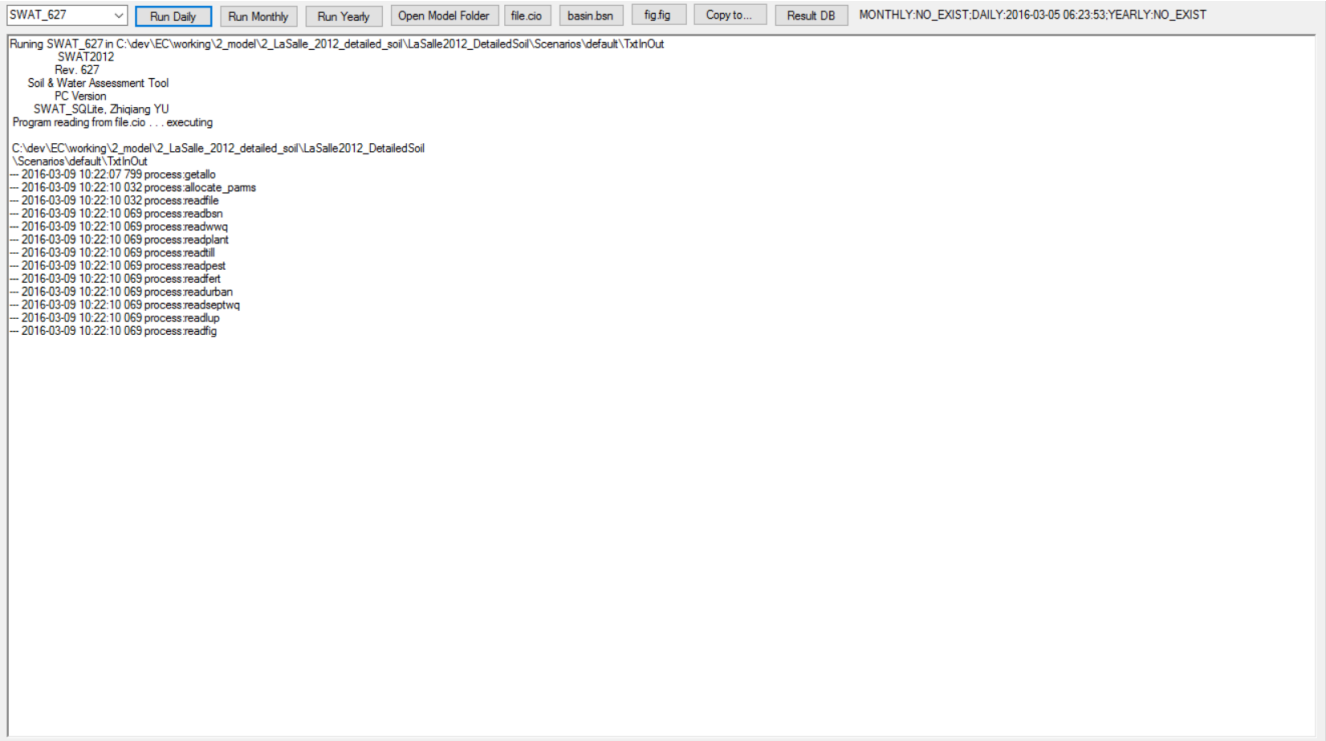


Figure 4-5. Scenario View

• Watershed View – Outputs of watershed level which is corresponding to the outputs in output.std.

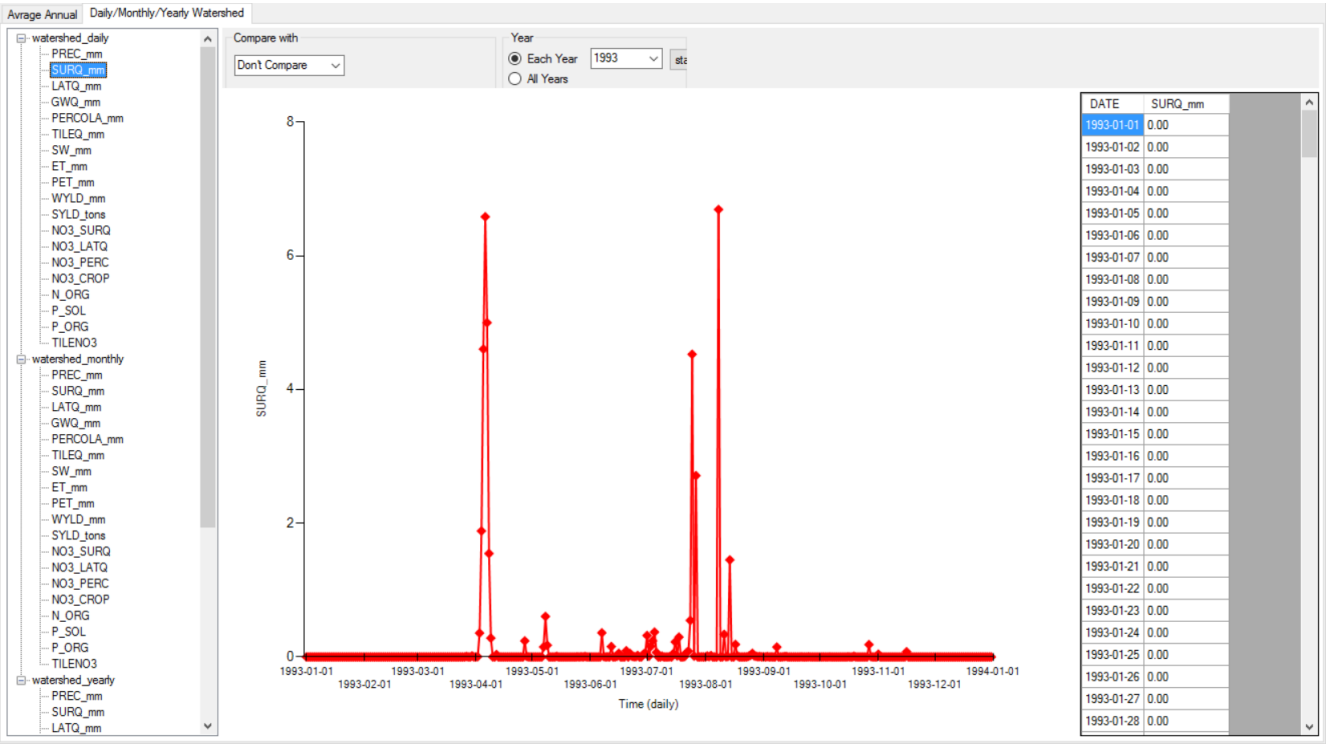


Figure 4-6. Scenario View

• HRU View – HRU outputs (mainly output.hru) with map, table and graph. As HRU don't have spatial locations, the subbasin layer is used to help locate the HRU.

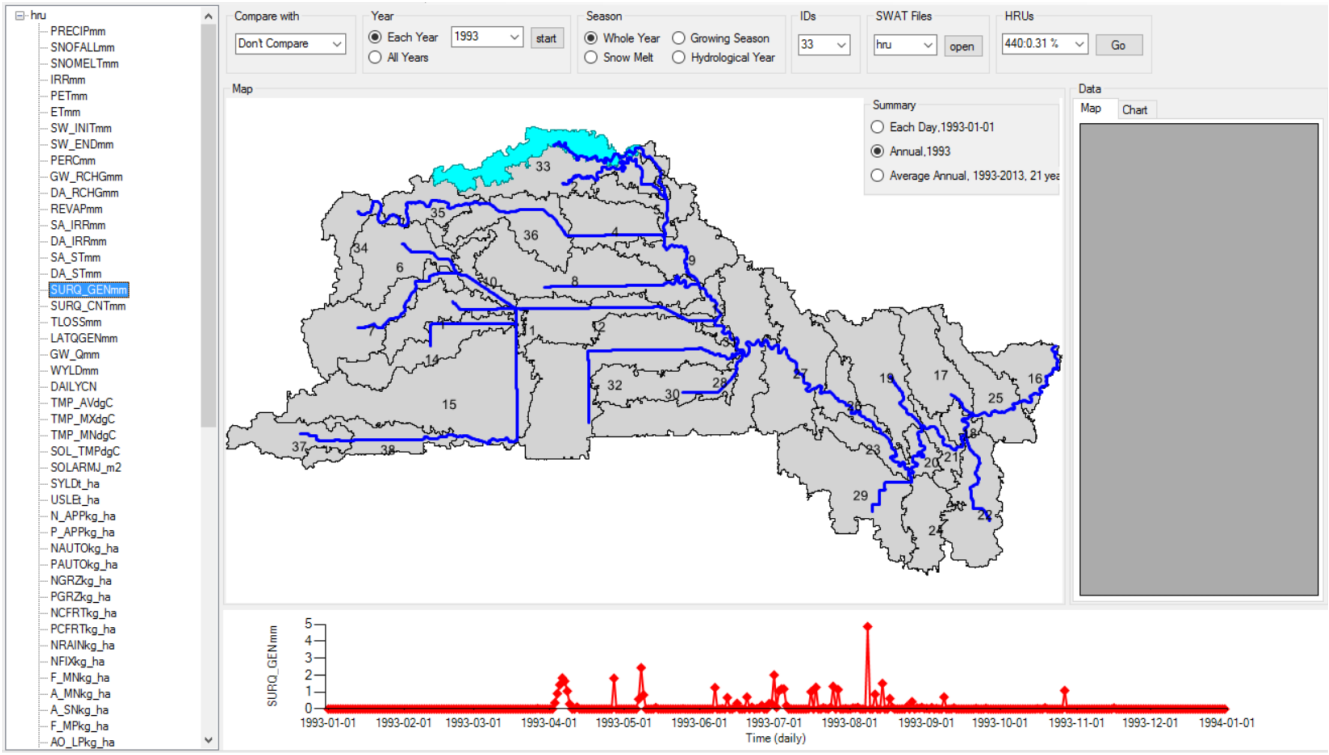


Figure 4-7. HRU View

• Subbasin View – Time series graph and thematic map for subbasin outputs (output.sub)

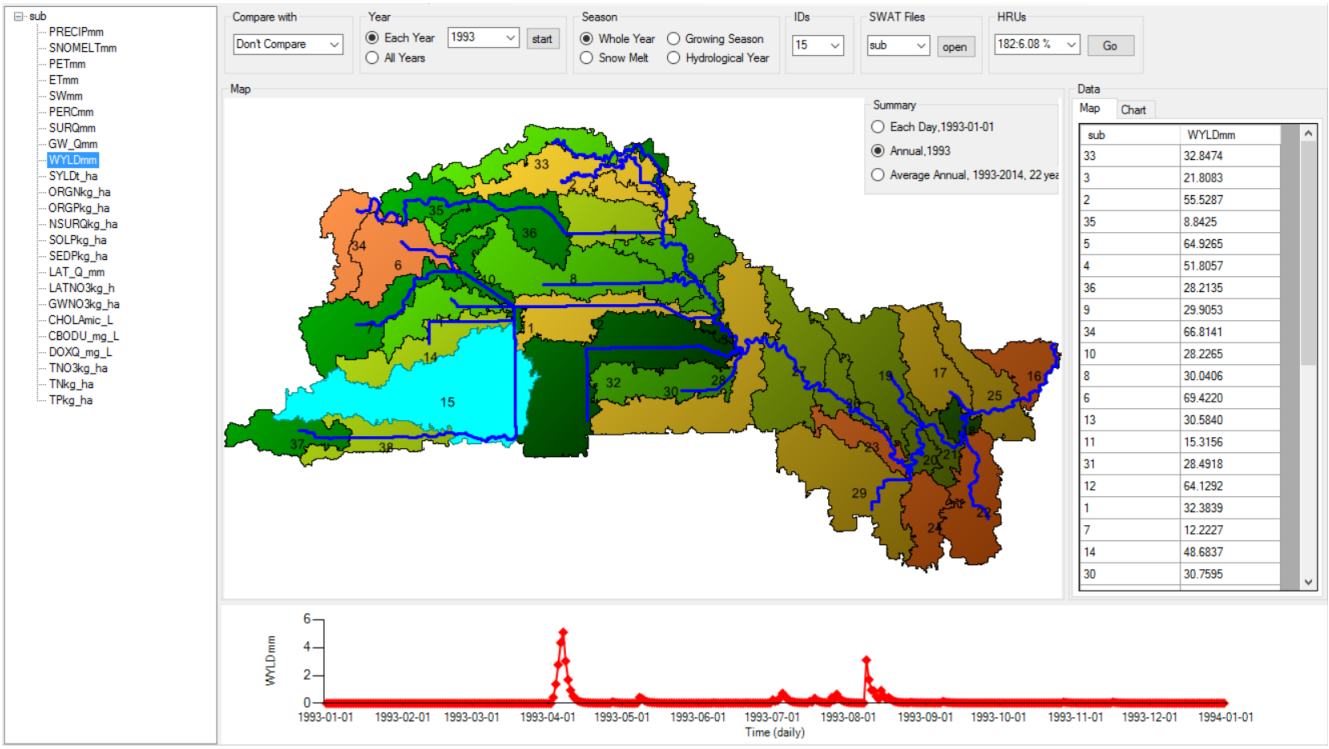


Figure 4-8. Subbasin View

- Reach View – Time series graph and thematic map for reach outputs (output.rch, output.sed)

