

# **SWAT USER GROUP**

**Best of  
1 - 1250 Messages**



**Caution**

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## 1-Problem in run swat

**Question:** I've run SWAT successfully a few weeks ago. but when I run it today, it failed with the following message.

I know it should be something about the temperature file, but I didn't find anything wrong...  
does anyone has a clue?

SWAT2009

Rev. 481

Soil & Water Assessment Tool

PC Version

Program reading from file. CIO . . . executing

Program reading from file. CIO . . . executing  
forrtl: severe (24): end-of-file during read, unit 119, file  
C:\SWAT\SWATEditor\  
SWATEditor\_Example\_Students\_HSE\Scenarios\Default\TxtInOut\tmp1  
.tmp

Image	PC	Routine	Line	Source
swat2009.exe	00DC005A	Unknown	Unknown	Unknown
swat2009.exe	00D0351A	Unknown	Unknown	Unknown
swat2009.exe	00D0271B	Unknown	Unknown	Unknown
swat2009.exe	00D10111	Unknown	Unknown	Unknown
swat2009.exe	008120C7	_OPENWTH	85	openwth.f
swat2009.exe	00459A0D	_MAIN_	90	main.f
swat2009.exe	00DC50C3	Unknown	Unknown	Unknown
swat2009.exe	00D69147	Unknown	Unknown	Unknown
swat2009.exe	00D6901F	Unknown	Unknown	Unknown
kernel32.dll	76CC3823	Unknown	Unknown	Unknown
ntdll.dll	77D3A9BD	Unknown	Unknown	Unknown
SWAT run failed. Hit Enter to exit				

### Answer:

Ensure that you have the same days of temperature as the number of years of simulation that you are running.

## 2-Question about swat

**Question :** I have some issues in running SWAT. The software launch the consol window but fail very quickly. I am wondering if it could be a problem with my inputs that would not be read. It could be during the precipitations and temperatures writing. Could it be a problem with excel ? I cannot use Access. Well, I do not know really what to do so if you have any advice do not hesitate... I have to finish my project in one month... !!!

- See attach a screenshot of the error message.

```
C:\winxp\system32\cmd.exe
      SWAT2009
      Rev. 488
      Soil & Water Assessment Tool
      PC Version
Program reading from file.cio . . . executing

forrtl: severe (24): end-of-file during read, unit 103, file C:\Documents and Settings\Arcview\Bureau\Projet ArcSWAT_MQ\Projet_avec INLET\Scenarios\Default\TxtInput\000010000.wgn
Image          PC            Routine         Line      Source
swat2009.exe   00DBF67A Unknown           Unknown    Unknown
swat2009.exe   00DBCDC8 Unknown           Unknown    Unknown
swat2009.exe   00D11A3A Unknown           Unknown    Unknown
swat2009.exe   00D10C3B Unknown           Unknown    Unknown
swat2009.exe   00D00D291 Unknown           Unknown    Unknown
swat2009.exe   0061A1B2 _READWGN          146       readwgn.f
swat2009.exe   00C65674 _READSUB          482       readsub.f
swat2009.exe   00596E50 _READFIG          163       readfig.f
swat2009.exe   004599EF MAIN__             84        main.f
swat2009.exe   00DC46E3 Unknown           Unknown    Unknown
swat2009.exe   00D68767 Unknown           Unknown    Unknown
swat2009.exe   00D6863F Unknown           Unknown    Unknown
kernel32.dll   7C817077 Unknown           Unknown    Unknown

SWAT run failed. Hit Enter to exit.
```

## Answer:

There is a problem with my wgn. The run swat is working with the US one. I had a problem with a station... Lets watch the attached file (screenshot of the error message in my inputs writing)

## 3-Swat input

### Question :

Does anyone know if SWAT or Arc SWAT outputs information on subbasin connectivity? Specifically, is there a way to quickly find out which sub-basins feed a particular downstream sub-basin?

**Answer:**

If you look in your project database, in the "Reach" table, it lists each sub-basin ("Subbsain") and its receiving sub-basin ("SubbsainR").

**4-Daily data**

**Question :**

I would like to know if weather allows me to enter data generation in a month and translates them to daily data. I have read in the manual there is a way to do it.

**Answer:**

Please let us know the purpose for getting daily data from monthly estimates. Is there a lack of climate data in your study area or are you trying to disaggregate GCM monthly estimates?

The weather generator in the SWAT model can simulate daily precipitation but it is based on statistical information derived from historical daily climate data. Please see the .wgn chapter in SWAT I/O manual for definition of the required statistics.

**5-Calibration in swat**

**Question :** The first calibration time are 3 years such as the year of 2004, 05,

06) , and the second calibration time are 2 year (2005, 2006) .Finally, the results of the flow data are different in the year of 2005 and 2006, and often get a big different .I do not know how it happened ?

Could you tell me why and give me any advices ?

**Answer:**

How long is your warm-up period? A warm-period that's too short that could definitely significantly alter one's flow regime.

## **6-Arc SWAT model on a tropical watershed**

**Question :** I am using the Arc SWAT model on a tropical watershed in Malaysia. After setting all configurations and building the databases I encountered with a critical problem. There is surface runoff on the overland plane but we cannot see a high outflow in the reach! The outflow is around 1 cm while the observed outflow is about 20 cm! I changed land use and soil maps and tested all changes in parameters (e.g. surlag, Ch\_n, OV\_n, ch\_k, ....) but the result is the same. Also I changed SWAT 2009 to SWAT 2005, but no changes in outflow! I think the model is blocked and does not response to any changes. I change the routing algorithm from Variable Storage to Muskingum also, but no response.

Could this error caused by using a projection system rather than UTM? Because our data projection system is in the category of National Grid (RSO Kertau Malaysia Meters).

### **Answer:**

- As long as your projection uses meters, it shouldn't matter whether it is UTM or an alternate regional system.
- Double-check your precipitation units -- they should be in mm (not cm, for example).
- In general, make sure you believe your precipitation inputs -- are some stations giving un-representative values? Bad precipitation data can lead you astray.
- Make sure you have no water losses to deep aquifer recharge; or seepage through ponds, wetlands, or reservoirs; or transmission losses through channels. I.e., set their K values to zero. You may add them back in as needed, but for now, make sure you do not have some uncontrolled losses.  
My guess is that something is not quite right with your inputs. If your weather inputs, and land area inputs, are anywhere close to reality, SWAT will almost certainly give an uncelebrated water yield within a factor of 2 -- your factor of 20 indicates something else is wrong besides the model. Also, just in case -- when you make a change in an input table (when you edit SWAT inputs), you must re-write those changes into the txtinout folder for them to have any effect.

## 7-Lack of precipitation data

**Question :**I want to know How I can minimize the effect caused by the lack of precipitation stations. The problem I have is that it considers the rainfall in one day for a very large surface therefore generates very high flows. Anyone know of any work that addressed this problem?

### Answer:

Depends on your study area. Is your area in the US, and if so, have you checked out the National Climatic Data Center's website to locate rainfall stations? If that doesn't work or the precipitation data are lacking (e.g. very localized storms that occur in between precipitation stations), there is an extension to SWAT called NEXRAD-SWAT in which you feed in NEXRAD precipitation data estimates which are interpolated into each subbasin; you'd have to contact your local river forecast center to obtain the radar estimate files, though. More information about this product, including the technical specifications necessary to run it and how you can download it, <http://xzhang.pbworks.com/w/page/27189956/FrontPage> can be located at don't know about areas outside the US, though; there is a global historical climatology network [ht](#) How long is your warm-up period? A warm-period that's too short that could definitely significantly alter one's flow regime. [tp://www.ncdc.noaa.gov/ghcnm/](http://www.ncdc.noaa.gov/ghcnm/).

## 8-Error in volume reservoir

**Question:**I have a problem in the reservoir. The volume are less than the Volume of principal spillway (1000000m<sup>3</sup>) and is always 141400 m<sup>3</sup>... The Flow In is similar to Flow Out. I have an error when start run: error(74) floating underflow...I don't find the problem..

### Answer:

Reservoir volumes are given in ha-m in SWAT, if I recall. You are giving values in m<sup>3</sup> if that makes a difference. If you're getting an underflow error, you probably can't trust the results of the run.

You'll need to figure out what is causing the problem. Find out which module (the first \*.f file in the output in the DOS window) the error is

occurring in and then you might be able to figure out if some of your input data are incorrect.

## 9-SWAT MODEL CALIBRATION

**Question :**I have done sensitivity analysis and found the most sensitive parameters as cn2 (curve number), Sol\_awc and esco in that order. However after changing several times the cn2 the simulated flow remain constant or did not change in order to raise the flow to match the observed flow. Can somebody advise?

### Answer:

Did you do "write swat input files," specifically choosing .mgt, .sol, .bsn, (and .hru if you distributed esco across HRUs or sub basins) following your changing of the parameter values?

## 10-Loading land use

**Question :**I am working with SWAT 2009.7b, When I want to load my land use raster file, the error will come like this{ the raster layer :land use doesn't have attribute table. how can I achieve the attribute table, beside this I have the vector file but it doesn't work too.

### Answer:

I had a similar issue last night; it was because I inadvertently deleted some of the raster files using "my computer," instead of managing all my raster files within arc catalog. I'd recreate your raster file and you should be fine.

## 11-Nash-Sutcliffe or PBIAS?

**Question :**I am currently calibrating my model and am getting excellent monthly Nash-Sutcliffe (N-S) values (0.88) and decent/good seasonal N-S on flow (0.6-0.9)! I have yet to run daily. However, after initial parameter modifications based on sensitivity analysis and auto calibration, I'm getting even higher N-S values but poorer PBIAS ones. It seems that N-S and

PBIAS are inversely proportional on monthly and seasonal flow in my research. For instance, my initial N-S for winter flow was 0.64 with a PBIAS of 29.26%. After running auto calibration on the snowmelt parameters, my N-S shot up to 0.9 but my PBIAS also increased to 30.48%. My initial N-S for spring was 0.76 with a PBIAS of 1.6%, the auto calibration on snowmelt increased N-S to 0.77 and my PBIAS to 2.2%. My N for seasonal flow is 14 for winters and 15 for spring (it's lower for winter, defined as winter as Dec/Jan/Feb, because I'm beginning my simulation in January). I see similar patterns on monthly flow. .

I have two questions.

- A) Has anyone seen a PBIAS for seasonal flow that is 30% or more? This seems a bit high to me but Moriasi et al. (2007) indicates that PBIAS up to 25% on monthly flow is acceptable.
- B) Even more important: would I be correct in assuming that my primary goal should be maximization of N-S, and then to just use PBIAS if the values fall within an acceptable range (and not work actively to calibrate based on N-S?)

### **Answer:**

Yes, you should really try to balance good NSE and PBIAS statistics. If you must "compromise" one vs. the other, consider what you'll be doing with the model output. How would a poorer PBIAS affect the application vs. a poorer NSE? If you're concerned primarily with runoff vs. low flow periods, which statistic is more important to "optimize." Is there a range of flows that your model is performing worse for than others, and how does this affect each statistic? You might want to run the NSE and PBIAS calculations for certain flow regime (high, medium, low, etc) or for a certain time frame (spring, summer, fall, etc.) depending on how you'll use the predicted flows. Try to obtain the best statistics for the range of data that may be used to draw conclusions or recommend watershed management practices.

## **12-Integration of Irrigation data into SWAT**

**Question :**could any help me with any documentation about how to integrate irrigation data into SWAT modeling.

### **Answer:**

Irrigation is applied to soil as infiltration.

You may want to refer to Chapter "MGT" in the input/output document.

### **13-Pond evaporation**

**Question :** I want to simulate the hydrologic cycle between several ponds. Could anyone tell me the evaporation method swat used on pond.

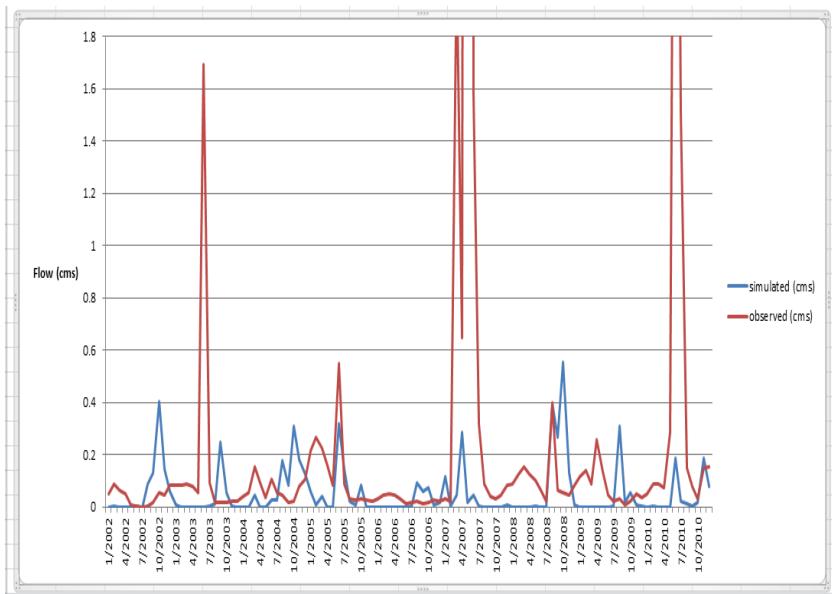
### **Answer:**

Pond, Wetland, and Reservoir evaporation rates are all set at 0.6\*PET. PET depends on which method you choose (Penman-Montieth, Priestly-Taylor, or Hargreaves). You can alter the 0.6 coefficient (pndevcoeff and wetevcoeff in the pnd table, evrsv in res table) if you want. (If you look at the tables and the values are zero, that really means "default" and the code will use 0.6).