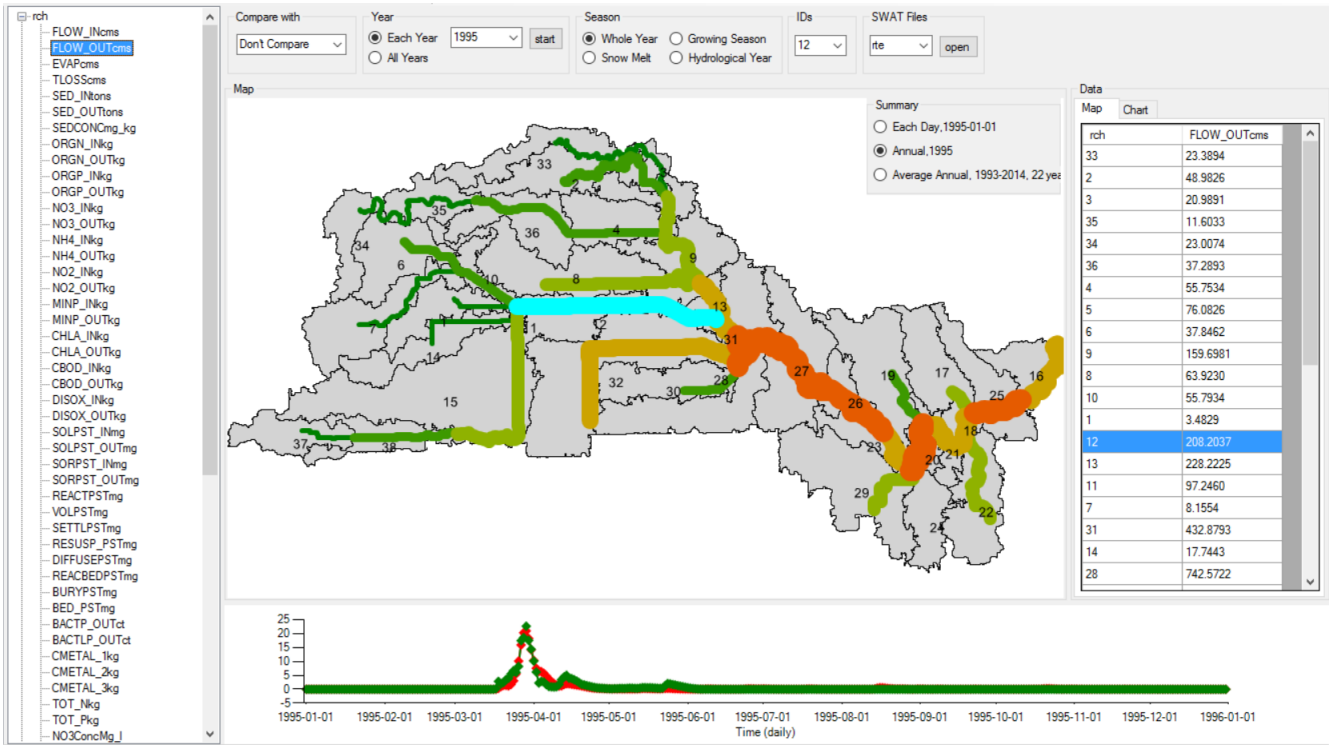


Figure 4-9. Reach View

- Reservoir View – Time series graph for reservoir outputs (output.rsv)

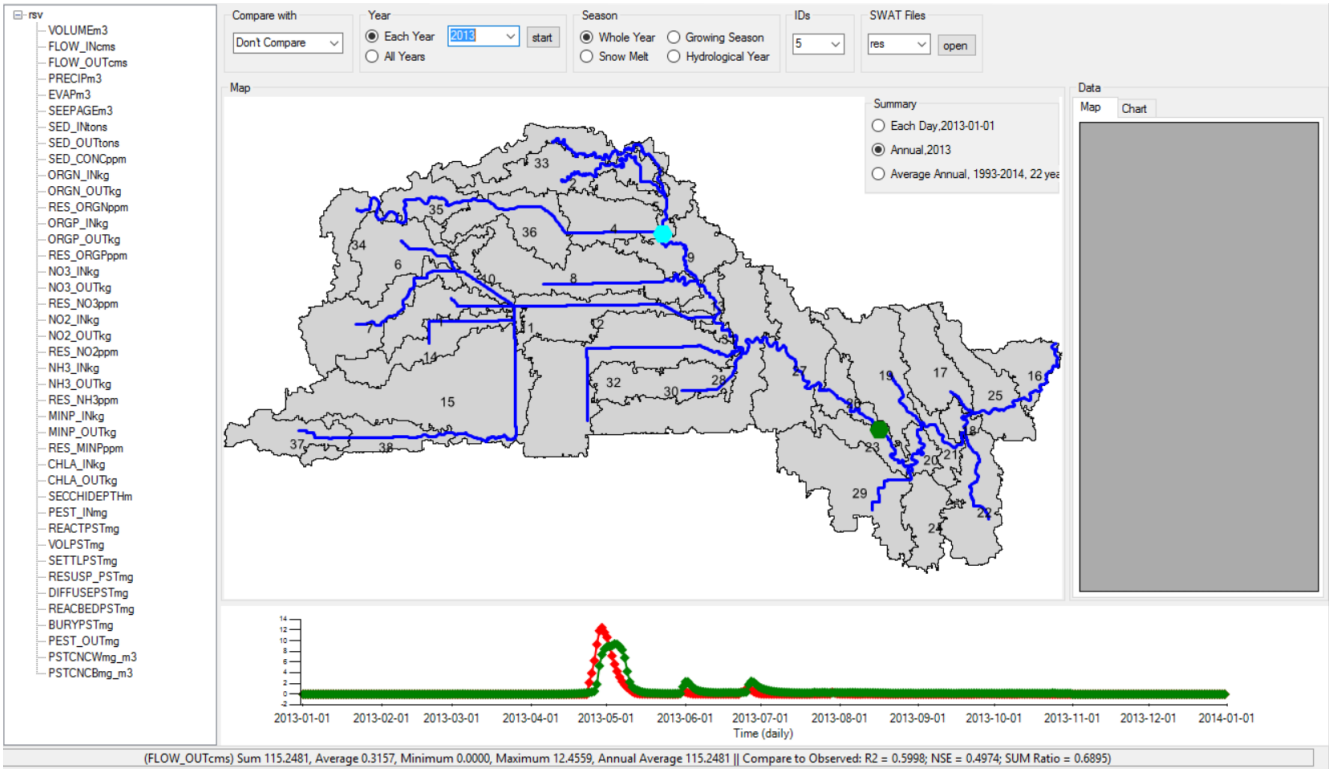


Figure 4-10. Reservoir View

- Difference View – Compare outputs of same components from different model or scenarios. R2 is given as the indicator how different they are.

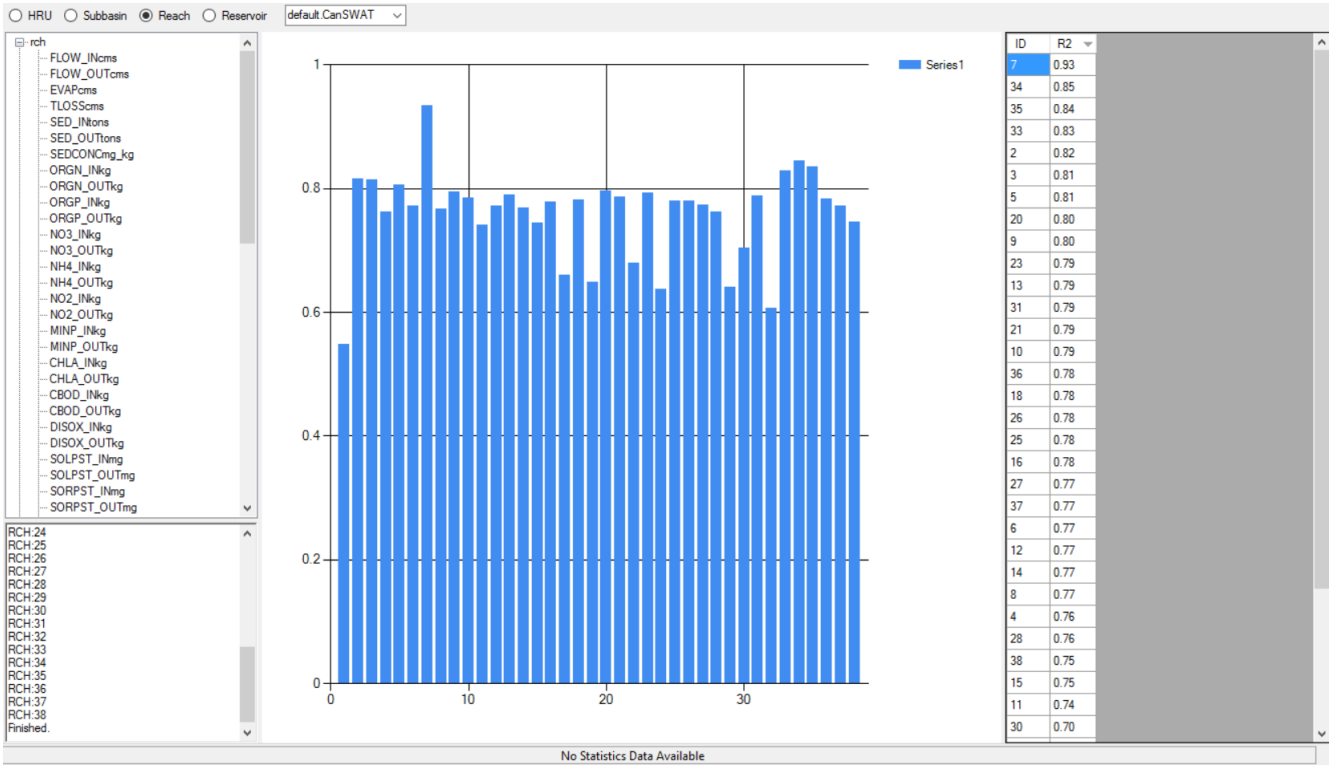
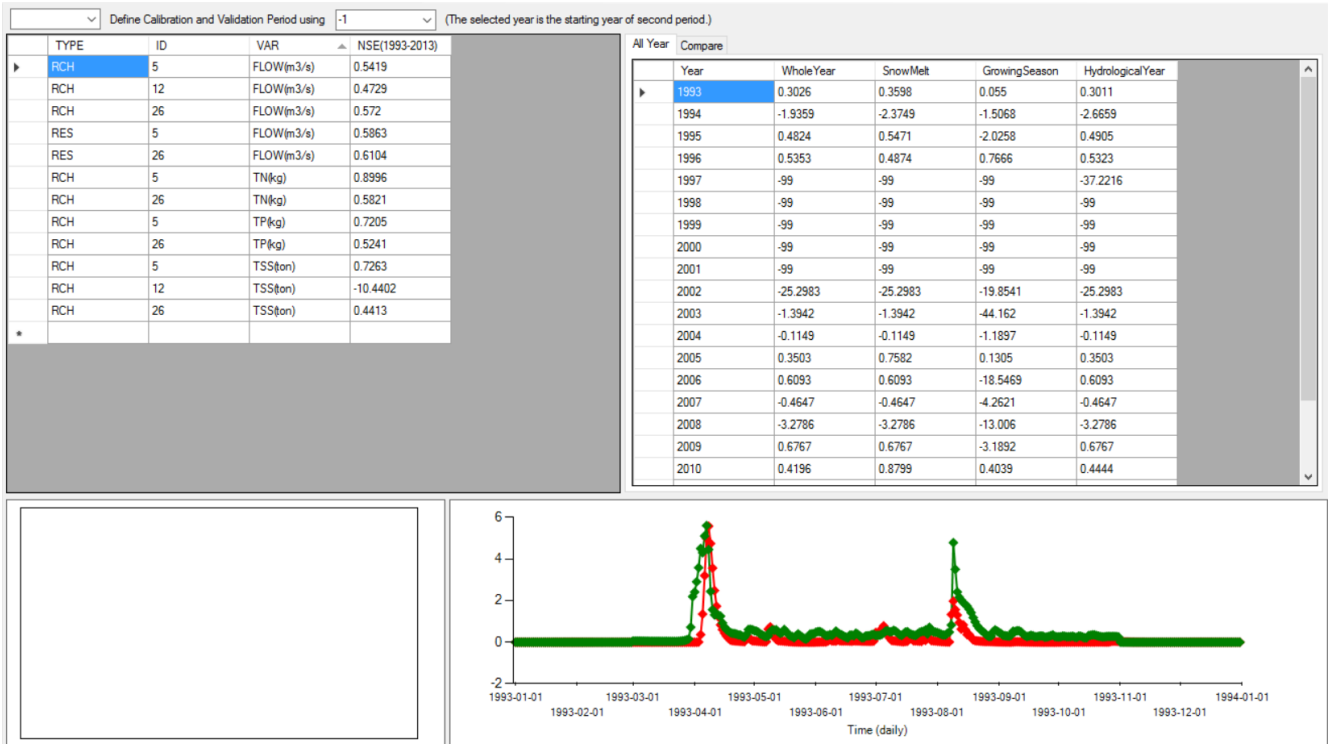


Figure 4-11. Difference View

- Performance View – Show various performance statistic (NSE, bias, RMSE, etc.)