### **14-Is calibration possible on these observed peaks?**

**Question :** After performing some manual calibration, I am experiencing great difficulty matching the observed peaks in the attached image. My watershed is in a semiarid region that experiences convective flash floods. After the NCDC rainfall stations proved unusable because of the convection, I used nexrad radar data for precipitation. Yet, a portion of my watershed is situated in a radar "dead zone," which is leading me to conclude that the radar may have underestimated precipitation for some of the peaks. I can take care of the non-observed peaks without any problem through adjusting nutrients, base flow, etc. but I have found it nearly impossible to match the observed peaks without greatly hindering my overall Nash-Sutcliffe value (currently -0.07). Even by setting gwqmn to 0, revapmn to 1, alpha\_bf to 0.99, rchrg\_dp to 1, etc and changing eT and ICN, I only produce a little flow for the peak observed times while greatly over simulating the non-peak periods. Increasing cn2 by 10 also hinders my overall nash-sutcliffe although it would help me approach the observed peaks. I'm \*not \*asking for assistance in calibration; all that I'd like to ascertain is if SWAT can match these observed peaks without having to adjust precipitation values (e.g. through realistic fertilization values, etc.) or

if I should go in another direction with this research. I would rather not have to adjust precipitation since there are no realistic sources of the exact precipitation quantities outside of the xmrg NEXRAD radar products, which I am already using



## Answer:

The short answer to your question is no. In my opinion, I would not try to "force" model parameters to correct something that does not appear to be linked to them. If you eliminate the three high event periods, your calibration looks okay and minor parameter adjustments will take care of some of the imperfections. In the case of the three high event periods, it is likely a result of your precipitation inputs.

## 15-Evaporation from reservoir too low

**Question :**I am modeling a river basin in the Southern High Plains (USA) where evaporation rates can be quite high (open pan Evaporation = 100 inches or 2500 mm annually). The local lake managers are estimating evaporation from their reservoirs at similar rates as above. I currently have the reservoir evaporation set at max (1) and the model is pulling weather data from what are appropriate stations. However the model is reporting evaporation antecedent that are about 1/10th that of the lake managers are estimating. Any thoughts?

## **Answer:**

What output are you looking at? If you're looking at the rate given near the bottom of the output .std file, I believe the mm of evaporation reported for reservoirs is a watershed-wide number as a component of the annual water budget. I.e., the total volume of water evaporated from reservoirs (annually), divided by the total watershed area (not just the reservoir area), and expresses as mm. So if your reservoir is about a tenth of the area of the watershed, then the actual rate over the reservoir would be about 10x larger.

## **16-Manual Calibration**

### **Question :**

I do not how to manual calibrate after running SWAT. Actually, I tried to edit manually some parameters including AlphaBf, CN2, CH-N2, CH-K2 ...in the simulation folder (Sim1) but cannot Run model after editing.

Now, I want to manual calibrate OV-N, CH-K1, CH-N1. Anybody can help me? I am using SWAT 2005.

### **Answer:**

To edit input parameter during manual calibration, I generally write update queries in Access to alter the tables in the project data base. To not clutter up the project data base with my own queries, I make a new Access database with links to the input tables in the project data base. After modifying the input tables in the project database, then they need to be re-written to the text files in the TxtInOut folder before running SWAT. I do a similar thing for analyzing output data -- I create my own Access data base with links to the output tables, and write queries to extract and manipulate the data I need. (Note that you must have Arc SWAT read the output text files into the output database first, after your model run.) The capability for Access to manipulate input and output data is tremendously useful -- I think it's a great improvement in Arc SWAT from previous versions. You just have to remember that SWAT itself reads and writes text files in the TxtInOut folder. Anytime you modify the input tables in the database, you need to write those results as text files to TxtInout. And, after running the model, you need to read the output text files from TxtInout into the output database. There you can use the power of Access / SQL to extract the specific data you need.

## **17-Reervoir storage capacity**

**Question :** I have one reservoir within the watershed having gross storage capacity (388 MCM) and I want to know..... is there any limit about the reservoir storage capacity in SWAT.....which variable in .res file denote reservoir storage capacity.

### **Answer:**

You can set/adjust the limits in the swat2009 database's restrng table.

## **18-What should I do after auto-calibration?**

**Question :** I have run auto-calibration(Arc SWAT interface) successfully with the help from the user's group. I reran the calibrated model and was trying to compare the result from "output. std" with the one without calibration, however they are the same results. If it's wrong, what should I next?

### **Answer:**

After running auto calibration, did you modify the parameters in a subsequent run and save that run as a separate one? Also, after modifying the parameters, did you "write swat input files?" Otherwise, the changes don't take effect. If not, try doing that and see what happens.

## **19-Swat cup error**

**Question :** I guess there is a bug in Swat-cup. No matter how I changed the parameters, it told me "Index was outside the bounds of the array". The most weird thing is even I deleted all the parameters, it still shows the error message.

### **Answer:**

I advise checking the ranges of the parameters to be calibrated in swat-cup against those in the absolute\_spat\_values.txt file. That error usually means that your range exceeds the required ranges in the text file in or more parameters (e.g. if you allow gwqmin to be altered in your calibration by adding 1000 and you already have some HRU with gwqmin values of 4967, you will get that error because, according to absolute\_spat\_values.txt, the maximum value for gwqmin is 5000).

## **20-Sub basin output and observation**

**Question :** I am wondering how can I get the output for each sub basin, I checked the .rch and .sub and couldn't find it. Another question is how to get the observation file for each sub basin. I can only find the one in the outlet which is from USGS gages.

### **Answer:**

After you run SWAT, be sure to do "SWAT simulation" -> "read SWAT output," and then make a check mark next to "output.rch, output.sub," etc. and then save the simulation? I'd open up Microsoft access, go to your scenarios folder, choose the scenario (which would be "default" if you didn't save a particular run)->"tables out," and then on the right hand side of the screen, double click on "rch." If you don't follow the steps in the 1st paragraph, though, nothing will appear in Microsoft access.

## **21-Using SWAT to forecasting flash flood?**

### **Question :**

I wonder if the SWAT model can predict flash flood in real time or not? and there have been any studies on this issue yet?

### **Answer:**

SWAT was not developed for simulating the flood event. But You can try to calibrate the model with historic floods in the sub daily mode.

## **22-LAI reached during simulation is too low**

### **Question:**

I am modeling poplar and wheat for a river catchments in central Germany. The aim of the work is to compare the water balance effects of the two species. I got the simulation set up and the water balance adds up just fine. The problem is, my LAI time series do not look good. I don't know why, but for some reason I just never reach my BLAI (maximum LAI) specified in my crop. at. Both, wheat and poplar reach a maximum LAI of around 2 in my simulation, even tough BLAI=4 is for wheat and BLAI=5.5 is for poplar. I played with PHU (potential heat

units do maturity) and the other LAI effecting parameters in the crop. at, but just cannot achieve the desired effect. Does anyone know what could be the reason for my low LAIs?

### Answer:

Low LAI values may be due to stresses- nutrients or water.. check nutrient stress numbers..

### 23-Sufi2 error

**Question :** I am using Sufi2 for calibration. When I ran, Sufi2\_run.Bat, the error showed up:" Index was outside the bounds of the array". I am not a hydrologist, so please help me out.

Number\_of\_Parameters= 15  
Number\_of\_LH\_sims= 20

r_CN2.mgt	0	0.15
v_ALPHA_BF.gw	0	0.01
v_GW_DELAY.gw	34	45
v_CH_N2.rte	0.0	0.1
v_CH_K2.rte	0	0.1
v_ALPHA_BNK.rte	0	1
r_SOL_AWC(1).sol	-0.05	0
r_SOL_K(1).sol	-0.2	0.8
r_SOL_BD(1).sol	-0.05	0.06
v_SFTMP.bsn	-0.3	1.0
v_ESCO.bsn	0.95	0.99
v_CANMX.bsn	-0	20
r_SOL_z.sol	-0	1
v_GW_REVAP.gw	0.02	0.2
v_GGWQMN.gw	0 1	

2. Another error is from Sufi2\_post.Bat, it says" can't open input file q\_1.out". I was thinking that is output file extracted from SWAT.rch

### Answer:

When I've had the problem, it usually meant that my values, once adjusted exceed those for one or more parameters in the absolute\_swat\_values.txt file (e.g. if gwqmin is maxed out at 5000 in absolute\_swat\_values.txt and increasing it by 10% within your sufi2 project gives a gwqmin of 5002, the error will be generated).

## 24-Initial conditions

**Question :**I'm using MW Swat. I wish know which is the initial condition of soil moisture that uses SWAT for default. Is the average moisture? I have to calibrate my basin. Which is the appropriate criterion to initialized the model for soil moisture and others important parameters?

### **Answer:**

You can set initial soil moisture for all the soils using the variable FFCB in the bsn input file.

## 25-SWAT calibration for nitrogen - nitrate

**Question :**I was wondering if somebody could help me out in calibrating my model for nitrogen - nitrate. I tried everything, but nothing works. I really don't know where I am committing the mistake. Somehow I am not able to reduce the amount of NO<sub>3</sub> leached, and therefore, getting very low amount of NO<sub>3</sub> in surface runoff. I have changed NPERCO value to maximum (i.e., 1), but still NO<sub>3</sub> is very low in surface runoff. I have used following values for various nitrogen variable in the model.

RCN: 1.0

CMN: 0.0015

CDN: 0.0

SDNCO: 1.0

NPERCO: 1.0

N\_UPDIS: 5.0

ERORGN: 0

SOL\_ORGN: 100 for all soil types

SOL\_NO3: 0.0 for all soil types

Here is the model output summary for nutrients which clearly indicate low NO3 in surface runoff and high leached NO3:

#### NUTRIENTS

ORGANIC N = 0.276 (KG/HA)

ORGANIC P = 0.054 (KG/HA)

NO3 YIELD (SQ) = 1.778 (KG/HA)

NO3 YIELD (SSQ) = 0.071 (KG/HA)

SOL P YIELD = 0.360 (KG/HA)

NO3 LEACHED = 28.076 (KG/HA)

P LEACHED = 2.500 (KG/HA)

N UPTAKE = 125.735 (KG/HA)

P UPTAKE = 18.093 (KG/HA)

NO3 YIELD (GWQ) = 7.877 (KG/HA)

ACTIVE TO SOLUTION P FLOW = 19.753 (KG/HA)

ACTIVE TO STABLE P FLOW = 15.548 (KG/HA)

N FERTILIZER APPLIED = 175.626 (KG/HA)

P FERTILIZER APPLIED = 41.934 (KG/HA)

N FIXATION = 36.335 (KG/HA)

DENITRIFICATION = 0.000 (KG/HA)

HUMUS MIN ON ACTIVE ORG N = 26.618 (KG/HA)

ACTIVE TO STABLE ORG N = 15.856 (KG/HA)

HUMUS MIN ON ACTIVE ORG P = 8.187 (KG/HA)

MIN FROM FRESH ORG N = 85.695 (KG/HA)

MIN FROM FRESH ORG P = 19.992 (KG/HA)

NO<sub>3</sub> IN RAINFALL = 1.895 (KG/HA)

INITIAL NO<sub>3</sub> IN SOIL = 54.125 (KG/HA)

FINAL NO<sub>3</sub> IN SOIL = 52.238 (KG/HA)

INITIAL ORG N IN SOIL = 1750.469 (KG/HA)

FINAL ORG N IN SOIL = 2583.207 (KG/HA)

INITIAL MIN P IN SOIL = 331.169 (KG/HA)

FINAL MIN P IN SOIL = 1265.305 (KG/HA)

INITIAL ORG P IN SOIL = 214.432 (KG/HA)

FINAL ORG P IN SOIL = 455.040 (KG/HA)

NO<sub>3</sub> IN FERT = 1.591 (KG/HA)

AMMONIA IN FERT = 114.828 (KG/HA)

ORG N IN FERT = 59.207 (KG/HA)

MINERAL P IN FERT = 21.096 (KG/HA)

ORG P IN FERT = 20.838 (KG/HA)

N REMOVED IN YIELD = 65.931 (KG/HA)

P REMOVED IN YIELD = 7.634 (KG/HA)

AMMONIA VOLATILIZATION = 0.910 (KG/HA)

AMMONIA NITRIFICATION = 23.189 (KG/HA)

NO<sub>3</sub> EVAP-LAYER 2 TO 1 = 12.084

## **Answer:**

From the output it appears that there is no deNitrification being simulated which explains the high nitrate volume. Try to reduce SDNCO to about 0.6 - 0.7 and see if it helps.