TYPE	ID	VAR	NSE(1993-2013)
RCH	5	FLOW(m3/s)	0.5419
RCH	12	FLOW(m3/s)	0.4729
RCH	26	FLOW(m3/s)	0.572
RES	5	FLOW(m3/s)	0.5863
RES	26	FLOW(m3/s)	0.6104
RCH	5	TN(kg)	0.8996
RCH	26	TN(kg)	0.5821
RCH	5	TP(kg)	0.7205
RCH	26	TP(kg)	0.5241
RCH	5	TSS(ton)	0.7263
RCH	12	TSS(ton)	-10.4402
RCH	26	TSS(ton)	0.4413

Year	WholeYear	SnowMelt	GrowingSeason	HydrologicalYear
1993	0.3026	0.3598	0.055	0.3011
1994	-1.9359	-2.3749	-1.5068	-2.6659
1995	0.4824	0.5471	-2.0258	0.4905
1996	0.5353	0.4874	0.7666	0.5323
1997	-99	-99	-99	-37.2216
1998	-99	-99	-99	-99
1999	-99	-99	-99	-99
2000	-99	-99	-99	-99
2001	-99	-99	-99	-99
2002	-25.2983	-25.2983	-19.8541	-25.2983
2003	-1.3942	-1.3942	-44.162	-1.3942
2004	-0.1149	-0.1149	-1.1897	-0.1149
2005	0.3503	0.7582	0.1305	0.3503
2006	0.6093	0.6093	-18.5469	0.6093
2007	-0.4647	-0.4647	-4.2621	-0.4647
2008	-3.2786	-3.2786	-13.006	-3.2786
2009	0.6767	0.6767	-3.1892	0.6767
2010	0.4196	0.8799	0.4039	0.4444

Figure 4-12. Performance View

Status Bar

Status bar is located at bottom of the interface. It shows there type of information.

- The year selected as the time range of outputs;
- The basic information of selected SWAT component;
- The statistics for current time series data. If only one time series is available, sum, average, min and max is displayed. If more than one time series data (observed and/or comparison) is available, R2 and NSE is also displayed.

Importing Observed Data

Observed data is important for model calibration. The most common observed data is flow. Sometimes, the water quality is also available. SWAT Output Viewer has the ability to display observed data with model outputs in the same graph and calculate performance statistics.

The observed data is imported in Project View, where the map of the watershed is given to select a reach or a reservoir that has observed data available. By default, all reaches and reservoirs are in blue as shown in Figure 5-1.

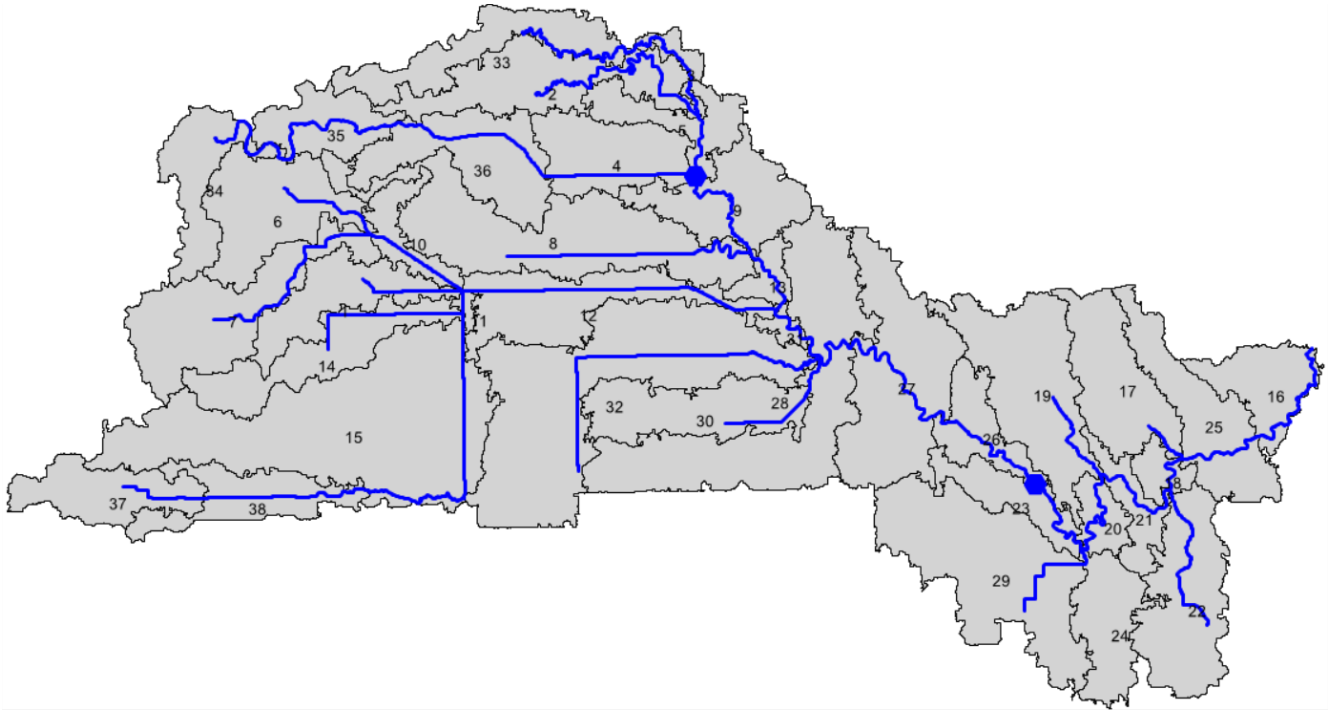


Figure 5-1. Watershed Map in Project View

- To select a reach or a reservoir, click the Select tool in the toolbar and click the desire reach or reservoir on map. The reach/reservoir will be highlight on map and the variable list in Observation section (located on right) becomes enabled. This list gives all available variables (flow, TSS, TN and TP) that could be linked to observed data.

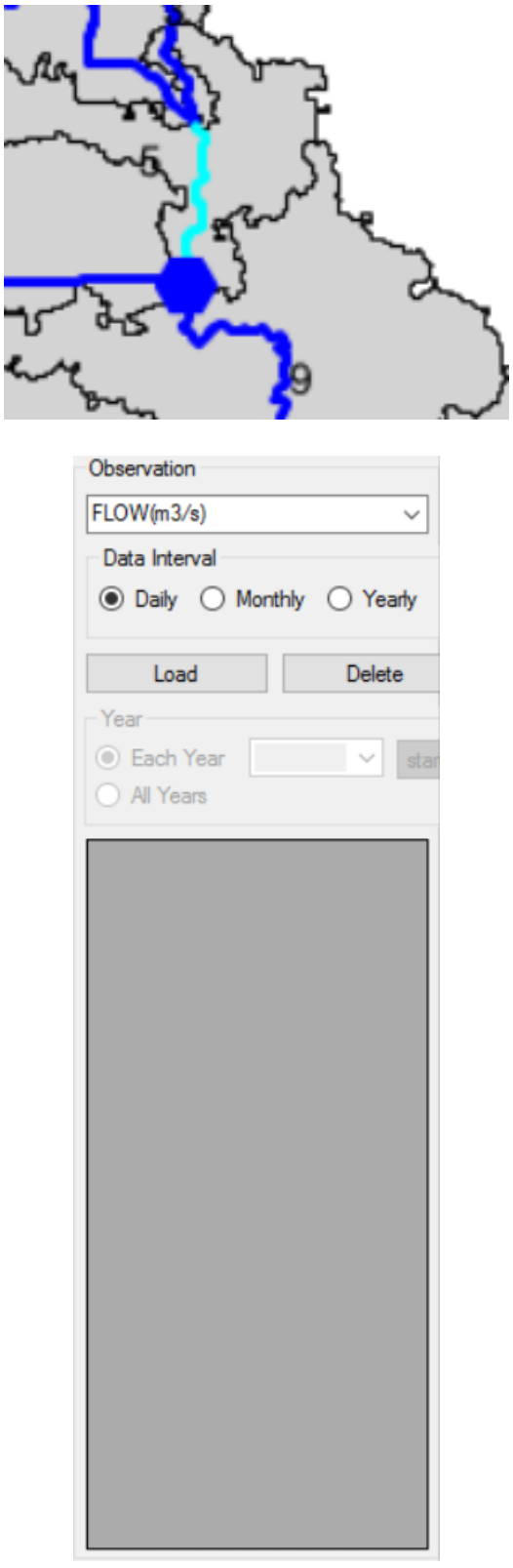


Figure 5-2. Map Selection and Variable List in Project View

- Select right variable the observed data would be linked to. Make sure they are using same unit. And then select data interval the observed data used. By default, daily is selected, which means the observed

data will be compared to daily outputs.

- Click Load button to open the observed data file. Currently, only csv file is supported. The csv file should have two columns: date and data value. The first row is assumed to be column name and will not be read. The date format is given in Table 5-1, where yyyy is year, mm is month and dd is day.

Table 5-1 Date Format for Observed Data

- A confirmation message window appears once the data is imported successfully and the data would be shown in graph located at bottom. The data is also shown in the table on the right. By default, all data is displayed. Data of certain year could be displayed by select Each Year. A simple statistic information is also shown in status bar. After the reach/reservoir has observed data, the map feature would become red.

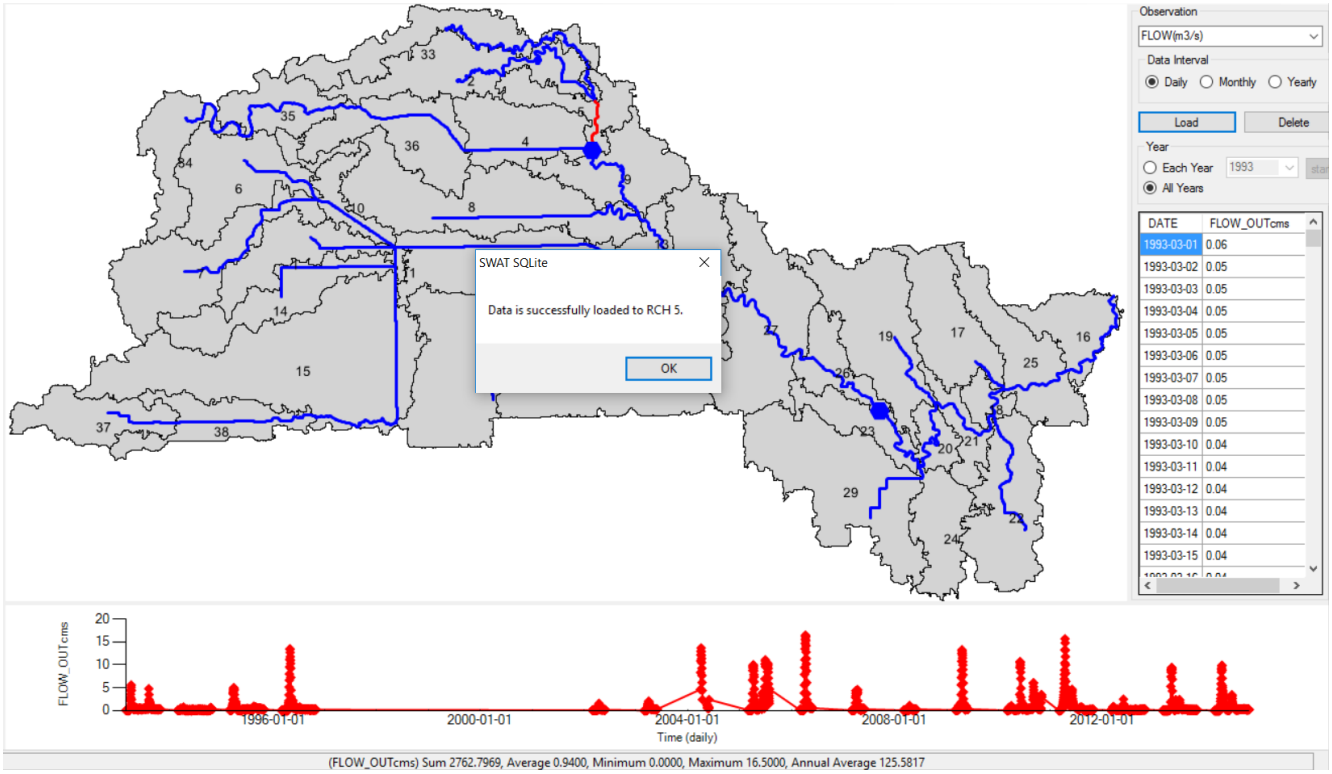


Figure 5-3. Confirmation Message and Time Series Graph in Project View

- Continue to add more observed data to other reaches or reservoirs.

The imported data is saved in a database located in Scearios folder. Separate databases are created for daily, monthly and yearly observed data. The data is only required to be imported once. It will be read automatically from the database.

Running Simulation

To run simulation for one scenario, select the scenario in Project Explorer first and then click one of the three run buttons located on top of the scenario view. The all run the model but generate outputs in different time interval.

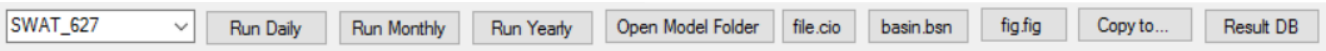


Figure 6-1. Function Buttons in Scenario View

A different model engine could be selected from model engine list if available. To add a model engine, copy the executable file to swat_exes folder located in installation folder. The default model engine is SWAT v627. Note that this is not the original model engine that would generate output files. It has been modified to generate results in database.

When the model starts to run, information would be shown in the text box in the main view to tell the progress.