## **26-Lake and wetland within a sub basin**

**Question :**If there is a lake/pond and a wetland located within a sub basin, how does swat simulate such a situation. The WET\_FR and PND\_FR as well as min/max areas of lake and wetland need to be specified so that there won't be any overlap. Are the outflows from lake and wetland routed to the stream outlet separately? And there is no interaction between the lake and the wetland.

## **Answer:**

First, keep in mind that Swats' Ponds and Wetlands are somewhat conceptual entities that are useful for providing a reasonable approximation of how these surface detention features actually function. Because they can't be placed spatially in a sub basin exactly as in the real landscape, there is a loss of realism. But they provide an essential tool in SWAT to account for the effective, aggregate impact of these features on watershed hydrology and on sediment and nutrient transport.

I believe the code starts with WET\_FR, and directs that fraction (say it's 25% of the sub basin area) of the total water yield from each HRU to the Wetland. This includes all components of flow (surface, lateral, groundwater). A water balance for the Wetland is calculated for that day (inflow minus ET, minus seepage losses (but see notes below), and any remaining water yield from the Wetland (principally surface outflow here) then gets added to the rest of the sub basin's water yield (the 75% that wasn't included in WET\_FR) -- producing an updated total water yield from the sub basin.

If you've got a Pond as well (i.e., PND\_FR > 0), then SWAT directs that fraction (let's say it's 15%) of the newly updated water yield to the Pond.

Once again, a water balance is calculated, considering inflow, seepage, and evaporation, and any excess is spilled to the channel, and added to the water yield from the rest of the sub basin (the other 85%) that by-passed the Pond. So there's some double-processing, since some of the water that entered the Wetland also ended up in the Pond. This isn't necessarily right or wrong -- it certainly could be this way in nature. SWAT had to choose some way to do it, and this was reasonable. This double-processing may, however, make interpretation of model results a little more complicated.

I may have it backwards -- perhaps Ponds are processed before Wetlands -- but I'm pretty sure the calculations are sequential (serial), rather than in parallel.

Note also that SWAT also does a sediment and nutrient budget calculation in the Wetland and Pond at each time step as well, in addition to the water budget. Given this configuration, I don't think there's a limitation on how WET\_FR and PND\_FR interact. If you think 100% of the sub basin first drains to wetlands, and then all of that subsequently drains to a pond, you could in theory set WET\_FR = 1 and PND\_FR = 1. Finally -- in the current version of SWAT, we're pretty sure that the seepage from Ponds, Wetlands, and Reservoirs gets lost from the system, whereas in our watershed, such seepage nearly always ends up contributing to base flow somewhere down gradient. We're working on revising the code to address this issue. It may be partially functional in SWAT2009 -- I haven't checked it entirely yet. And, we think it would be useful to do the Wetland and Pond calculations in parallel to simplify model output interpretations (which would mean that WET\_FR + PND\_FR should be constrained to be < 1)

## 27-Chlorophyll a modeling

**Question :**Has anyone been doing daily chl-a modeling as part of their analysis (this would mean having the QUAL2E function turned on - IWQ=1). We are using this to assist in nutrient calibration, but so far have not had much luck keeping chl-a levels consistent in the water column. They appear to be extremely variable from day to day, and need to be manually "seeded" to partially stabilize. I guess my question would be, has anyone actually looked at their chl-a output, and does it look reasonable (relatively consistent on a daily basis, fluctuating seasonally as one would expect)?

## **Answer:**

I've only tinkered a bit with chlorophyll, but I think Qual2e requires an initial chlorophyll level -- which SWAT estimates based on nutrient loads from the sub basin. This "seed" amount of chlorophyll can be quite high, even in headwater reaches. If you leave Qual2E off, this chlorophyll passes downstream unaltered. If you turn Qual2E on, if I remember, the chlorophyll levels drop rapidly, and phosphorus levels increase beyond what was delivered from the sub basin. I personally think this extra phosphorus is extraneous -- it's an extra amount that comes from SWAT thinking that the added chlorophyll was from algae, which have a phosphorus content that is released upon decomposition. It's a useful exercise to run SWAT without Qual2E, and then run it with Qual2E turned on, and see how much your phosphorus loads increase. I'm not sure how chlorophyll is handled in reservoirs. I think it just looks at the P concentration (mineral, organic, or both?) and produces a chlorophyll content from a simple regression equation. I presume it passes this chlorophyll downstream.

## **28-Scripting swat i/o files - #hru in .sub vs. #hru modeled**

**Question :**I am working on a tool to automate the lup.dat file generation and respectively modefing the swat input. There I found the following trouble: I setup a SWAT project with Arc SWAT. In the .sub files of the sub basins is HRUTOT(a number) and a list of HRU files. checking this files in the folder I find for some sub basins more .hru files and their relatives then listed in the .sub file. Is there anybody who could explain this? What is the impact of that onto my simulation?

## **Answer:**

Ann van Griensven figured the problem out. Those HRUs which were not considered/listed in the .sub file are older once which were generated during another setup and left in the memory. So they are not of that "scenario".

## **29-Sensitivity analysis output**

**Question :**I have a doubt in differentiating between the sensitivity results for with Discharge and without discharge case in the sensitivity output file ( sensout.txt ). There are two Ranked categories (if I am not mistaken ) one is with Q and the other is without Q provided that the flow data is used in the sensitivity analysis test.

**Answer:**

With Q: This analysis shows how sensitive the closeness of fit (between simulated flow and observed flow) is to changes in parameter values. Without Q: This analysis show how sensitive simulated flow values are to changes in parameter values. The "Without Q" option can be interesting in that it shows what parameters may be most influential in changing simulated flow. But, when it comes time to decide on which parameters to focus on for actual calibration, I personally prefer to rely more on the "With Q" option.

## 30-Calibration

**Question :**I'm using arc Swat and I want to calibrate the model, but I'm not sure of the format of the table that contains the observed data (flow-m<sup>3</sup>/s).

**Answer:**

Willem Vervoort was kind enough to help me with this just a few weeks ago. If you are using the auto calibration in Arc SWAT, here's what Willem said re formatting (notes in brackets are mine): "isn't it supposed to be strictly space delimited and with exact space counts (Fortran formatting). I would have to look it up in Ann's {van Griensven's] manual. Page 31 suggests: year (1X5i) day (2x,3i), 3x, measured values (1X11F.3) Let me see if I can interpret this again year: 5 spaces all integer then 2 blank spaces (2x) and 3 spaces with possible integer values for day [make sure your units match the SWAT outputs, i.e. flow is in m3] then 3 blank spaces and then measured values in 11 spaces with a maximum of 3 digits after the decimal point. I would use R to do this (using format() and write.table()), but I think there is also a way to do this in Excel." I used a concatenate function in Excel to get the exact number of spaces between columns, then copied and pasted into Notepad and saved it as a .txt file, and it worked. I was using it for sensitivity analysis but I'm assuming it would work the same for auto calibration.

## **31-How to multi-site calibration in SWAT**

**Question:** I can calibrate SWAT model at an monitoring station. But I have observed data at 2 stations, so I want to calibrate at both stations. How do I do in Arc SWAT? Because as I see, in the auto calibration in Arc SWAT, it only allows to select a sub-basin, and a monitoring station on the sub-basins, but does not allow to select more than one sub-basin.

**Answer:**

Are you only doing auto calibration? If so, please see the attached document. It will give you instructions on how to calibrate for multiple sub basins with the SWAT auto calibration routine.

 **Guidelines for using the sensitivity analysis and auto-calibration tools for multi-gage or multi-step calibration in SWAT. PDF**  
1309K [Download](#)

## **32- SWAT RUN NOT Successful**

**Question:**

My SWAT Model is not run successful it showing the following error, the file. I am attaching with this mail. acc to my knowing the error in File. CIO

Soil & Water Assessment Tool  
PC Version  
Program reading from file.cio . . . executing

```
forrtl: severe (24): end-of-file during read, unit 1, file D:\file.cio
Image          PC          Routine          Line      Source
swat2005.exe   006A47F9 Unknown           Unknown Unknown
swat2005.exe   006A4657 Unknown           Unknown Unknown
swat2005.exe   006A3834 Unknown           Unknown Unknown
swat2005.exe   006A3C69 Unknown           Unknown Unknown
swat2005.exe   0069B545 Unknown           Unknown Unknown
swat2005.exe   0048CE9  GETALLO          124  getallo.f
swat2005.exe   004DC995 MAIN             71   main.f
swat2005.exe   006E0719 Unknown           Unknown Unknown
swat2005.exe   006C5BB9 Unknown           Unknown Unknown
kernel32.dll   7C817067 Unknown           Unknown Unknown

D:>
```

The screenshot shows a Windows desktop environment. In the foreground, a command prompt window is open with the title 'Command Prompt'. It displays an error message from the 'forrtl' library indicating an end-of-file condition during a read operation on unit 1, file 'D:\file.cio'. The window also lists several loaded modules with their corresponding PC addresses, routines, lines, and source files. The background of the desktop is blue. At the bottom, a taskbar is visible with icons for the Start button, Task View, File Explorer ('TxtInOut'), Google (Mozilla Firefox), and the Command Prompt window itself. The system tray shows the date and time as 5:19 PM.

## Answer:

Comparing your file. CIO with mine, The only difference I see is that you do not have the SLRFILE, RHFILE and WNDFILE file names set on yours file. CIO.

Yours:

SLRFILE: name of solar radiation file	
RHFILE: name of relative humidity file	
WNDFILE: name of wind speed file	
cst.cst   FCSTFILE: name of forecast data file	
Watershed Modeling Options:	
basins.bsn   BSNFILE: name of basin input file	
Database Files:	
crop.dat   PLANTDB: name of plant growth database file	
till.dat   TILLDB: name of tillage database file	
pest.dat   PESTDB: name of pesticide database file	

fert.dat | FERTDB: name of fertilizer database file  
urban.dat | URBANDB: name of urban database file

Mine:

slr.slr | SLRFILE: name of solar radiation file  
hmd.hmd | RHFILE: name of relative humidity file  
wnd.wnd | WNDFILE: name of wind speed file  
cst.cst | FCSTFILE: name of forecast data file

Watershed Modeling Options:

basins.bsn | BSNFILE: name of basin input file

Database Files:

crop.dat | PLANTDB: name of plant growth database file  
till.dat | TILLDB: name of tillage database file  
pest.dat | PESTDB: name of pesticide database file  
fert.dat | FERTDB: name of fertilizer database file  
urban.dat | URBANDB: name of urban database file

### 33-Daily precipitation generated by WXGEN

**Question:** I have a question concerning the replacement of daily missing data by the weather generator included in SWAT. I would like to evaluate the performance of the weather generator to fill the daily missing data in precipitation times series. Is it possible to have access to daily precipitation generated in SWAT in files output for each station by sub basin? Which is the name of the file exactly?

**Answer:**

Run the model on daily basis and look at the output.sub file. There is a output variable column titled PRECIPmm

### 34-Soil data error

**Question :**I want to add soil data into the model, I selected the "Name" radio button . But when load a look-up table ,there is an error dialog box as follows.

Unexpected Program Error Error Call Stack Sequence

CreateOutputFilesDbase LUGridShp.vb Line: 3158

Error Number

91

Description

Object reference not set to an instance of an object

**Answer:**

I think you should check the soil look up table and user soil in SWAT database. Maybe SWAT database lacks some soil types. On the other hand, I do not know the SWAT version you used. SWAT 2005 and SWAT 2009 have some difference.

## 35-Weather station

**Question :**during my weather input, there are 6 weather station , but after writing all weather data , rainfall , temperature , its showing only five station in swat.

**Answer:**

As per my experience SWAT get most closes stations to it sub-basins' centroids. So I guess one of you station should be far from the other stations.