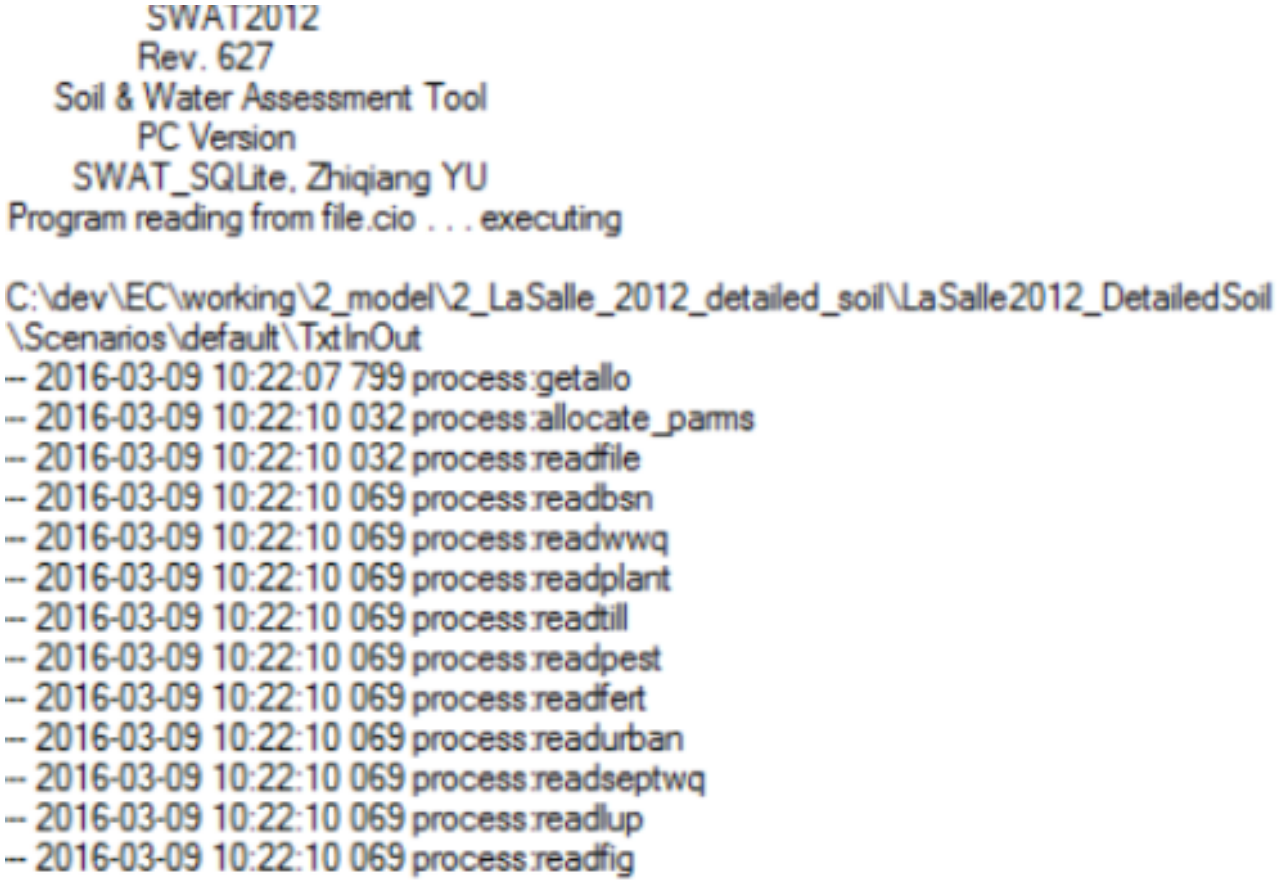


Figure 6-2. Model Simulation Progress Message in Scenario View

Once the model simulation finish successfully, the Project Explorer will be refreshed to add output nodes in the scenario node. It’s ready to view the outputs.

Viewing Outputs

Views for SWAT Outputs

In SWAT Output Viewer, SWAT outputs are displayed in several views based on the type of model component or level it belongs to. Table 7-1 lists all the SWAT output files and the view to display it in SWAT Output Viewer. All the outputs are categorized into five groups (watershed, HRU, subbasin, reach and reservoir). Each group has a corresponding view in SWAT Output Viewer for data display.

Table 7-1. SWAT Output Files and Corresponding Views in SWAT Output Viewer

Layout of Views

Except for watershed view, all other four views are using the same layout as shown in Figure 7-1. The view is comprised of five information panels: 1) Variable List, 2) Control Bar, 3) Map, 4) Table and 5) Graph.

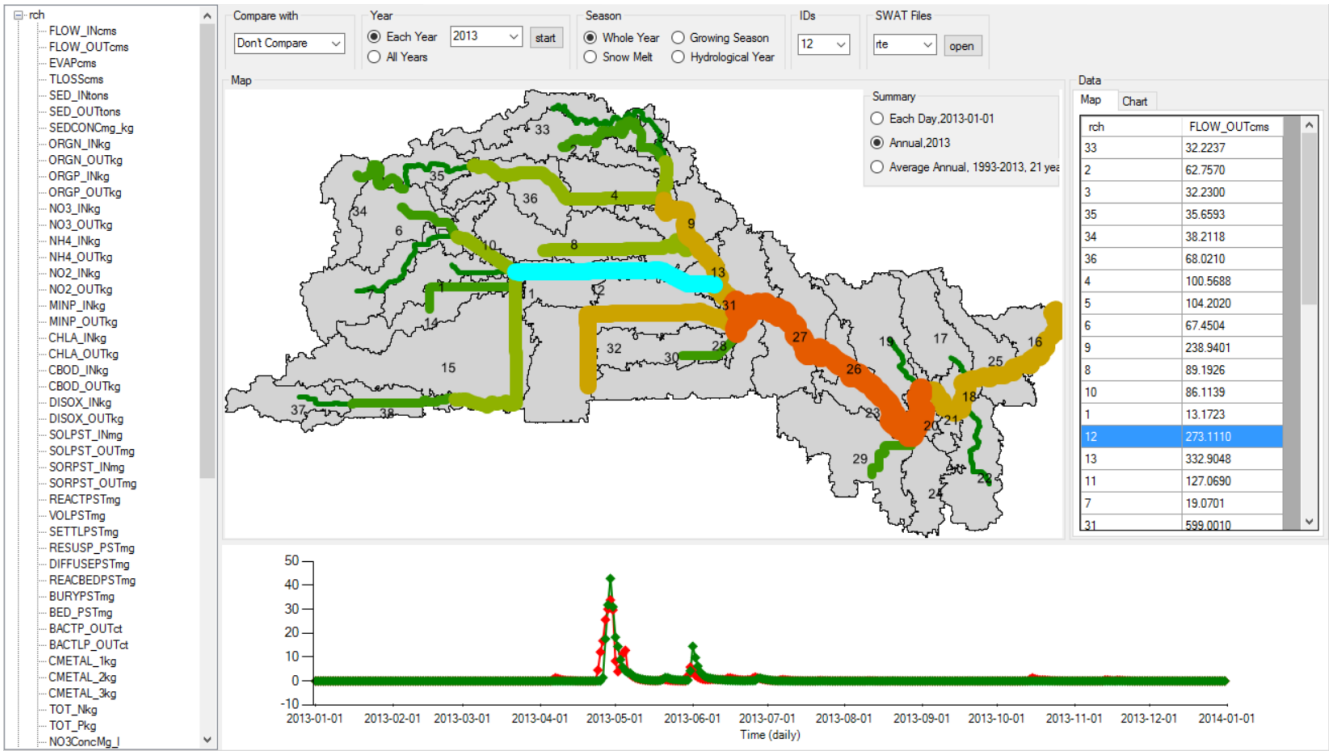


Figure 7-1. Layout of Reach View

Variable List

Variable List is used to define which output variable will be displayed. It lists all available output variables in a tree structure. The first level is the extension of the SWAT output file, such as rch and sub. All output variables in that file are list in the second level. From Table 7-1, HRU view has the ability to show outputs from six output files. So it may have six first level nodes. Reach view may have two (rch and sed). Subbasin and reservoir view would only have one.

Control Bar

Control Bar controls how the data is displayed.

Defining Time Range

The time period of time series data could be defined with Year and Season section. For a daily model running for several years, generally it's a good idea to see the outputs year by year. This could be done by select the Each Year option and select the year. It's also possible to go through all years by click the start button.

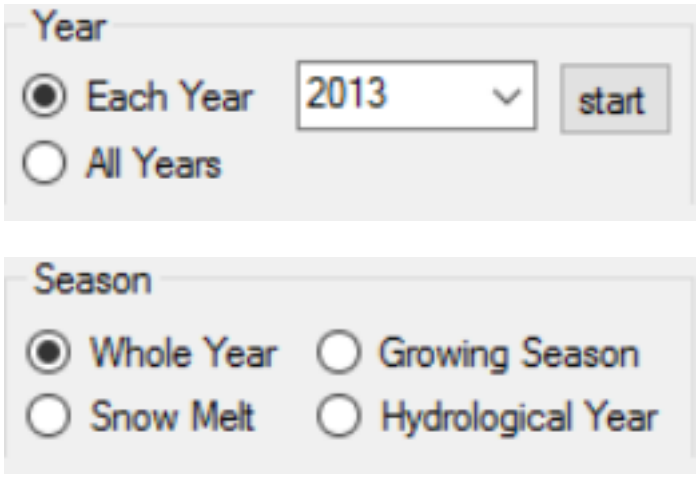


Figure 7-2. Year and Season Control in Control Bar

Season is a pre-defined time period in one year. It help to see the model behavior in certain time period. Four seasons are available in current version: 1) Whole Year (Jan – Dec), 2) Growing Season (May - Oct), 3) Snow Melt (Mar – May) and 4) Hydrological Year (Oct – Sep). Once one season is selected, only data in that time range will be displayed in graph. An example is shown in Figure 7-3, where year is 2013 and snow melt is selected.

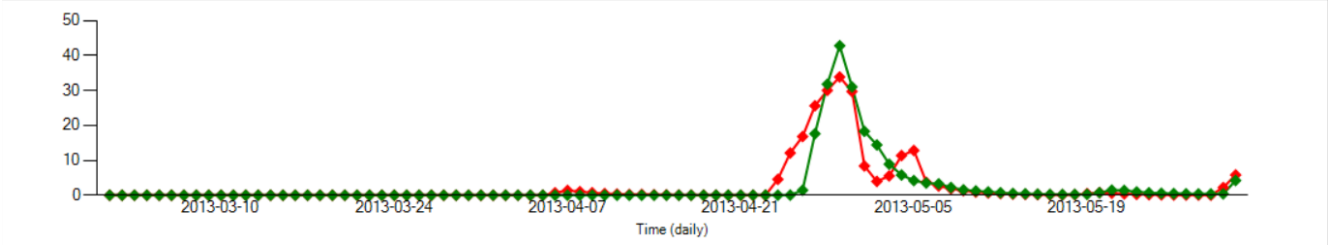


Figure 7-3. Graph for Reach Flow in 2013 Snow Melt Period

Selecting SWAT Component

The IDs list could be used select the model component for time series data display. The ID of all available SWAT components are list in the list. And this list is synced with map selection, i.e. the selection in IDs list and the selection on map will change each other. Although it's generally easier to make the selection on

map, it’s easier to use the IDs list when you don’t know the location of a specific component.

Figure 7-4. IDs List in Control Bar

Once a SWAT component is selected, its key information is displayed in the status bar as shown in Figure 7-5. The main information displayed is area (HRU and subbasin) or drainage area (reach).

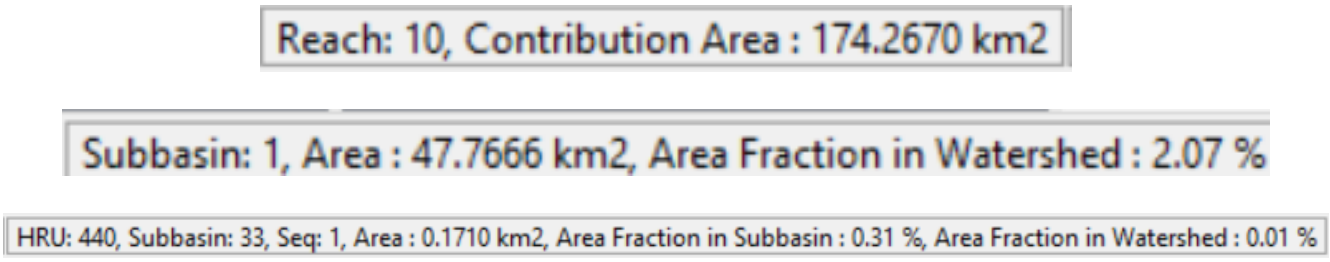


Figure 7-5. SWAT Component Inform in Status Bar

Viewing and Editing Model Files

The SWAT Files section gives the opportunity to open model files for selected model component. As there may be more than one model files, a list is given to specify the extension of the file. This could be used to make sure changes to parameters are applied. Minor changes could be also made here.

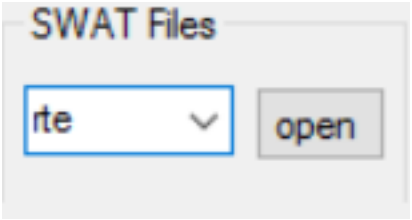


Figure 7-6. SWAT Files in Control Bar

Defining Comparison Outputs

The Compare with section allows to add comparison dataset to the time series graph. The available comparison dataset includes 1) outputs from different scenarios but with same model engine and 2) outputs generated with different model engine on same scenario. It could be used to find the different between these two datasets.

As shown in Figure 7-7, the available outputs is shown in the drop list if there are some available. To distinguish them, they are named with the scenario name and model engine name.