## 36-SWAT-CUP daily observed data

**Question :**I want to do the calibration on a daily basis, calibration period is from 1989 to 1998 so i have 3652 observed data, the data are prepared as follows

```
no_obs_vars=      1
Obj_Fn_Type(1=mult,2=sum,3=r2,4=chi2,5=NS,6=br2,7=Sqr)=      5
behavioral_threshold=.45

q_14
var_weight=      1
var_Threshold=    -1
wt_below_threshold=      1
wt_above_threshold=      1
pcnt_Error=      10
NO_Data=      3652
1  q_14_1989.1  5.660
2  q_14_1989.2  5.660
3  q_14_1989.3  5.660
4  q_14_1989.4  5.660
::::::::::
::::::::::
::::::::::
3645  q_14_1998.358  3.310
3646  q_14_1998.359  5.230
3647  q_14_1998.360  4.750
```

3648	q_14_1998.361	4.750
3649	q_14_1998.362	4.750
3650	q_14_1998.363	4.590
3651	q_14_1998.364	4.270
3652	q_14_1998.365	4.270

is it wrong format ? what is daily observed data format?

### **Answer:**

For me it looks about right. Although 10 years are a bit much for daily calibration.. I figured out, that Swat Cup does not care about, what you have inside the second column ("q\_14\_1989.1").. Just about th number of the observed day (column 1) and the value itself (column 3). Keep in mind not to put in observed data for your warm-up period (NYSkip)..

## **37-Weather sources in MWSWAT**

**Question :**I have run the Arc SWAT 2000 for my watershed and find out runoff. Now, I want to use MWSWAT for the same watershed and want to compare the results in Arc swat and MWSWAT. In MWSWAT, i gave my dem, mask, land use and soil map which I used in Arc swat.

In mswat, I cleared, step 1.

In step 2 I gave my own land use map and soil map which I used in Arc swat. (with UTM Projection ) and in land use table and soil table I give global\_landuse and global\_soil . It created 7 HRUs.

In step 3, I give in database, weather sources and in table I give wgn\_US and run the model.

then the message appears, swat run failed .If I am able to go to step 3 does it mean that there is no mistake in input files upto step 2 ?

### **Answer:**

Your message raises a number of questions. Are you sure the global\_landuse and global soil mappings are correct for your land use and soil maps? Do you not have any weather data? Just using weather sources (which the documentation advises you not to use) will give an empty collection of weather gauges. wgn\_US is only suitable if your area is in the USA. When

you get the message "SWAT run failed" there will have been a command window showing what happened. Getting to step 3 without any errors being displayed means just that - no errors were detected. If, for example, global\_landuse was not suitable for your land use map, but happens to contain all the values (just integers) found in it, no error will be reported, but your input data will be useless.

## **38-MWSWAT watershed delineation**

### **Question :**

I am recreating my SWAT model in MWSWAT and have stumbled on the first step. For some reason I cannot draw a new mask. If I use the "current view extents" than I can do the delineation, but I cannot draw my own mask. It would be silly if I have to get back to ARCGIS to create a mask shape file to use in MWSWAT.

Any clues? I am running windows XP MWSWAT 4.8 and have watershed delineation plunging and the MWSWAT plug in installed. Is there a plug in that I am missing?

### **Answer:**

I don't understand what you mean by "cannot draw a new mask". I just tried it with the latest version of Map Window and I could do it (this is a version due for release soon). If you are using version 4.8.1, the current release candidate, then you should go back to 4.7.5, the last stable release (in the Map Window website, select Downloads -> Plugins & Tools and look for previous release candidates). Watershed delineation in 4.8.1 is known to have some problems. There are other ways to make a mask with Map Window, eg using the Shape file Editor plugin. You could try running without a mask - do you really need one? Its main effect is to speed up watershed delineation a little. It can be dangerous in cutting off part of the watershed. (Conversely, it can be used to force watershed delineation to stay within a boundary when that is known precisely.)

## **39-Running SWAT with monthly data**

### **Question :**

Could you help me to show how to run the SWAT model with monthly data such us monthly temperature, monthly precipitation, monthly humidity..

**Answer:** You can use weather generator to generate daily data from monthly data.

see: <http://www.eawag.ch/forschung/siam/software/modawec/index>

## 40-Default Manning's N and Range Grasses

### Question :

Does anyone know the reasoning behind why the default values for Ch\_N1 and Ch\_N2 in SWAT are 0.014? Also, does anyone know which grasses are represented by the "range-grasses" land use class? My watershed contains mostly native C4 grasses (little bluestem, blue grama, buffalo grass) which were identified by both the Crop Dataset Layer (CLD) and the NLCD as "range-grasses", but I just wish to confirm that SWAT's definition of "range-grasses" coincide with that in the CLD and the NLCD. I see by looking at the SWAT crop database, for instance, that the parameters for Little Bluestem are similar to those of the "Range-Grasses" category with some exceptions in OV\_N and CN2, but am just looking to confirm that the "range-grasses" category in SWAT was designed as a generic category for the different grasses in the SWAT crop database.

### Answer:

For the Manning's N, SWAT just assigns almost a lower bound to this as it does with most parameters. I would definitely change it based on the type of stream you have. I found that this helped my calibration a lot and also it is a more realistic representation of the basin flows.

Here is a good reference:  
[http://www.fsl.orst.edu/geowater/FX3/help/8\\_Hydraulic\\_Reference/Man ni...](http://www.fsl.orst.edu/geowater/FX3/help/8_Hydraulic_Reference/Man ni...)

## 41-Bias correction of GCM data for SWAT

**Question :** I want to use the GCM MIROC 3\_2\_hires data to assess impacts of climate change on flow. The GCM resolution is at about 1.125 lat/lon. I want to use the data from the GCM with the available resolution (without spatially downscaling it). When I compare the 20th century precipitation from MIROC with station observation in my study area, MIROC has overestimated the precipitation and I want to make bias correction for the future precipitation from the GCM depending on the 20th century precipitation statistics. May any one give me a good reference on bias correction of GCM data?

## **Answer:**

There are two related papers. one for monthly data, The other for daily data. hopes helpful.

\* V.M. Ines, James W. Hansen, 2006, correction of daily GCM rainfall for crop simulation studies, Agricultural and Forest Meteorology 138 (2006) 44–53.\* \*Andrew W. Wood and Edwin P. Maurer, Long-range experimental hydrologic forecasting for the eastern United States,\* \*JOURNAL OF GEOPHYSICAL RESEARCH, VOL. 107, NO. D20, 4429, doi:10.1029/2001JD000659, 2002.\*

## **42-Calibration Versus Validation model efficiency**

### **Question :**

I have few absurd in calibration and validation phase of SWAT model.

\*The calibration step come out with suitably sufficient model efficiency while the validation phase is characterized with significantly low model efficiency values\*. I am tracing the root cause but could not able to figure them out rightly. Is it due to the fact that the calibration phase which brings sufficiently good model result is not representative of the catchments property or there is an inherent problem in the model to generate the validation phase output? Please kindly clear such vague in due course and suggest the appropriate step I am supposed to follow?

## **Answer:**

Two possible reasons are as follows.

1. Over parameterization. This happens when you adjust too many parameters for the amount of observed data you have during the calibration period. As an extreme example, suppose you calibrate at the monthly time step, and your calibration period is only two years, but you have 12 parameters in auto calibration. Well, then you could probably get a very high model efficiency for the calibration period because so many parameters with so few data points means that some of the parameters are likely adjusted to account for random effects (instead of actual hydrologic dynamics) during the calibration period. Then when you try the validation period your model efficiency will probably drop dramatically. I don't know what the "rule of thumb" would be to prevent over parameterization. At the

daily time scale, would it be 20 days for each parameter?. to me that doesn't seem strict enough, especially for arid or semi-arid basins. How about 5 peaks in the observed discharge for each parameter? That seems more reasonable to me, but I can't claim to have tested this. I don't know of any "rule of thumb".

2. Change in precipitation. If the precipitation record for the calibration period is a lot different from that of the validation period, then your model efficiency might also drop. I think the model developers recommend at least three years of calibration data, but more years include both wet years and dry years .There are other possibilities, such as changes in management practices.

### **43-Maximum number of outlets**

**Question :** Is there a maximum number of outlet points that can be used in the model?

**Answer:**

It will be 99999 outlets.

### **44- Aster GDEM**

**Question :**

I downloaded Aster GDEM data (30m) from <http://www.gdem.aster.ersdac.or.jp/search.jsp> already but I do not know how to create DEM map in ArcGIS 9.3. Could you tell me the way to do that as soon as possible?

**Answer:**

In ArcGIS 9.3, you can create DEM map by using 3D analyst tool. The process includes 3 steps:

- From topographic map, create contour map (vector)
- From contour map, create TIN
- Convert TIN to raster (DEM)

### **45-DEM download**

**Question :**

Do you know which are the potential web site to get the good DEM data?. The data I got from alabamaview.org contains error. I am looking for other site as well. If you know other site where I can get DEM, please let me know. I am ready to pay if there are any commercial site.

**Answer:**

You can download DEM data from two sources:

1. <http://srtm.csi.cgiar.org/> for DEM 90 m
2. <http://www.gdem.aster.ersdac.or.jp/search.jsp> for DEM 30m

## 46-Reservoir vs. pond

**Question :**

I have a dam on the main stem of the main river in my watershed. The sole purpose of the dam is to control flooding; no irrigation or municipal water is taken from it and there are no organized releases. I have attached a picture of it. I understand from the SWAT help PDF that main stem structures should be inserted as reservoirs, however since there are no releases I am wondering if I should instead call it a pond. What are your thoughts?



**Answer:**

If there are sub basins upstream of the dam (i.e., if it receives flow from more than just the sub basin it's located in), you'll have to model it as a reservoir. Reservoirs receive flow from the surrounding sub basin and all upstream sub basins. Ponds receive runoff only from the surrounding sub basin. You could alter your sub basin configuration (delineation) so that there are no upstream sub basins - the feasibility of that will depend on the scale and purpose of the model you're developing. I'm not sure what you mean when you say it has "no releases." I assume that floodwater does leave the system via drainage after the peak is attenuated. If that's the case and you want to simulate the storage and eventual release of water back to the stream system, proceed with the reservoir or pond option as you prefer. If there are truly no releases (i.e., it's 100 % volume retention), then just eliminate the drainage area from your model.

## 47-Tributary channel

### Question :

How to view the tributary channels in Arc Swat? is it the Longest path? I think the Reaches are main channels. Is this right?

### Answer:

I think there is no real (geo-referenced) tributary channels in Arc SWAT. Tributaries are defined by some physical parameters, but you cannot really locate it.

## 48-About water transfer

### Question :

In my basin there are currently two existing reservoir; name song and nam ngum. Water is transferred from Nam Song to Nam N gum. I went through the SWAT user manual it says we have to include this information in Watershed configuration file. I could not get it can anybody please explain me how to incorporate this water transfer issue?

### Answer:

I had a look at it SWAT 2009 doc.

I think there are two possible ways to do this is  
- either using WURES and WURTNF in the reservoir file, but I think that only helps with the extraction as I don't know if you can have negative extraction. I haven't tried this, but maybe you can adjust the code.

- The other option is the .fig file. You can use the command "4" to transfer water from one sub basin (where your first reservoir is) to another sub basin (where your second reservoir is). While this is not physically moving it from reservoir to reservoir, it will do the same thing. If your sub basin is relatively small compared to your reservoir, you would have the same effect. (page 33 - 35 in the io doc)

## 49- SEDIMENT YIELD RESULTS

**Question :** How does one relate sediment simulation results obtained at HRU level with expected results at farm level considering that the entire HRU may not be implemented with BMP in practice.

**Answer:** I am not sure if I understand your question correctly. But BMP implemented in a HRU affect the loading from entire HRU. The HRU framework does not allow direct transfer of HRU results to farm results due to its fragmented topology. When transferring HRU-scale BMP effectiveness at the farm-scale, there is always going to be some level of error because of spatial aggregation/desegregation.

## 50-Land use code

**Question :**

We are facing immense difficulty while loading the land use/land cover data as per the SWAT land use code as because in Indian scenario a substantial portion of hilly region lies under wasteland/snow/rocky or similar type of barren area. But in SWAT 2009 there is no such parameter code for reclassification.

**Answer:**

I believe the main model functionality for the land use, slope and soil section of SWAT is to provide a consistent basis for the delineation of HRUs. If you understand the concept of HRUs then this should be a straight forward modification to your particular problem. What I would suggest is that you select the SWAT land use code that is the closest in land use description to your wasteland/snow/rocky. Keeping this in mind perform modification in the assigned CN or any other parameter that might depend on the land use classification in the "Edit SWAT Input" section so as to more closely replicate your particular scenario.

## 51- Infiltration too low and runoff too high

**Question :** Please see attached plots of modeled and observed flows for the reach

I am trying to calibrate my model and I am getting far to little base flow and too much runoff.

So far I have tried the following:

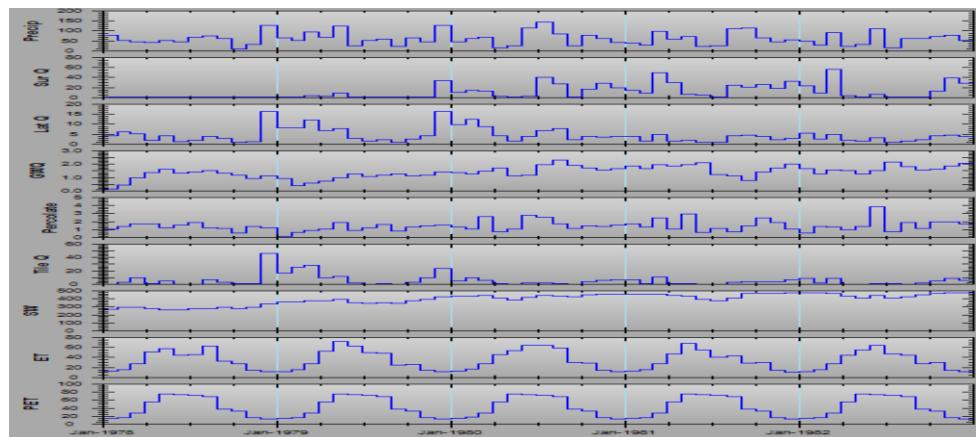
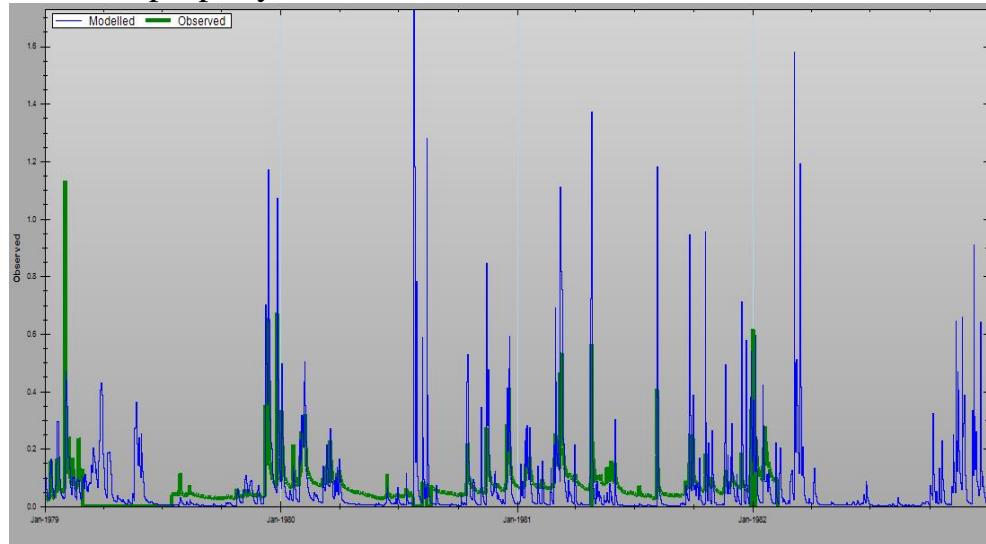
1.Reducing CN2/CNOP

2.Changing CNOP ,PET Method, CNCOEF

3.Increasing SOL\_Kvalues

4. Adjusting \*ALL\* the GW parameters. I've tested all these parameters to extremes with little or no effect. I

simply can't find a way to increase infiltration and I can't see what is limiting it. I think there is something not right with SW as it doesn't seem to fluctuate properly?



## **Answer:**

This is dangerous, because I have not personally used the tile drainage routine in SWAT --

But at least one colleague has told me that with tile drainage, the lateral flow component was large and not really controllable. In the end he concluded that the sum of tile Q + lateral Q was the "effective" flow due to tile drainage. He didn't say that the groundwater and base flow component was consequently limited -- but perhaps it was small in his watershed to begin with, in contrast to yours. I wonder, if you removed tile drainage from your watershed, would your model then be responsive to changing the groundwater parameters? I realize this may not solve your problem -- but it might help us better understand what the model is doing. Tile drainage is VERY important and we'd better be getting it about right. I do know there are studies that have concluded that tile drainage has increased base flow, so I presume there should be ways in the model to slow the delivery of water, via tiles, to the river such that it becomes part of the base flow. A subsurface tile that receives groundwater discharge is functioning like a new stream channel, and additional tile lines simply increase the channel network density. They should contribute to base flow like any channel, but the increased density should increase the base flow recession rate, i.e., the alpha\_bf. At least, that would be my working hypothesis.

## **52-Uncheck limit HRU output**

### **Question :**

I am interested in the details of SWAT output at HRU level, when I unchecked the limit HRU button and run swat model at a daily step, I got the error message: "Not enough space on temporary disk".

### **Answer:**

You can reduce the HRU output by asking SWAT to print fewer output variables. Look at the SWAT2009 Input/Output manual chapter for file.cio. Look for the IPDVAS variable in this chapter.

## **53-The file is already open**

### **Question :**

could someone help me? when I click on set up swat run I get a window that tells me that the file is already open, do not understand what that means and also will not let me run it.

### **Answer:**

I've received this error a few times when there was another error that caused the setup SWAT run to fail. In my case it was because the date range of my reservoir daily outflow files did not match the date range of my weather data. When I tried to re-setup, I got the error message saying the file is already open. The only way around it was to close Arc GIS and re-open the project. After I fixed the error in my daily outflow file, the run was set up correctly and I did not receive the message.

## **54-Outside the domain of the matrix**

I need to do simulations with SWAT for my final project with some urgency because the deadline is over. When I going to run Write All in Write input tables I get the error:

Outside the domain of the matrix

### **Answer:**

In my experience, this usually means that the date range of your input files (weather, reservoir outflow, etc) may not match each other. Or the date range you specify to run the model is not within the date range of your input files.

## **55-Precipitation in outputs**

### **Question :**

I'm a little bit confused as to how the annual summary for the watershed in each year, specifically the precipitation, is generated for the outputs. I ran a climate change scenario generated using a single precipitation/temperature "station" - right near the basin centroid. My daily precipitation time series indicated average precipitation of 400-500 mm/year, but according to my outputs, I'm getting fewer than 20 mm for each year. According to the outputs, my average annual precipitation is now a meager 17 mm, which doesn't seem to jive with the input data. True, for the most part, I'm getting 1 mm of precipitation per day, but even still my outputs file seems to severely underestimate precipitation relative to the input file. I've attached the .dbf for the precipitation time series,

as well as the output.std file. My warm-up period is the first three years of the precip.dbf.

### **Answer:**

The out put.std file you attached does not contain any data. Looks like it only has the headings for your warm-up period.

## **56-Sensitivity analysis problem**

### **Question :**

I am looking for helps with my sensitivity analysis. My SWAT was able to run sensitivity analysis without observed flow data, but after I tried to plug in observed data, SWAT never ran successfully. So I suspect that there are some problems with my observed data files. I know there were a lot of discussions on observed data format before, I actually used those discussion as my guide to create observed data files, but they just didn't work! I attached the files that I used here, would someone please have a look my files and help me with them? As you can see, I tried bother .dat and .prn format but neither worked. About the format, I followed 1X5i, 3x 2i, 3x, 1X11F.3. For the parameters chosen for output, I selected average/load for all of them. I chose 'flow' as the only parameter for comparison between observed and simulated values.

### **Answer:**

Try doing 5 (col 1) 5 (col 2) 14.3 (col 3).

In col 1, you enter the year, in col 2 - the month, and in col 3, the observed data.

## **57-Extract daily flow from daily output table**

### **Question :**

I am spending too much time on the extraction of daily flow from the daily output table. First, I have to open output.std in excel, then delete all the information but the daily water yield(mm) by hand. It is such a pain.

### **Answer:**

Yes, there is a far easier way to do it. "SWAT Simulation" -> "Read SWAT output," then check the checkboxes, click on "import files to database,"

then on "open swat output.mdb." If you are using an earlier version of SWAT, just go to "my computer" (or "computer," or "windows explorer," or whatever it's called on your system), navigate to your project directory0->scenarios->default->tables out and then choose the sub basin in which you are interested out of the access table.

## **58-Error**

### **Question :**

Surjido me a problem is that when I type in the location definition weather data from my station for all the variables I get the following error:

**error in file: occurred in: Make Temp: at 98**

### **Answer:**

You should check again file tmp about format, data...

## **59-How can we get sub basin wise shallow and deep aquifer recharge**

### **Question :**

Is it possible to get subbasin wise shallow and deep aquifer recharge? Is it fine to sum up the values obtained for shallow and deep aquifer recharge in hru output file, subbasin wise to get the results?

### **Answer:**

I think this should work. I forgot how the data are reported for each HRU -- but if it's in millimeters (mm), you'll need to multiply the mm of recharge by the HRU area to get volumes, then add up those volumes, to get the total for a subbasin.

## **60-Updating a parameter in Arc SWAT**

### **Question :**

I am just wondering about the best way to change/update a parameter in Arc SWAT. Suppose, I want to increase my CN by 5 percent for selected HRU's, should I go back to the "Edit Input" section and make the

necessary changes for the respective HRU's or there is a more convenient way to deal with this?

**Answer:**

I recommend you use SWAT-CUP to do it. You can also update the values in .mgt using MATLAB or equivalents and then simply run swat.exe.

## 61-Subbsain surface adapted to reservoir surface?

**Question :**

I am currently modeling a very large watershed with huge reservoirs whose volume varies considerably through the year. My problem is that I need that the subbsain surface changes according to the reservoir surface to avoid double counting of the precipitation and evaporation. I looked at the source code but it is still unclear if SWAT does it already or not. Can you help me in this matter?

**Answer:**

Since this is a large reservoir, I assume in your land use this area would be explicitly identified as a water HRU. If it is a water HRU, SWAT assumes, a water HRU always contains water and does only PET calculation and does not even account for rainfall/runoff or other hydrologic processes. Only the active water spread area based on the actual volume and shape factors is used to catch the rainfall extent and used for water balance calculation. So double accounting does not happen in the calculation within the model. In fact because of change in surface area, the model would slightly under predict the surface runoff generated from the local catchments, because the water HRU does not contribute to any runoff.

## 62-Missing precipitation

**Question :** I have a question about the precipitation input data. if I have missing data I have to put -99 or is the same if I put -999. Because when I'm implementing temperature data with missing data -999, swat changes data temperature with -99, but not for precipitation!

**Answer:** A negative 99.0 (-99.0) should be used for both precipitation and max/min temperatures for the model to generate.

## 63-Weather generator

**Question :**I would like to ask you, if anyone of you has got weather generator, that I can use in the Czech republic. I am not sure if I can make my own, so it would be nice to use some, that is already working... Is it possible to use one from the Germany, Poland or Austria.

**Answer :**<http://swatmodel.tamu.edu/> check out WGN macro file on the website. it helps u to generate the weather data in a SWAT input form

## 64-How to turn off the In-stream function in SWAT

I want to compare the subbsain sediment loading with channel deposition, so I would like to turn off the In-stream function. But I do not know how. There must be a document or manual talking about this, anyone give me a direction?

**Answer:** To stop all channel erosion, set the erodibility factor to zero (or the cover factor). To stop channel deposition is not quite so easy. You can come close by setting the SPCON parameter to as large a value as possible, I think. To get subbsain loads, use the sub or hru output tables. Net channel deposition in the watershed would be the difference between the sum of the subbsain loads and the SED\_OUT from the reach at the watershed outlet. Reservoirs in the system would be included as part of the sediment-depositional feathers here. If you wanted channels separately from the reservoirs, you'd have to subtract out the amounts trapped by reservoirs (see rsv output table).

You could also subtract sed\_out from sed\_in for each reach and sum those to get net channel deposition. Finally -- it's always good to calculate things in several different ways, to check that your calculations make sense, and to check that SWAT is internally consistent.

## **65-Regarding ET methods and possible omission of WIND and RELATIVE HUMIDITY weather variables**

**Question :** I have gone over quite a bit of literature and it is my understanding that the Hargreaves method produces acceptable PET estimations. I want to omit wind-speed and relative humidity from my exercise -- is this possible? From what I have gleaned from the SWAT literature, it appears that the only function of the WIND variable is for use in the Penman-Monteith equation. I see that the relative humidity variable is used in the Penman-Monteith and Priestley-Taylor methods, but there is also a passing mention of relative humidity being used for a water stress calculation. In brief -- can I run SWAT without using the relative humidity variable?

### **Answer:**

I wish I knew the answer. If I recall, open water evaporation is based on either PT or PM methods, implying that even if you choose Hargreaves, SWAT is somehow generating humidity and wind. If this is in fact true, I presume SWAT is using its weather generator with data from the nearest stations in its USA database, unless there is an algorithm within the Hargreaves routine to estimate these things from T alone. Those working outside the USA may have better insight here.