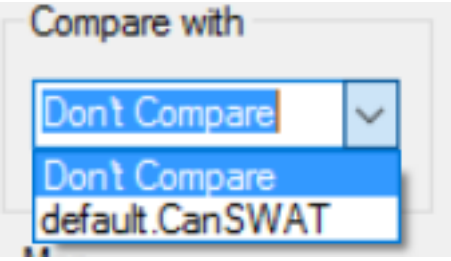


Figure 7-7. Compare with Section in Control Bar

Once the comparison outputs are selected, its data would be displayed in graph along with the original outputs as shown in Figure 7-8. Notice that the original outputs are in red and the comparison outputs are in blue. With this selection, the statistic between these two time series data would also be calculated and shown in status bar as shown in Figure 7-9, where SUM Ratio is the ratio of summation of data points in original datasets to the summation of data point in comparison datasets. In the given example, the original dataset is only 10% of the comparison dataset.

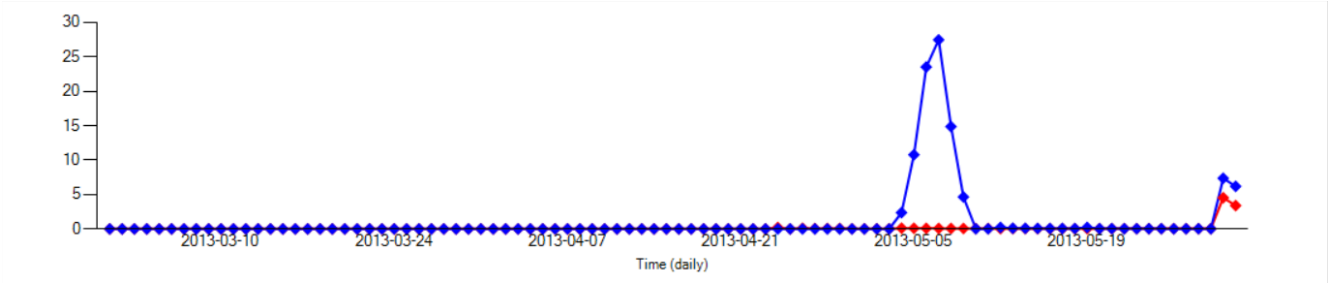


Figure 7-8. Graph Showing Time Series Data with Comparison Dataset

Figure 7-9. Statistics for Original and Comparison Dataset

For SWAT components with observed data, the comparison outputs would be displayed along with the original outputs and the observed datasets which are in green as shown in Figure 7-10. This would help identify which outputs are more close to observed data.

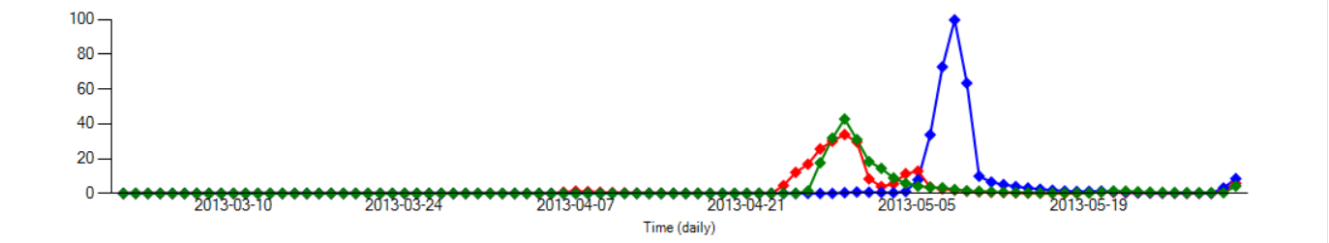


Figure 7-10. Graph Showing Time Series Data with Comparison and Observed Dataset

Map

Map is used to 1) select SWAT model components and 2) show the spatial distribution of selected variable in selected time range with different symbols.

Data Source

The shapefiles located at Watershed\Shapes folder are utilized as the data source for the map display. They are generated automatically in the model creation process. If they are deleted for some reason, the map couldn’t display properly.

The subbasin and reach layer is available from the shapefiles. But reservoir layer is not there. To display reservoir layer, it’s required to generate a shapefile with name monitoring_points2.shp from the MonitoringPoint feature class in project database.

Selecting Model Component on Map

Model component could be select on map (except for HRU). To select a SWAT component, click where it’s located on the map. If the selection is made successfully, the selected feature will be highlighted. To make selection precisely, only the corresponding layer is selectable, e.g. only subbasin layer is selectable in subbasin view.

As described in Selecting SWAT Component in Control Bar, the selection made on map is synced with selection made with IDs list.

Thematic Map

A thematic map is automatically generated with data from selected variable of selected subbasin and reach. With different symbols, the thematic map shows the spatial distribution of select variable, which would help identify 1) potential issues in current model and 2) key locations for targeting BMPs.

In subbasin view, the subbasins are rendered from green to red for values from low to high as the one shown in Figure 7-11.

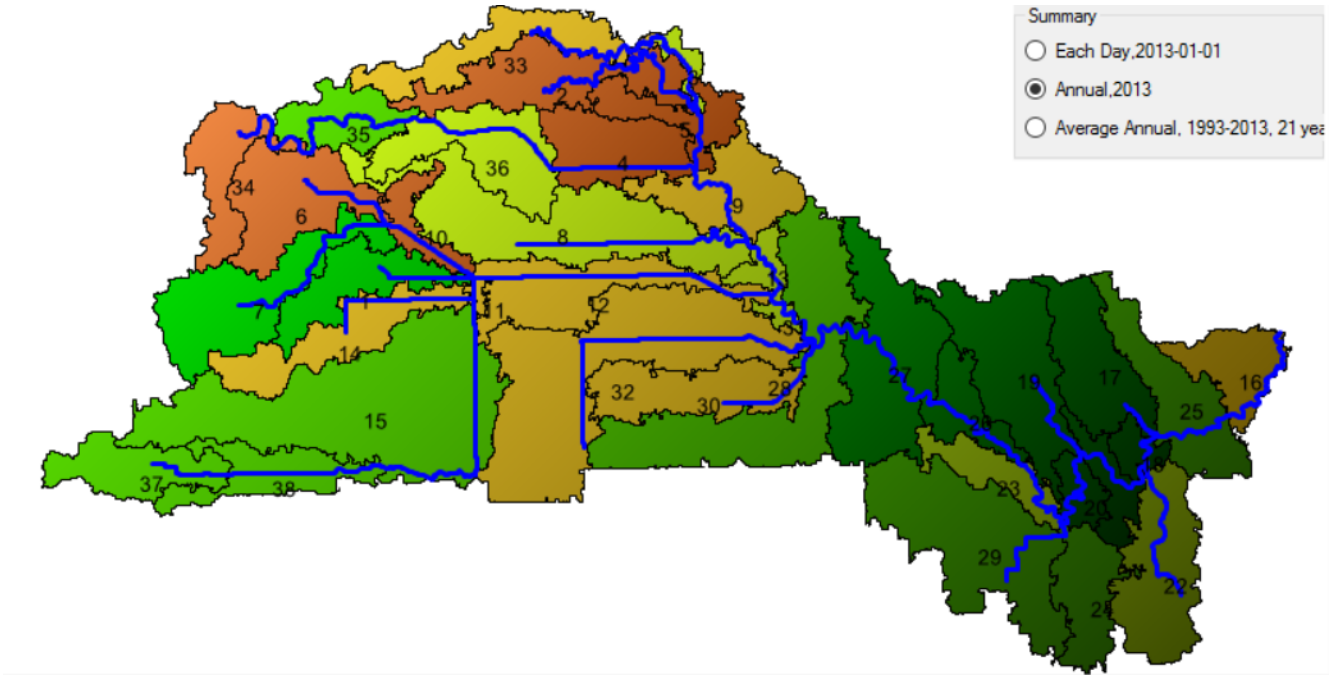


Figure 7-11. Subbasin Thematic Map for Water Yield in 2013

In reach view, reaches are drawn with different color and thickness to show how the selected variable change in the reach network.

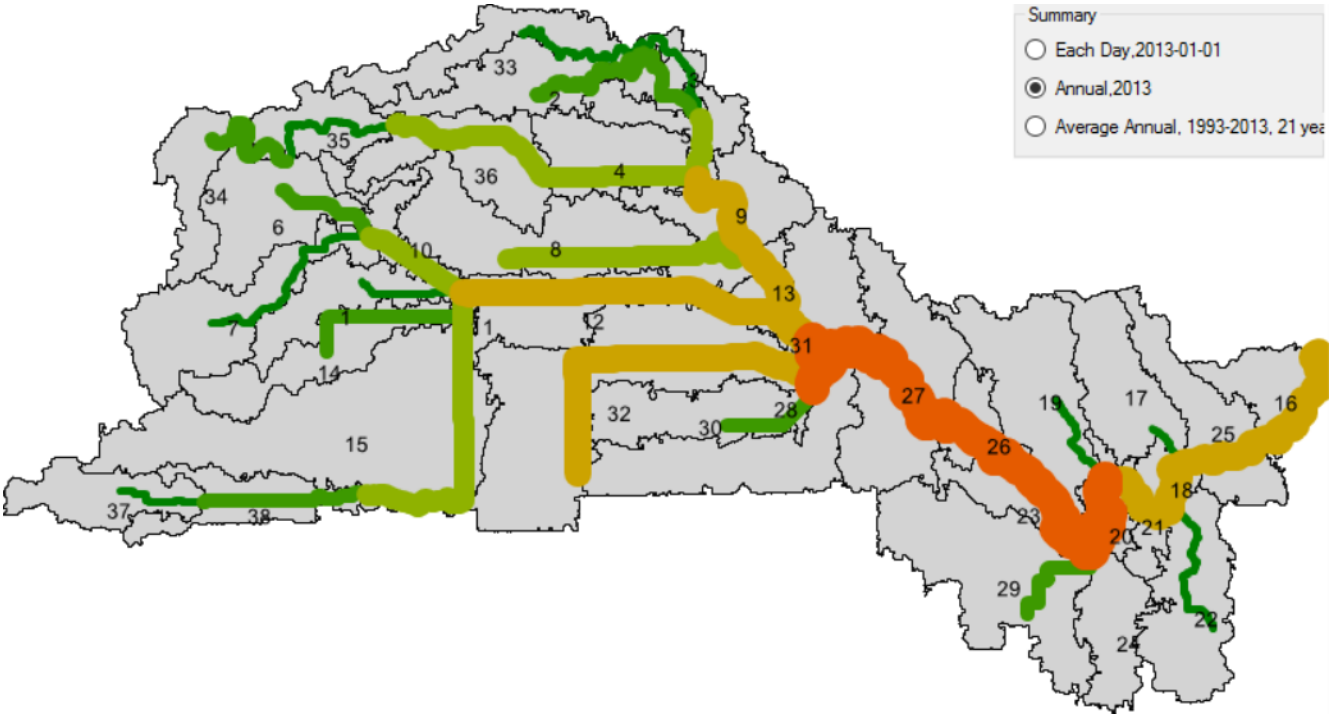


Figure 7-12. Reach Thematic Map for Flow in 2013

The thematic map supports three types of data: 1) Each day, 2) Annual and 3) Average Annual, which could be selected with the Summary control panel (Figure 7-13) located at right top corner of the map. They

define how the data is summarized and then displayed on map.

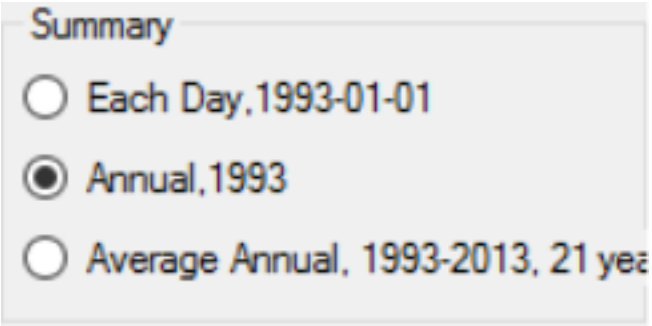


Figure 7-13. Thematic Map Data Summary Control Panel

Each day option renders the map with the data of selected day. The day could be selected from the Chart Table on right.

Annual option summarized the data for given year first and then displays on map. For loads, summation is used. For concentration, average is used. This is the default option.

Average Annual option calculates the average annual value for all available years and the displays on map.

The dataset for the thematic map could be checked out in Map Table (Figure 7-14) located at right of the map, where the data could be sorted by double-clicking the column title.

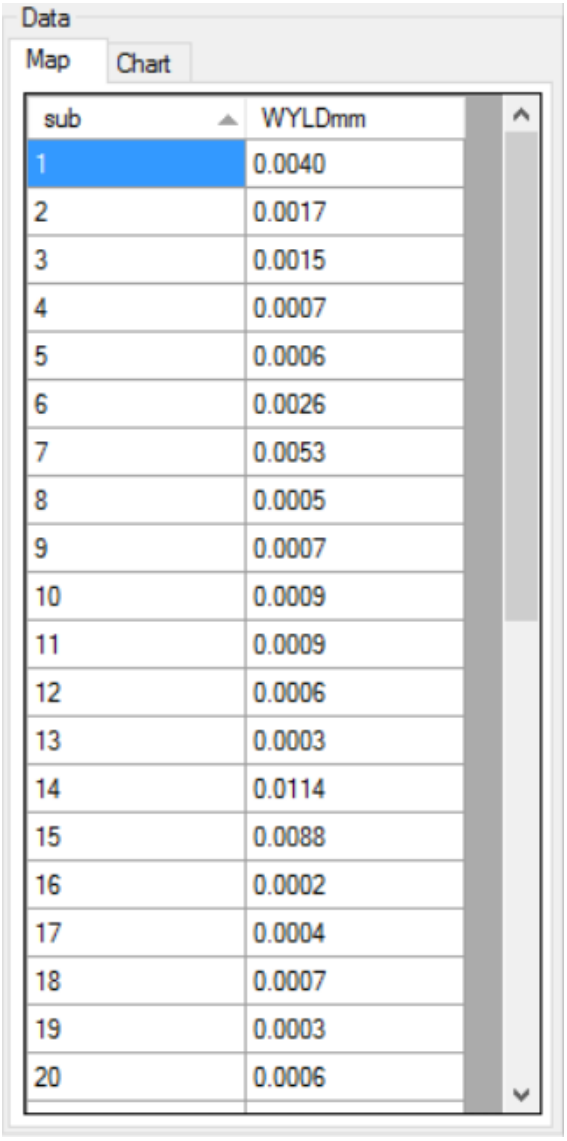


Figure 7-14. Thematic Map Data Table

The data could also be imported by selecting Export current results to CSV menu on the map.

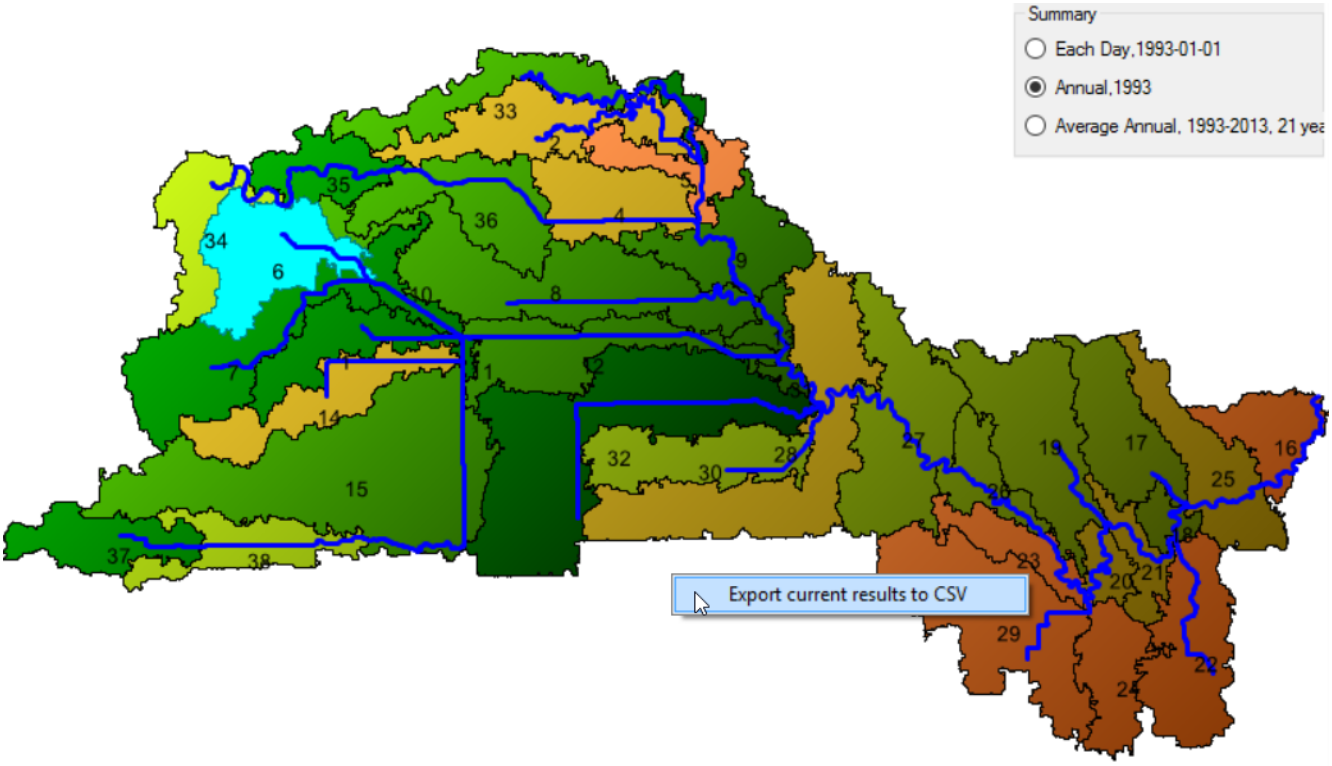


Figure 7-15. Export Current Results to CSV Menu for Thematic Map

Table

Table section show the time series data and the thematic map data in table. It has two tabs as shown in Figure 7-14. The Map tab shows the thematic map data and the Chart tab is for time series data shown in graph. Note that the Chart tab is empty in current version.

Graph

Graph shows the time series data in a graph as shown in Figure 7-16.

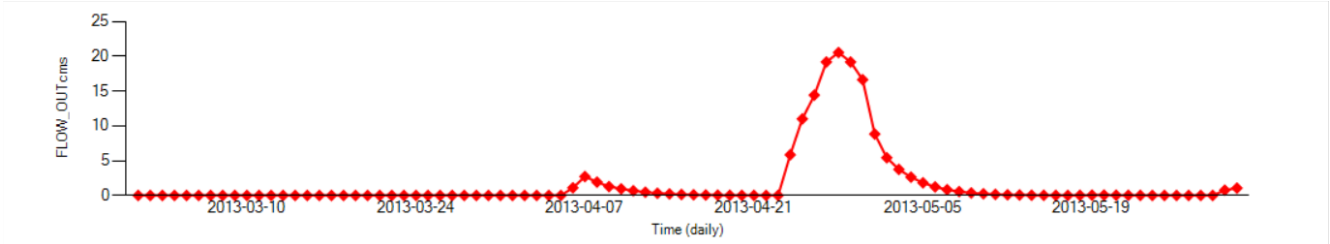


Figure 7-16. Time Series Graph

When observed data is available for selected SWAT component, the observed data (green) is also shown in the same graph (Figure 7-17). The observed data needs to be imported in project view. Once it's imported, it will be automatically added to the graph.

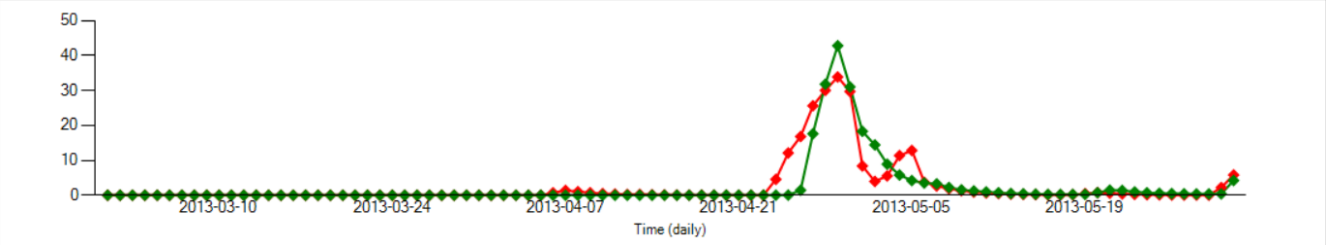


Figure 7-17. Time Series Graph with Observed Data

When comparison outputs are selected, the time series from comparison outputs are also added to the graph in blue (Figure 7-18).

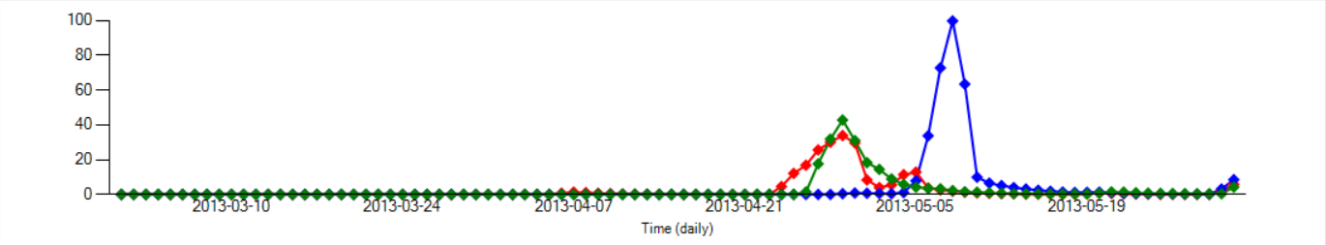


Figure 7-18. Time Series Graph with Observed Data and Comparison Outputs

The time series datasets could be downloaded by selecting Export current results to CSV menu. The exported file is saved in exports folder (in installation folder).

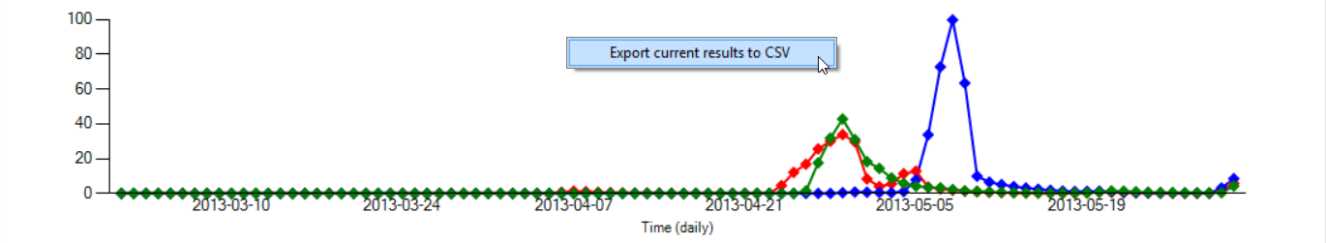


Figure 7-19. Export Menu in Time Series Graph

Steps to View Outputs

Time Series Data

To view time series data, follow following steps.

- Select the right node in Project Explorer, e.g. select Reach for reach outputs and Subbasin for subbasin outputs.
- Select the right variable in Variable List. The name of variables is similar to the column name used in SWAT output files. If one is not there, check file.cio to make sure that variable is not ignored. By default, HRU outputs are not generated.

- Select the SWAT component from IDs list or on map.
- Change the time range of the time series data by changing year and season.
- If available, select comparison outputs for comparison.

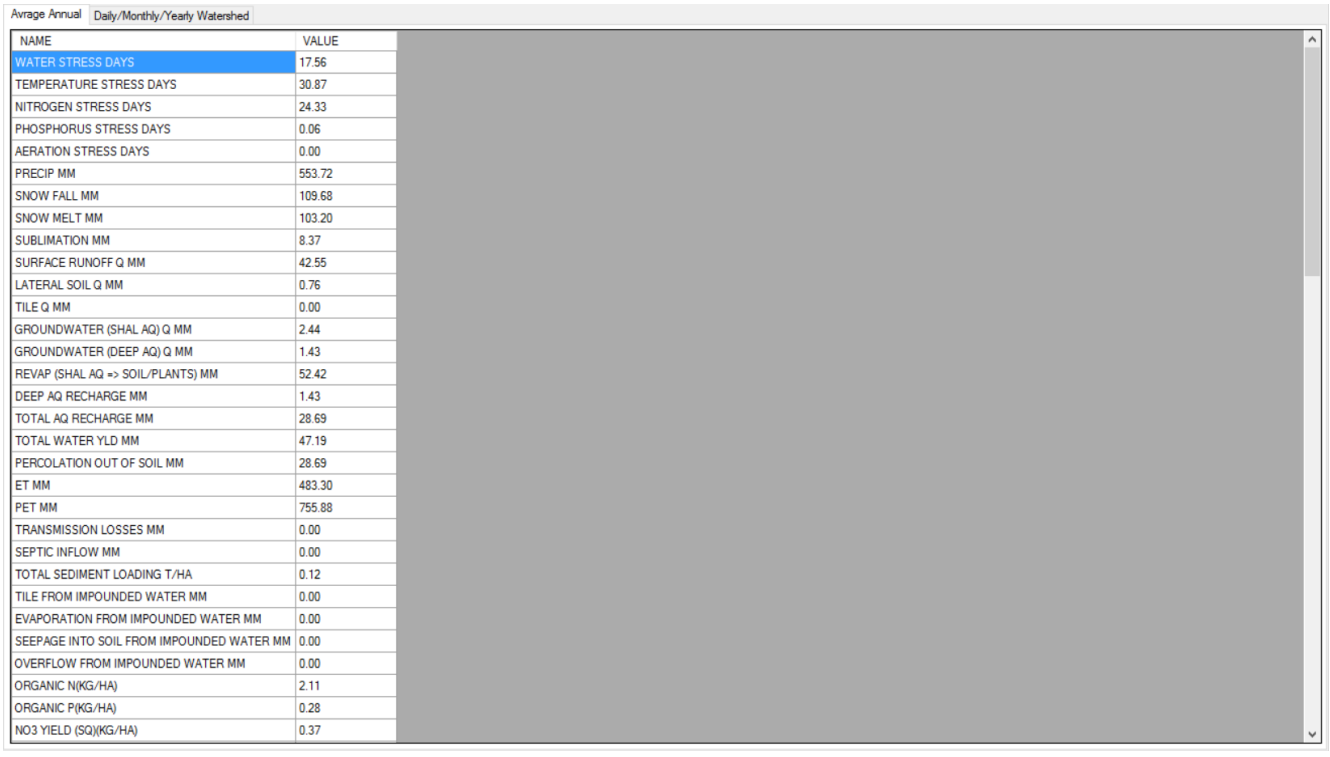
Thematic Map

To view thematic map, go with following steps.

- Select type of data and variable in Project Explorer and Variable List same as step 1 and 2 in viewing time series data.
- Change year for data of that year.
- Change the option for summary method to switch the data between different thematic maps.

Viewing Watershed-level Summaries

There are two tabs available in Watershed View. The Average Annual gives the average annual for the whole watershed.