## **66-Water balance**

**Question :** I know from another user that a program that from the results of swat makes a general balance indicating the errors

### **Answer:**

SWAT CHECK. <http://swatmodel.tamu.edu/software/swat-check/>

## **67-Point and Non point source data**

**Question :** I have some point sources such as wastewater treatment plants in my watershed, which I am planning to include in my project. I am just wondering that how can I obtain the data for those sources and what is the best way to include those sources in my SWAT model (expected format of the data, etc). Also I am looking for the specific non point sources data including the tillage operation, fertilizer application and the management

practices occurring in the region to use in my SWAT project. Is there a specific website/online source to find information about these data?

### **Answer:**

If you want to incorporate WWTP information within SWAT you will need to obtain the monitoring data collected at the WWTP outfall. I am not sure how it works in North Carolina, but in Wisconsin the Dept. of Natural Resources has each permittee's monitoring data (average daily flow and concentration data collected during a given interval). From the monitoring data we can calculate a monthly or annual load and incorporate it as a point source within SWAT. Obtaining monthly loads is best, but if the information is course you can extrapolate monthly loads from the annual information. Reference the SWAT user manual in regards to the specifics for setting up a point source input file. In SWAT 2009 the type of input file you setup is dependent on the time step of the point source (rechour, recday,recmon, recyear). Basically the SWAT input file will include the station coordinates and load information.

## **68-"Record is deleted"**

**Question :** When entering precipitation and temperature files into SWAT, I get the following error: "Error-2147217071-record is deleted DAO. Table Defs." At this point, the only option was to hit "OK," which I did. Now, it seems that the daily precipitation data dbf is properly created from the original text file. Then, I got another error: "Error in precipitation gage data. Monitoring point features for not coincide [sic] with precipitation station table." I am doing this on a backup copy of my project; otherwise all looks great. I'm pretty sure the formatting of the precipitation and temperature .dbf files (attached) is correct based on my past-experience with SWAT and my review of the documentation. The text files containing the daily values are definitely formatted correctly. I have ensured that the files are in the appropriate folders and that the names of the station files are identical to those in the listed in the table. Yes, there should only be one precipitation station, which is the same location for the temperature station, for the exercise I'm conducting.

### **Answer:**

To follow up, I also goggled the error and found some information at:  
<http://edndoc.esri.com/arcobjects/8.3/ComponentHelp/esriCore/fdoError...> All it says, though, is "Data Source could not be locked." Hopefully this helps, although please note I'm using Arc GIS 9.3 not 8.3.

## 69-REVAP

**Question :** Does the total ET also includes REVAP values in it. If not what is the role of REVAP in whole water balance.

**Answer:**

I don't know for sure, but my guess is that REVAP is already a part of the total ET. However -- you should check this by setting REVAP to zero, noting the ET, and then compare the results against runs where REVAP is positive.

## 70-Error run swat2009

**Question :** I'm using SWAT2009 version 488. I set up SWAT successfully But when I run SWAT appears the error in attached file. Is the same error that in 6 Dec 2011 you have discussed with Mr. Ammar Rafiei.

I have tried to change the user soil and to use swat2009rev and db...but the result is the same. Can you help me to understand the reason of this error?

```

Setup and Run SWAT Model Simulation

C:\> C:\WINDOWS\system32\cmd.exe
  SWAT2009
  Rev. 488
  Soil & Water Assessment Tool
  PC Version
  Program reading from file.cio . . . executing

forrtl: severe (408): fort: (2): Subscript #1 of the array SOL_BD has value 7 which is greater than the upper bound of 6
Image          PC      Routine      Line      Source
swat2009.exe   00DBF67A Unknown       Unknown  Unknown
swat2009.exe   00DBCDC8 Unknown       Unknown  Unknown
swat2009.exe   00D11A3A Unknown       Unknown  Unknown
swat2009.exe   00D1226E Unknown       Unknown  Unknown
swat2009.exe   004E944B _READSOL      117     readsol.f
swat2009.exe   00C617EE _READSUB      415     readsub.f
swat2009.exe   00596E50 _READFIG      163     readfig.f
swat2009.exe   004599EF _MAIN_        84      main.f
swat2009.exe   00DC46E3 Unknown       Unknown  Unknown
swat2009.exe   00D68767 Unknown       Unknown  Unknown
swat2009.exe   00D6863F Unknown       Unknown  Unknown
kernel32.dll   7C817077 Unknown       Unknown  Unknown

SWAT run failed. Hit Enter to exit.

```

## Answer:

I had same error, the solution is that just go to your user soil table. surely there are sth wrong with soil table .

## 71-N03kg and ORGNkg NaN in Urban HRUs

**Question :** I have a 374 sq km watershed in East-Central Illinois that is 90% row cropped. The rest is low-density (2 HRUs) and medium-density (2 HRUs) urban areas. I have my flows calibrated and validated, and I've moved onto nitrate. For the low-density HRU's the amount average annual value of N03 kg produces Not a Number in the output.std. In the reach file there isn't anything displayed for those HRU's and any downstream HRU. All other reaches have Nitrate, even matching some of my observed data for an unconnected branch. Surprisingly, the NO3 kg in the reach file displays for the first year of any simulation I run, but for the second year there isn't anything displayed. The average annual value in the output.std would indicate that there's a calculation somewhere that produces NaN in day 1 of year 2. Again, the flows look fine. I've tried fiddling with CN, USGS Regression or Build-Up/Wash Off and some of the parameters in the urban database to crank up NO3 levels in these HRU's without any luck. Even assigning them the same

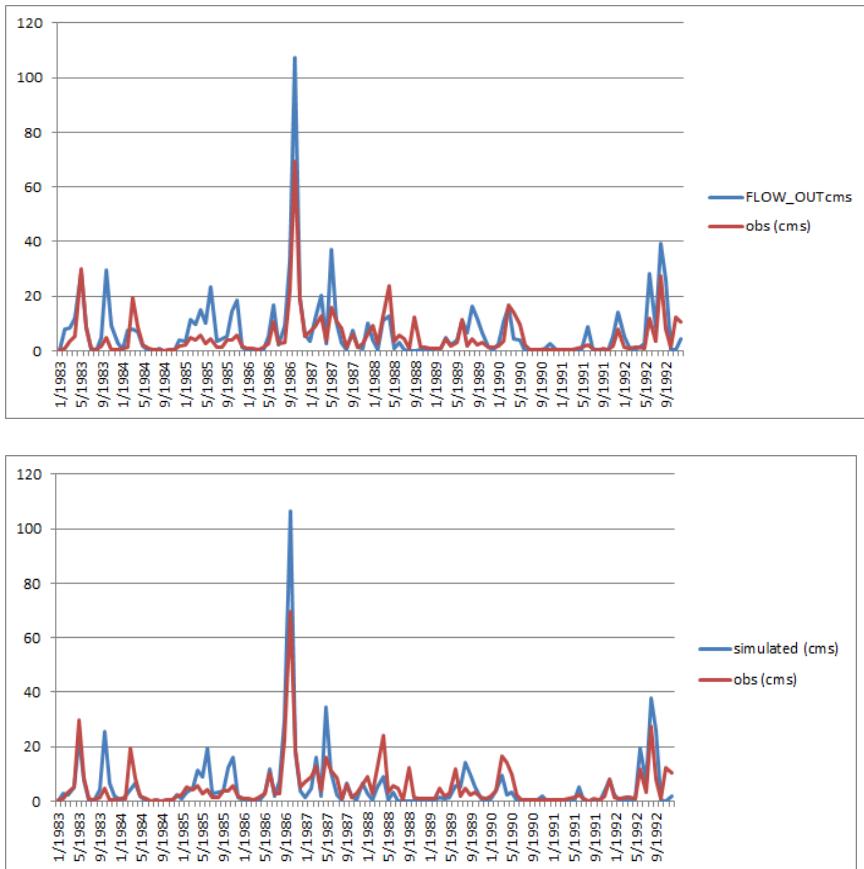
classification in the mgt file as the medium-density HRU produces NaN. I find the behavior strange and I'm considering reclassifying the area to medium-density as a solution, as there are 2 HRU that are medium-density working fine. But, I'm not confident this will address the issue. I just think it might be convenient because these rural town areas are not part of the analysis. Before I go down that route, has anyone seen this behavior or have experience setting up urban areas?

**Answer:**

The soil for those H R Us did not have realistic values for SOL\_AWC, SOL\_K. That solved the problem.

## **72-Manual calibration when sens. analysis says nothing's sensitive**

**Question :** In attempting to calibrate my model, I conducted a sensitivity analysis using observed data. The most sensitive parameter was CN2 but the sensitivity index for it was only 0.435E+00, which I wouldn't even use if this was the calibration stage. I tried manually calibrating with all three T methods - the best in-terms of Nash-Sutcliffe was Penman-Montieth and Hargreaves. However, I can't break the 0.4 N-S threshold. My small (1060 km<sup>2</sup>) watershed only contains one stream gage active for the calibration period, and the calibration period is from 1980-1992 so that's before radar in case precipitation is really a problem. The precipitation and temperature gage is a QA/QC USHCN & GHCN site, and I double-checked the QA flags for the largest reported precipitation events. Nevertheless, it's looking to me that precipitation is the problem especially since sensitivity analysis wasn't that helpful, but am just wondering if someone has another idea in mind. I can confirm that the crop yields are correct, and that the stream gage data were approved for publication. My base flow/direct runoff ratio is also in the ballpark. The upstream portion of the watershed is a metropolitan city, but the rest is entirely rural. The upstream portion also contains an aquifer but that's only a small portion of the watershed.



### Answer a:

I think you should employ multiple statistics to evaluate model performance as recommended in Dr. Moriasi's paper. The N-S statistic in your data set is strongly influenced by a single peak in November 1996. Several publications indicate the influence of outliers on N-S (see McCuen et al. 2006, J. Hydrol Eng., 11(6):597-602, for instance). In addition, you may want to discuss your statistics with and without this month.

### Answer b:

The only thing I can think of offhand is to maybe censor your precipitation data, so that your maximum daily rainfall amount allowed is something like 75 mm, or even 50 mm. I've noticed in my watersheds when rainfalls exceed 100 mm then SWAT seems to significantly overestimate flows (and consequent erosion). This would lower your largest model peaks, and maybe allow you to shift the other parameters a bit to match some of the smaller peaks. The N-S coefficient is sensitive to the peaks, so this should improve your fit.

## 73-Trend analysis in historical climate data

**Question :** This question might be a bit off the track but I am still curious. I have precipitation, maximum and minimum temperature data on a daily basis for my study watershed for a period of 59 years. My question is what is the procedure to analyze/study the seasonal variation and the trend of the data for precipitation and temperature in my watershed for these many years?

**Answer a:**

The seasonal Kendall-test (or Mann-Kendall) would work, but be sure to remove any autocorrelation beforehand b/c the literature has concluded that autocorrelation could greatly improve the odds of getting a statistically significant result when one really doesn't exist. I would download the Makesens program, which is an MS Excel macro and which computes the test for you, and the user manual for it is really good. (Google "makesens" and the spreadsheet and program is the second link that comes up).

**Answer b:** I think aggregating the data to the seasonal level is a good idea, and then analyze your seasonally aggregated time series (for example, Winter 1960, Winter 1961, .Winter 2009) for a trend using Mann-Kendall. And, yes, check for autocorrelation after aggregating and before doing the Mann-Kendall test. If you're lucky, you'll find no statistically significant autocorrelation, and then you can proceed with Mann-Kendall, at least that's the way I understand it. You might also be interested in aggregating at the annual level. You should also check that your data doesn't contain inconsistencies, like changes in the location of measurement stations, etc.

**Answer c:**

I think I just got my names mixed up. Kendall-Tau deals with correlation rather than trends -- apologies!

According to Helsel & Hirsch ("Statistical Methods in Water Resources"), the Seasonal Kendall Test is the same thing as the Mann-Kendall test applied to each season, and then combined.

## 74-Right sitting of dam

**Question:** I have been trying to examine the impact of dams on flow regime downstream. Ideally siting the dam at a gauging station location

enables you to check for changes in flow. However, i do not see any changes at the gauging station where the dam is sited in SWAT.

### **Answer:**

I think we need more information to figure out your problem. Make sure that the output you are looking at is the outflow from the reservoir, and not the reach or subbasin the reservoir is in. The Reach output is input to the Reservoir (not the other way around).

## **75-Weather Generator used together with measured data**

**Question:** another question about the weather generator: if we use our own measured precipitation and temperature series, will the weather generator use them to generate the other missing parameters (relative humidity,solar radiation) to maintain some sort of climate coherency, or will it only use statistics from the weather generator database? If it doesn't, then should we used our measured data to generate statistics to replace the statistics in the WG? (we are looking at a watershed close to Vermont, so we used US statistics from the WG).