NAME	VALUE
WATER STRESS DAYS	17.56
TEMPERATURE STRESS DAYS	30.87
NITROGEN STRESS DAYS	24.33
PHOSPHORUS STRESS DAYS	0.06
AERATION STRESS DAYS	0.00
PRECIP MM	553.72
SNOW FALL MM	109.68
SNOW MELT MM	103.20
SUBLIMATION MM	8.37
SURFACE RUNOFF Q MM	42.55
LATERAL SOIL Q MM	0.76
TILE Q MM	0.00
GROUNDWATER (SHAL AQ) Q MM	2.44
GROUNDWATER (DEEP AQ) Q MM	1.43
REVAP (SHAL AQ => SOIL/PLANTS) MM	52.42
DEEP AQ RECHARGE MM	1.43
TOTAL AQ RECHARGE MM	28.69
TOTAL WATER YLD MM	47.19
PERCOLATION OUT OF SOIL MM	28.69
ET MM	483.30
PET MM	755.88
TRANSMISSION LOSSES MM	0.00
SEPTIC INFLOW MM	0.00
TOTAL SEDIMENT LOADING T/HA	0.12
TILE FROM IMPOUNDED WATER MM	0.00
EVAPORATION FROM IMPOUNDED WATER MM	0.00
SEEPAGE INTO SOIL FROM IMPOUNDED WATER MM	0.00
OVERFLOW FROM IMPOUNDED WATER MM	0.00
ORGANIC N(KG/HA)	2.11
ORGANIC P(KG/HA)	0.28
NO3 YIELD (SQ)(KG/HA)	0.37

Figure 7-20. Average Annual Outputs in Watershed View

The Daily/Monthly/Yearly Watershed gives more detailed data in daily, monthly and yearly. Select the variable in the tree view on the left, the data will be shown in graph and table. For daily and monthly data, it's also possible to view the data year by year by choosing the Each Year option and selecting the year in

the drop down list.

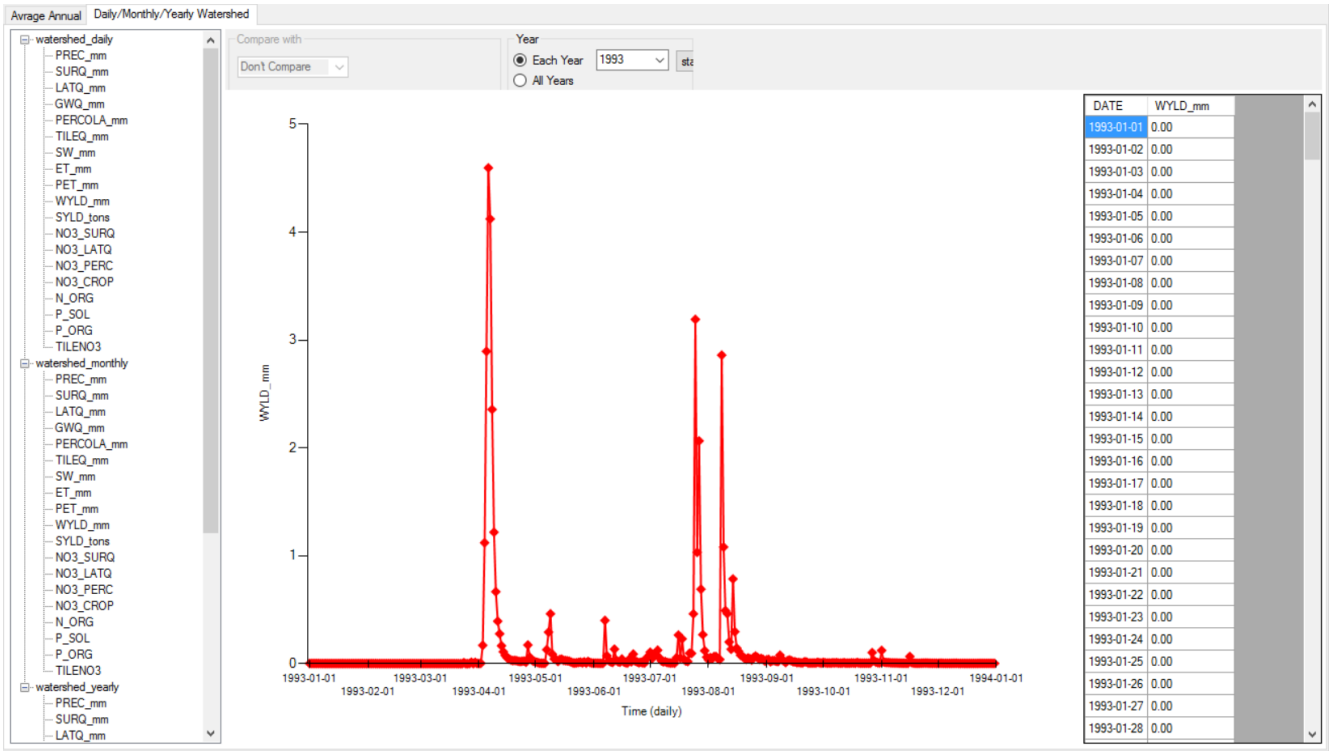


Figure 7-21. Daily, Monthly and Yearly Outputs in Watershed View

While the data is shown in graph and tables, some of the statistic information is also shown in the status bar.

Figure 7-22. Time Series Statistics for Watershed View

Comparing with Other Model Engine or Scenario

The impact of different engine and scenario could be evaluated in Difference View (Figure 8-1). R2 is used as the indicator for difference.

To check the difference for a variable, first select the variable by choosing the type of SWAT component (HRU, Subbasin, Reach and Reservoir) and then select the variable from the Variable List. The interface will extract time series data from two outputs and then calculate R2 for all SWAT components. The results are shown in the graph and table. In graph, the x-axis is the ID of SWAT components and y-axis is R2. In the table, the SWAT components with most difference (smallest R2) could be found by double-clicking on column R2.

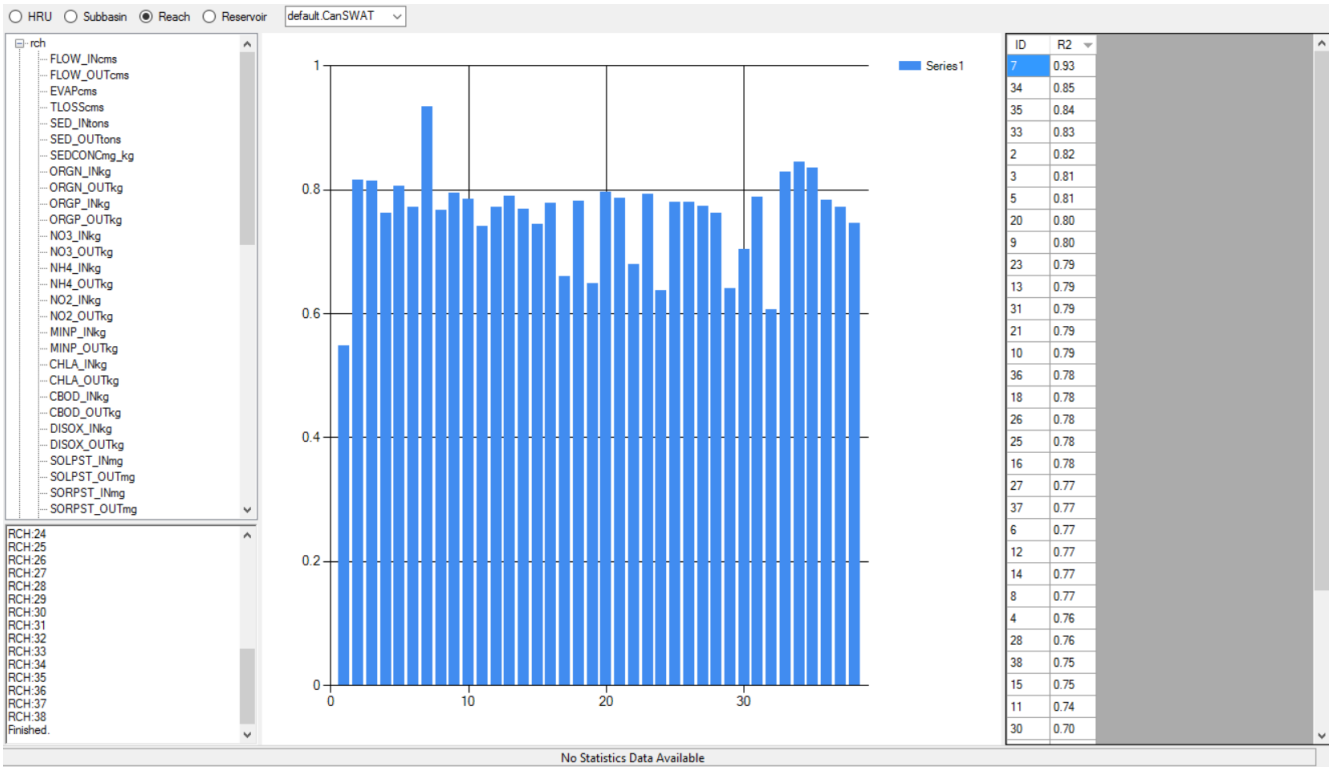
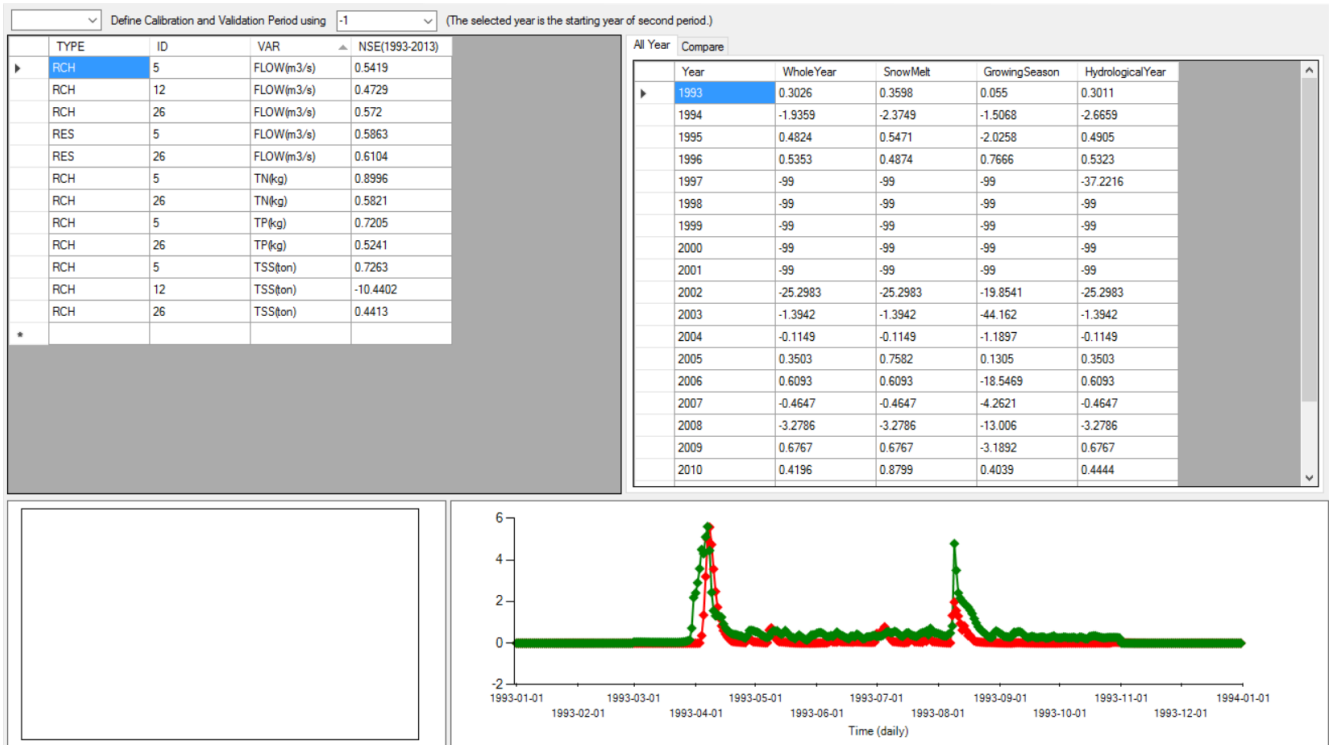


Figure 8-1. Difference View

Viewing Model Performance

The model performance statistics in subbasin, reach and reservoir view is only for selected subbasin, reach and reservoir. The performance view allows to view model performance statistics for all available locations. It's the perfect place for modellers when they are doing model calibration.

The performance view is shown in Figure 9-1.



TYPE	ID	VAR	NSE(1993-2013)
RCH	5	FLOW(m3/s)	0.5419
RCH	12	FLOW(m3/s)	0.4729
RCH	26	FLOW(m3/s)	0.572
RES	5	FLOW(m3/s)	0.5863
RES	26	FLOW(m3/s)	0.6104
RCH	5	TN(kg)	0.8996
RCH	26	TN(kg)	0.5821
RCH	5	TP(kg)	0.7205
RCH	26	TP(kg)	0.5241
RCH	5	TSS(ton)	0.7263
RCH	12	TSS(ton)	-10.4402
RCH	26	TSS(ton)	0.4413

Year	WholeYear	SnowMelt	GrowingSeason	HydrologicalYear
1993	0.3026	0.3598	0.055	0.3011
1994	-1.9359	-2.3749	-1.5068	-2.6659
1995	0.4824	0.5471	-2.0258	0.4905
1996	0.5353	0.4874	0.7666	0.5323
1997	-99	-99	-99	-37.2216
1998	-99	-99	-99	-99
1999	-99	-99	-99	-99
2000	-99	-99	-99	-99
2001	-99	-99	-99	-99
2002	-25.2983	-25.2983	-19.8541	-25.2983
2003	-1.3942	-1.3942	-44.162	-1.3942
2004	-0.1149	-0.1149	-1.1897	-0.1149
2005	0.3503	0.7582	0.1305	0.3503
2006	0.6093	0.6093	-18.5469	0.6093
2007	-0.4647	-0.4647	-4.2621	-0.4647
2008	-3.2786	-3.2786	-13.006	-3.2786
2009	0.6767	0.6767	-3.1892	0.6767
2010	0.4196	0.8799	0.4039	0.4444

Figure 9-1. Performance View

The Overall Performance section lists the value of selected performance statistic for all available SWAT components in a table. Selecting one row in this table, the performance for each year is given in Performance for each year section located on the right. Selecting one year, the corresponding time series data would be displayed in Time Series Graph, which is similar to the one in subbasin, reach and reservoir view.

Six performance indicators are supported in current version. They are NSE, R2, Bias, RMSE, (CV)RMSE and NRMSE. And the NSE is the default one. These indicators could be switched by using the Performance Indicator List located on top. Figure 9-2 shows overall performance table when R2 is selected.

	TYPE	ID	VAR	R2(1993-2013)
▶	RCH	5	FLOW(m3/s)	0.597
	RCH	5	TSS(ton)	0.7318
	RCH	5	TN(kg)	0.9323
	RCH	5	TP(kg)	0.8351
	RCH	12	FLOW(m3/s)	0.4839
	RCH	12	TSS(ton)	0.0895
	RCH	26	FLOW(m3/s)	0.6114
	RCH	26	TSS(ton)	0.6557
	RCH	26	TN(kg)	0.6213
	RCH	26	TP(kg)	0.6309
	RES	5	FLOW(m3/s)	0.6535
	RES	26	FLOW(m3/s)	0.6741
*				

Figure 9-2. R2 in Performance View

A year could be specified to divide the whole time range to two time periods. The performance for these two periods will be calculated and added to the overall performance table (Figure 9-3).

	TYPE	ID	VAR	NSE(1993-2013)	NSE(1993-2002)	NSE(2003-2013)
▶	RCH	5	FLOW(m3/s)	0.5419	0.436	0.5421
	RCH	5	TSS(ton)	0.7263	-99	0.7263
	RCH	5	TN(kg)	0.8996	-99	0.8996
	RCH	5	TP(kg)	0.7205	-99	0.7205
	RCH	12	FLOW(m3/s)	0.4729	0.5317	0.4474
	RCH	12	TSS(ton)	-10.4402	-99	-10.4402
	RCH	26	FLOW(m3/s)	0.572	0.549	0.5891
	RCH	26	TSS(ton)	0.4413	-99	0.4413
	RCH	26	TN(kg)	0.5821	-99	0.5821
	RCH	26	TP(kg)	0.5241	-99	0.5241
	RES	5	FLOW(m3/s)	0.5863	0.4366	0.5955
	RES	26	FLOW(m3/s)	0.6104	0.5989	0.619
*						

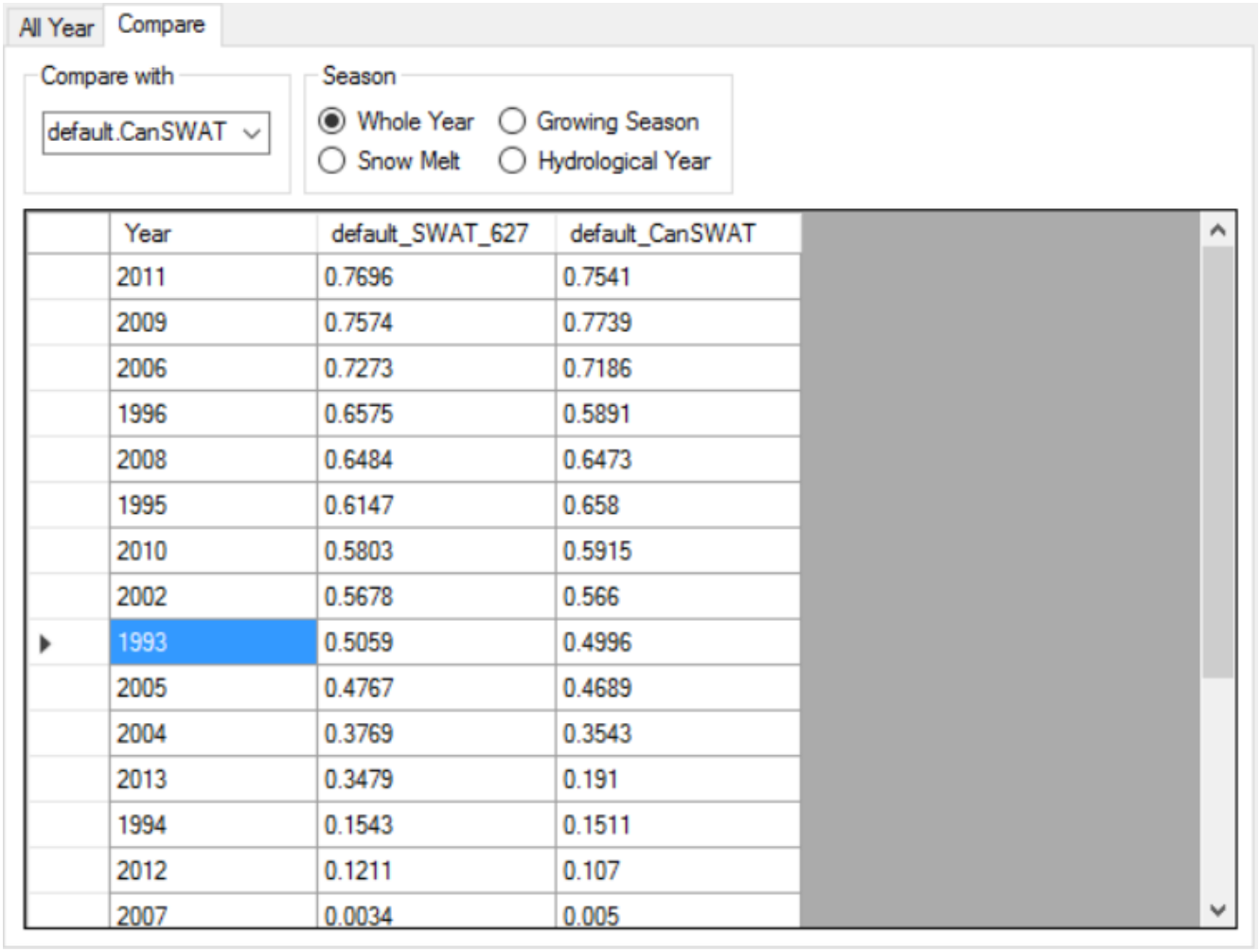
Figure 9-3. Over Performance Table with Year = 2003

The Performance for each year table lists the performance statistics of each year. In each year, four values are calculated for four seasons. The best year or the worse year could be found by sorting desired columns (Figure 9-4). Note that -99 means the observed data is missing for that year.

	Year	WholeYear	SnowMelt	GrowingSeason	HydrologicalYear
▶	2011	0.7696	0.7996	0.1991	0.7606
	2009	0.7574	0.7574	0.2449	0.7574
	2006	0.7273	0.7273	0.423	0.7273
	1996	0.6575	0.6202	0.9488	0.6564
	2008	0.6484	0.6484	0.3382	0.6484
	1995	0.6147	0.5985	0.0952	0.5993
	2010	0.5803	0.8971	0.5964	0.5938
	2002	0.5678	0.5678	0.4539	0.5678
	1993	0.5059	0.487	0.6606	0.4997
	2005	0.4767	0.7988	0.3403	0.4767
	2004	0.3769	0.3769	0.3376	0.3769
	2013	0.3479	0.3261	0.6436	0.3474
	1994	0.1543	0.2544	0.0855	0.1084
	2012	0.1211	0.0882	0.3033	0.1251
	2007	0.0034	0.0034	0.0922	0.0034
	2003	0.0009	0.0009	0.003	0.0009
	1997	-99	-99	-99	0.1157
	1998	-99	-99	-99	-99

Figure 9-4. Performance from Best to Worst Year Sorted by Whole Year

There is another tab (Compare) in Performance for each year section. It compares the performance of current model and selected model engine or scenario (Figure 9-5). The usage of Compare with and Season section is same as the one in output views (see Defining Comparison Outputs and Defining Time Range). With a comparison model engine or scenario is selected, the time series data from the comparison dataset is also added to the time series graph (in blue).



Year	default_SWAT_627	default_CanSWAT
2011	0.7696	0.7541
2009	0.7574	0.7739
2006	0.7273	0.7186
1996	0.6575	0.5891
2008	0.6484	0.6473
1995	0.6147	0.658
2010	0.5803	0.5915
2002	0.5678	0.566
1993	0.5059	0.4996
2005	0.4767	0.4689
2004	0.3769	0.3543
2013	0.3479	0.191
1994	0.1543	0.1511
2012	0.1211	0.107
2007	0.0034	0.005

Figure 9-5. Mode Performance for Different Model Engine

The Scatter Plot is for TSS, TN and TP, which usually has fewer observed data compared to flow. Selecting row in Overall Performance table would update this plot (Figure 9-6). Note that both axis are using logarithm.

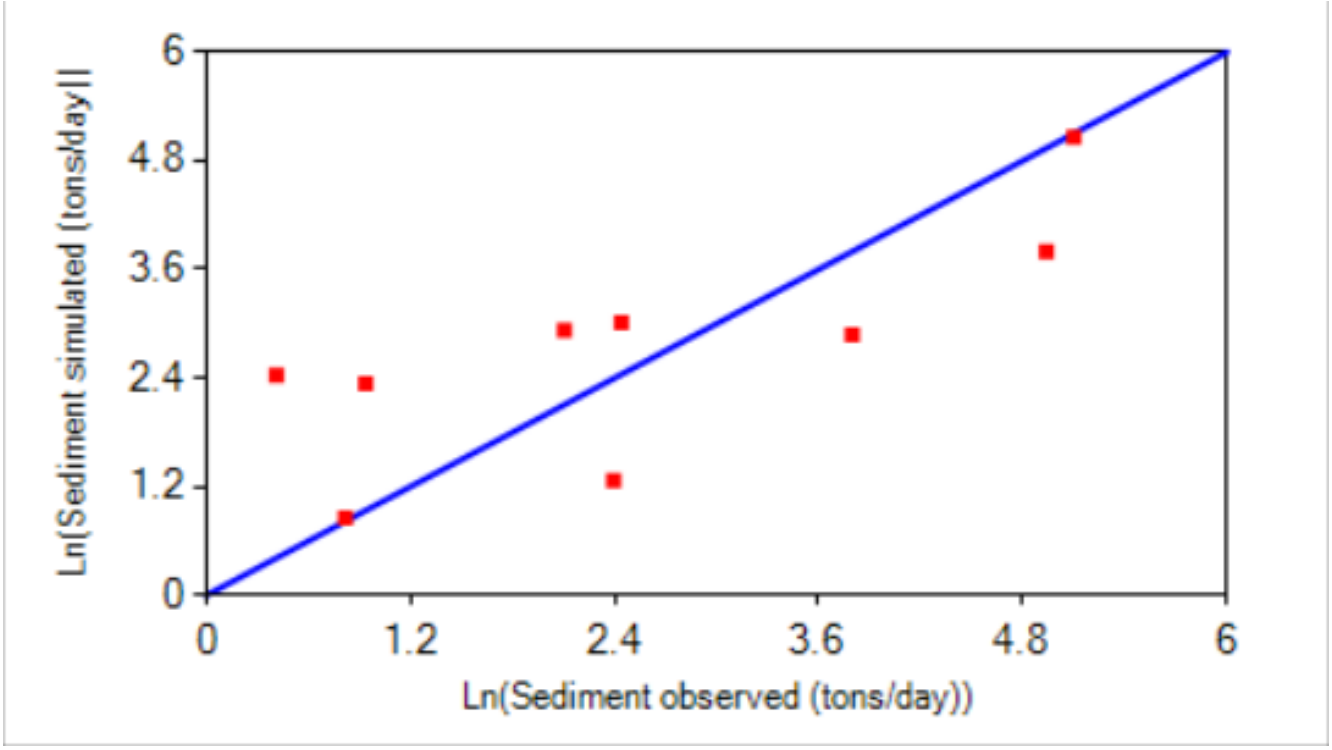


Figure 9-6. Scatter Plot for TSS in Performance View

Helper Functions

Opening file.cio, basin.bsn and Model Folder

File.cio and basin.bsn are two files that may need to be checked very often. They could be open by clicking the file.cio and basin.bsn button located on top of scenario view.

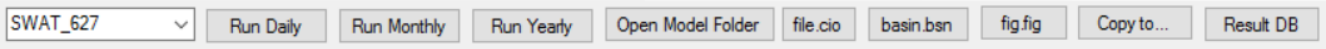


Figure 10-1. Function Buttons in Scenario View

The model folder (txtinout) could also be opened in File Explorer by clicking Open Model Folder Button.

Coping Scenario to SWAT_CUP

Working with SWAT_CUP sometimes requires updating the model by coping all model files to the backup folder. Instead manually doing this, click the Copy to button and browse to the SWAT_CUP project folder. All the model files will be copied to the backup folder in the project.