**Answer:** The weather generator does not interact with the daily weather files you input, other than to kick in when there is a -99 value. The weather generator uses average monthly values from selected weather stations to generate missing climate data. You can read all about it in the SWAT Theoretical Documentation manual. You can look at the stations and the data in Arc SWAT/Databases/Weather or in the SWAT2009.mdb. The first thing the weather generator does is decide if it is raining or not. It does so without referencing the PCP files you have provided. Creating your own WGN files won't help that.

The Arc SWAT Documentation has information about creating your own WGN stations. The SWAT I/O Manual has details on the required data for WGN stations.

## **76-Calibration using SUFI 2**

**Question :**Can anyone suggest me about how to rewrite and modify the new parameters in SWAT project as given by the SUFI 2 algorithm? Are the parameters automatically updated as soon as a iteration is finished or

we are supposed to change them manually? Also what exactly is meant by the "behavioral simulation"? In my case

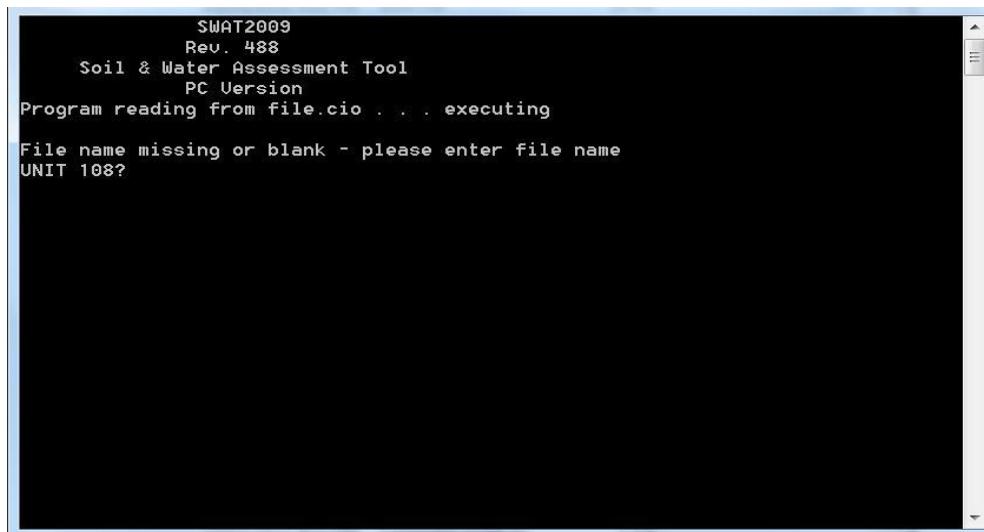
I had a simulation of 500 and in the summary stat table I found that the behavioral solution are 404. I did not change the default behavioral threshold of 0.5.

**Answer:** I have encountered the same problems/questions. Page 50 of the SWAT-CUP User Manual describes how to save the txt-in out files for the best simulation. However, I have not been able to obtain SWAT output that matches CUP output by manually entering the best parameters to SWAT from SUFI2. This is concerning, as it draws the SWAT-CUP SUFI2 simulations and/or statistics into question and makes it difficult to understand precisely what parameter values result in the "best simulation.

## 77-Error in running SWAT

### Question:

I run the SWAT interface, but I have some issues in running SWAT. I compiled the source-code and then build the .exe file with Visual Fortran. When I try to execute the exe. file, I get following error: File name missing or blank-please enter the file name  
UNIT 108?



```
SWAT2009
Rev. 488
Soil & Water Assessment Tool
PC Version
Program reading from file.cio . . . executing
File name missing or blank - please enter file name
UNIT 108?
```

## **Answer:**

Unit 108 can be one of at least a couple of files (urban.dat or .hru files).

## **78-Negative values for precipitation**

I'm working a series of precipitation values with a great number of anomalies. I corrected the precipitation values accordingly but, after the corrections, I have some negative values for precipitation. Maybe I could put these negative values equal to zero but how SWAT would work with some negative values for precipitation? SWAT will consider these negative values as NO DATA and then it will interpolate to have new data for those NO DATA values? Or it will put the negative values to zero?

## **Answer:**

The only negative values for precipitation (P) should be -99, which indicates a missing value to SWAT. SWAT would then (I believe) revert to estimating precipitation based on its weather generator program. Unless I'm missing something obvious, I don't see how any other negative values for P would be sensible. Assuming that you are in control of the time series of P that you are inputting to SWAT (whether an actual record, or a simulated record that you generated), then I would advise removing all -99 values. If you have more than one station, then fill in missing P values with those from the next nearest station, or use an average of existing stations. SWAT does not do this interpolation among existing stations for you (not that I know of).

## **79-SUFI2**

### **Question :**

I am currently calibrating my SWAT model with the SUFI2 algorithm in SWAT-CUP 4. I had a few queries in this regard.

- 1) I have ran the SUFI2 algorithm for the 13 default parameters that are already in par.inf\_text for 500 number of simulations in the 1st iteration. It almost took 4 days to complete the iteration. My question is that is it this long time that the program is supposed to take to complete 500 simulations? I am calibrating only for one USGS station at the upstream part of my watershed so I suspect when I go for multisided calibration with the datas from all the sites being provided in the observed.txt it is

going to take a long time? Is there anyway I can use the Parallel processing feature to reduce the operating time?

2) After my 1st iteration the summary stat is like this P\_factor 0.82, r\_factor 1.02, R square 0.77, NS 0.67

I believe according to the manual p-factor should be close to 1 and r factor should be less than 1. How many more iterations should I perform in order to get the calibration done?

3) With the new parameter range specified in the last iteration should I update the parameter values for the next iteration in SUFI2 or is there any need to run SWAT again?

### **Answer:**

First of all, the time it takes to run one simulation depends a lot on the number of HRU's you have. Have you tried running one simulation yourself and timed it? One easy way to do this is to open your SUFI2 project folder, look for swat2009.exe, and double click on it. 4 days sounds very long for 500 simulations, but if your computer takes 2 hours to run 1 simulation because you have many HRU's, then it makes sense. Also, you might want to check file.cio to make sure you aren't unnecessarily writing output files that you might not really need, like soilst.out, or even columns in the output.rch file that you don't really need. All this writing takes a good chunk of time and should be avoided unless you really need the information. To me, an NS value of 0.67 is very good if you are doing this at the daily time step, not bad even at the monthly. If you've only run 500 simulations, chances are you can still improve it pretty much, especially if you are calibrating 13 parameters.

## **80-Different calibration time will get different flow**

### **Question :**

The first calibration time are 3 years (such as the year of 2004、05、06) , and the second calibration time are 2 years

(2005、2006) .Finally, the results of the flow data are different in the year of 2005 and 2006, and often get a big difference. I do not know how it happened ?

### **Answer:**

How long is your warm-up period? A warm-period that's too short that could definitely significantly alter one's flow regime.

## 81-Land use update

### Question :

I am trying to use land use update (lup.dat) to urbanize my watershed. I make the lup.dat file using the Arc SWAT interface and then rewrite the file, and then run it. SWAT runs successfully but then when I look at my previous runs with no land use update and the run with the land use update, the flows are exactly the same and there are no changes at all. To test it, I urbanized all my forest and agricultural areas in the basin to see if it was just the amount of change that was insignificant, but there was still no change. I am looking at the flows in the watout.dat file. Is this because I am looking at the wrong flow, should I be looking at the output.rch files? or is this because by lup.dat isn't working?

### Answer:

there was a bug in arcswat2009.93.5 version, please upgrade to latest version to fix this issue.

## 82-Calibration Versus Validation model efficiency

### Question :

I have few absurd in calibration and validation phase of SWAT model. **The calibration step come out with suitably sufficient model efficiency while the validation phase is characterized with significantly low model efficiency values.** I am tracing the root cause but could not able to figure them out rightly. Is it due to the fact that the calibration phase which brings sufficiently good model result is not representative of the catchments property or there is an inherent problem in the model to generate the validation phase output? Pls kindly clear such vague in due course and suggest the appropriate step I am supposed to follow ?

### Answer:

Two possible reasons are as follows.

1. Over parameterization. This happens when you adjust too many parameters for the amount of observed data you have during the calibration

period. As an extreme example, suppose you calibrate at the monthly time step, and your calibration period is only two years, but you have 12 parameters in auto calibration. Well, then you could probably get a very high model efficiency for the calibration period because so many parameters with so few data points means that some of the parameters are likely adjusted to account for random effects (instead of actual hydrologic dynamics) during the calibration period. Then when you try the validation period your model efficiency will probably drop dramatically. I don't know what the "rule of thumb" would be to prevent over parameterization. At the daily time scale, would it be 20 days for each parameter?...to me that doesn't seem strict enough, especially for arid or semi-arid basins. How about 5 peaks in the observed discharge for each parameter? That seems more reasonable to me, but I can't claim to have tested this. I don't know of any "rule of thumb".

2. Change in precipitation. If the precipitation record for the calibration period is a lot different from that of the validation period, then your model efficiency might also drop. I think the model developers recommend at least three years of calibration data, but more years include both wet years and dry years. There are other possibilities, such as changes in management practices.

## **83-Simulated weather data for SWAT**

### **Question :**

I want to model SWAT for future time. So simulated weather data in the future which I can use for this simulation, I can download from where?

### **Answer a:**

you can use the climate change scenarios from GCMs (published by IPCC, 2007), or the scenarios of MONRE, 2009.

### **Answer b:**

You can download the GCM runs from the website  
<https://esg.llnl.gov:8443/home/publicHomePage.do> which is the WCRP CMIP3 multi-model database. You need register as user first.

## **84-Maximum number of outlets**

### **Question :**

Is there a maximum number of outlet points that can be used in the model?

### **Answer:**

It will be 99999 outlets.

## **85-In SWAT modeling**

### **Question :**

I have been trying to compare SWAT simulation result for discharge against observed data on monthly basis. However, I come to learn that there are two options for simulated discharge( one is from **reach** as FLOWOUT in m<sup>3</sup>/s) and the other one is from **Sub-basin** as WATER YIELD in mm). I expect both simulation results should be the same. But working out some sub-basins with u/s draining watershed do not have the same values. So which outflow/water yield do I use for comparison purposes. The second question is Observed discharge data format: Is there any automatic option to convert EXCEL format discharge data into .txt format maintaining all the spaces suggested by the user manual.

### **Answer a:**

Use the FLOWOUT from the reach to compare to observed flow records. This includes the water yield from the local subbasin plus input from the next upstream reach (if any), minus any transmission loss (seepage out of the channel, if your K > 0). I frankly don't know if the model calculates atmospheric exchange (precipitation additions and evaporative losses) over the area of the reach, but these are commonly small compared to other components (I think -- though this must depend on climate).

### **Answer b:**

Here's a response to your second question, In Excel set the column widths to the number of columns stated in the manual

- I think it's 5, 5, and 14. Then, from Excel, save it as a .prn file, e.g., as observed\_discharge.prn. Then close Excel (not sure you really have to) and go to the folder you saved observed\_discharge.prn in, and rename it observed\_discharge.txt. That should do it.

## **86-DEM download**

### **Question :**

Do you know which are the potential web site to get the good DEM data?. The data I got from [alabamaview.org](http://alabamaview.org) contains error. I am looking for other site as well. If you know other site where I can get DEM,

### **Answer:**

You can download DEM data from two sources:

1. <http://srtm.csi.cgiar.org/> for DEM 90 m
2. <http://www.gdem.aster.ersdac.or.jp/search.jsp> for DEM 30m

## **87-Strange SWAT2005 Running Results**

### **Question :**

It's so strange that I cannot get the same results using the same data through SWAT2005. I first run the project with 35 sub-basins. Then I divided fewer sub- basins and found the simulated flows were far less than the previous results. But when I tried to run the project with 35 sub-basins again, I was shocked that I couldn't get the same results as before. The modeling results were also far less than before. I am so curious about it. Are there any bugs? Do I have to install the model again?

### **Answer a:**

Here is my theory:

If you have less (and thus larger) subbasins than this means there is more opportunity for the water to evaporate or move to other parts of the water balance than with smaller subbasins, strictly because the travel time for the water to get to the main trunk of the stream is going to be larger.

I might be wrong, maybe someone else can comment.

However, overall I would not be surprised if the results are different. Maybe you can have a detailed look at the individual water balance components to see where the water actually went!!

### **Answer b:**

Another issue is the HRU definition. Using a different number of subbasins may result in a different number of HRUs which may result in more or less runoff depending on the land use.

## **88-about water transfer**

### **Question :**

In my basin there are currently two existing reservoir; nam song and nam ngum. Water is transferred from Nam Song to Nam Ngum. I went through the SWAT user manual it says we have to include this information in Watershed configuration file. I could not get it can anybody please explain me how to incorporate this water transfer issue?

### **Answer:**

I think there are two possible ways to do this is - either using WURESN and WURTNF in the reservoir file, but I think that only helps with the extraction as I don't know if you can have negative extraction. I haven't tried this, but maybe you can adjust the code. - The other option is the .fig file. You can use the command "4" to transfer water from one subbasin (where your first reservoir is) to another subbasin (where your second reservoir is). While this is not physically moving it from reservoir to reservoir, it will do the same thing. If your subbasin is relatively small compared to your reservoir, you would have the same effect. (page 33 - 35 in the io doc)

## **89-SWAT 2009 user's manual?**

### **Question :**

Please can someone tell me where I can find the SWAT 2009 user's manual? The Arc SWAT user's manual makes reference to it, but I can't find a copy to download...

### **Answer:**

The SWAT 2009 user's manual has not been released yet. You can check back periodically at <http://swatmodel.tamu.edu/documentation>. I am sure the folks at Texas will also post an update on this user group site announcing the release on the input/output and the theoretical documentation.

## **90-Long/lat of each HRU**

### **Question :**

Does anybody know how to obtain the long/lat for each HRU? I need that for spatial mapping.

### **Answer:**

I tried to create HRU feature class by checking it when overlaying the land cover, soil and slope. Then, I exported the FULL HRU and opened the attribute table then I added a field then I went to calculate Geometry then I got X-coordinate of the centurion and Y-coordinate of the centurion of each HRU..

## 91-Simulation for sediment yield

### Question:

This is Visual Singh from NIH, Rookie, India .....When I am simulating SWAT for Sediment yield , it is not giving effectively results for daily basis. While I am putting land use data, Soil map (define soil hydrological group) rainfall , min max temp., wind speed & RH respectively.

I want to know which factors is more responsible for sediment yield simulation in SWAT Model..

### Answer:

You can control via the landscape (HRUs, Ponds, & Wetlands) and the channel. Hopefully you can obtain a conceptual estimate of how much sediment loss occurs from your fields. By examining your HRU sediment yield you can tell if your landscape parameters are correct. If not, you will need to adjust the landscape parameters. Then you can adjust SPCON, SPEXP which controls the balance between deposition and degradation in the channel. If you have lots of channel erosion, you can use the CH\_COV and CH\_EROD. Please note, if your hydrologic calibration is poor, your sediment calibration will likely be the same. Ensure that the water budget is properly simulated before tackling the sediment calibration.

## 92-Error code 13

### Question:

I am facing an error in running the SWAT model.

The error window is:

"Error calling unlink for file c:\avs2000\new1\scenarios\default  
\text in out\basins.bsb returned error code 13"

### Answer:

If it would be possible for you to use our latest version, I think it would benefit you. The version that you are using is very old

and not supported anymore. Please review your options for Arc SWAT from the following link:

<http://swatmodel.tamu.edu/software/arcswat>

## 93-HRU output is empty

### Question:

In my SWAT runs, the HRU output is empty and there is no BIOMASS output. I am wondering if anybody can help me how to solve this problem.

### Answer:

How big is your study area and where is it?

Did you use the interface to set up and run SWAT?

Make sure you unchecked the "limit HRU output" in the "run SWAT model simulation" window check the input HRU files to see if these are written right! check output.std to see if the biomass output is available there?

## 94-PCP file

### Question:

I have 3 ran gauge stations in my watershed. In some of the stations, data are missing for some period. Does it take precipitation from another station for that period. How SWAT deals with the missing data in any station? does it take from another nearest station or simply it takes zero(0) for missing data of that station.

### Answer:

At most, SWAT will fill in missing values (which must be designated as -99) via its weather generator, if you've got the statistics for nearby stations included in Swat's weather-generator database (these values are automatically included for the USA).

But for precipitation, you usually should not let SWAT generate estimated values (unless you really are looking only at long-term average flows for climate-change studies). If you are trying to match monitored flow records or other monitored values, you really should fill in the missing values yourself with those from the nearest station you have data for. SWAT does not do this automatically.

Otherwise, you can pre-process the precipitation data with PCP\_SWAT, which takes the available data for each day and kriges it to estimate precipitation in each of your subbasins. This takes care of missing values and smooth precipitation over the entire watershed.

## **95-exaggerated simulated discharge**

### **Question:**

In my SWAT run the simulation results are much exaggerated when I compare them with the observed data. I tried to decrease the curve number, soil available water, threshold depth of water in shallow aquifer for revamp to occur and increase deep percolation loss and groundwater revamp coefficient. But the change is not satisfactory, even it is not changing that much. Is there any mechanism to lower the simulated discharge ?

### **Answer:**

In that case, I would verify precipitation input data. Make sure they are within reasonable range of rainfall in your study area.

## **96-To reduce the lateral flow**

### **Question :**

I am getting a very high lateral flow. Could anyone help how to reduce the flow. Which factor does affect the lateral flow more?

### **Answer:**

You can try to decrease it by changing the lateral flow lag time or hydraulic conductivities of soil layers.

## **97-Climate change analysis through Swat model**

### **Question:**

I am working on climate change analysis, I want to apply swat model for this , how can I do this

### **Answer:**

Are you have Globale Model Climate Change? when you are run finish on GMCC you can selected the parameters as Tem. or Rainfall.....then you can take those permanent input into the SWAT model. as What you want to modeling on climate change RFINC, TMPINC ... ? if you can try on Edit Input then go to Subbasin Data and on the Select input file you select on (.sub) you can see many parameters as RFINC.....

## **98-Sensitivity analysis and calibration**

### **Question:**

When I want to do sensitivity analysis and calibration, SWAT wants me to choose a subbasin. Is the sensitivity analysis and calibration done just for the chosen subbasin and I should do that for all subbasins one by one?

### **Answer:**

In the simplest situation, you have a stream gage measuring flow, and you make that the outlet for your entire basin. And then, when you want to calibrate, and you need to choose a subbasin, pick the one that has the stream gauge. Don't pick the other ones. The other ones drain into that one subbasin, and thus, in a sense, are already included.

## **99-PET file**

### **Question :**

Someone has an example of how to build an file of PET?

### **Answer:**

I have attached the chapter from our documentation on this file, along with an example input file.



pet.pet ch11\_input\_pet.doc

## **100-Error with SUFI2**

### **Question :**

I am trying to calibrate with SWAT-CUP SUFI2, the SFI.run finishes ok, but on running SUFI\_post , the program terminates with a message “ERROR simulation number 1 in variable file 1 is missing or has a problem”.

I have checked the observation data by running the program systematically from observation 1 to the 44th observation with a successful run including SUFI\_post. From the 45th observation I get the error message.

Anybody with an idea what is going on?

### **Answer:**

Are you using daily data or monthly data for calibration. In other words is your time step(1d,2m,3y)= 1 or 2 in SUFI2\_extract\_rch.def file? I have similar problems with the test example is SUFI, if I use daily data. But monthly data seems to run fine. It seems that there might be some bug in SUFI2 code for running calibration with daily data.

## **101-Weather data definition error**

### **Question :**

While inputting the weather data, it gives me " Error in file: occurred in: Make pcp " and " a column was specified that does not exist"

I can see that the temp, precipitation and weather generator stations are in the same folder. What can be the cause of the error?

### **Answer a:**

I didn't get the situation very well. But, are the files in witch format?

If in .dbf you got to have the column "DATE" and the other "PCP".

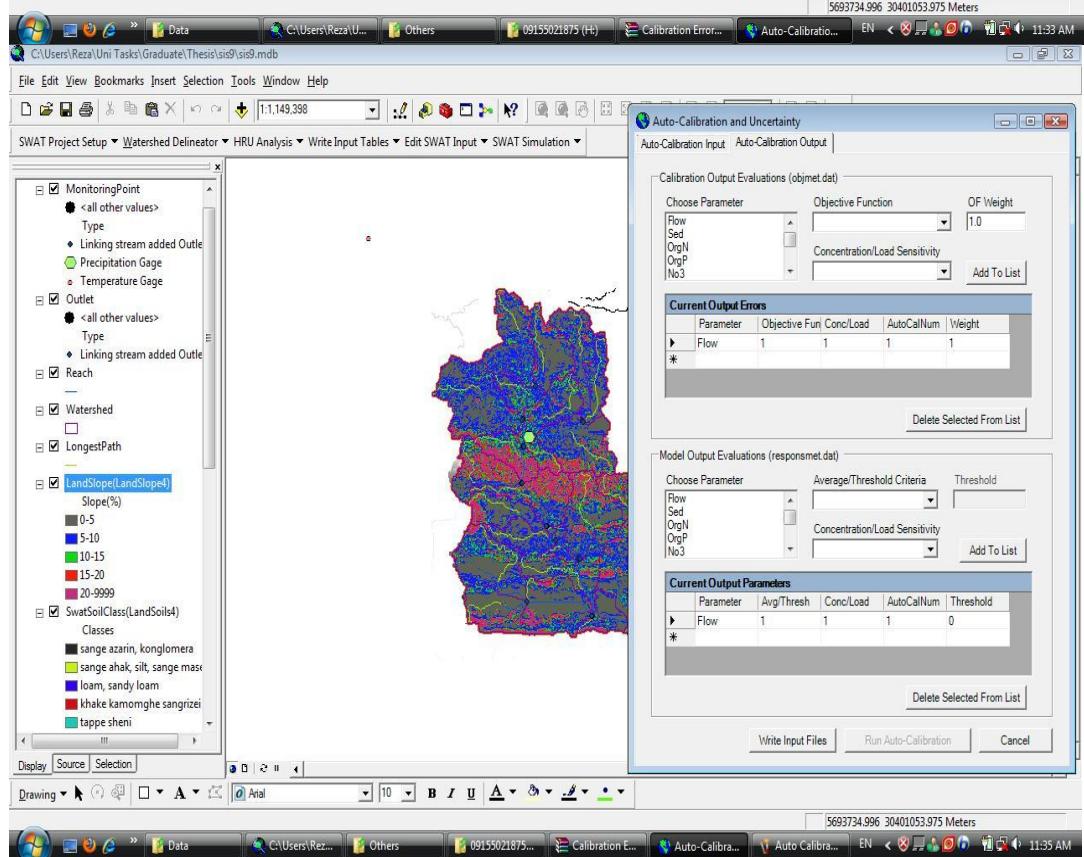
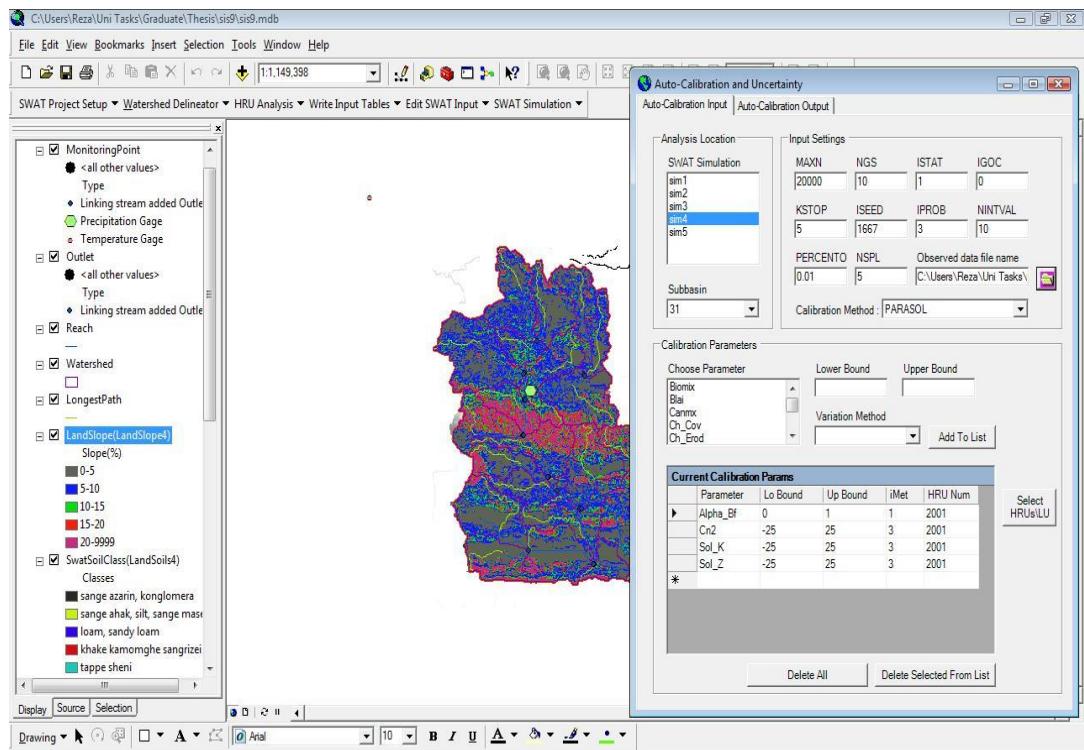
### **Answer b:**

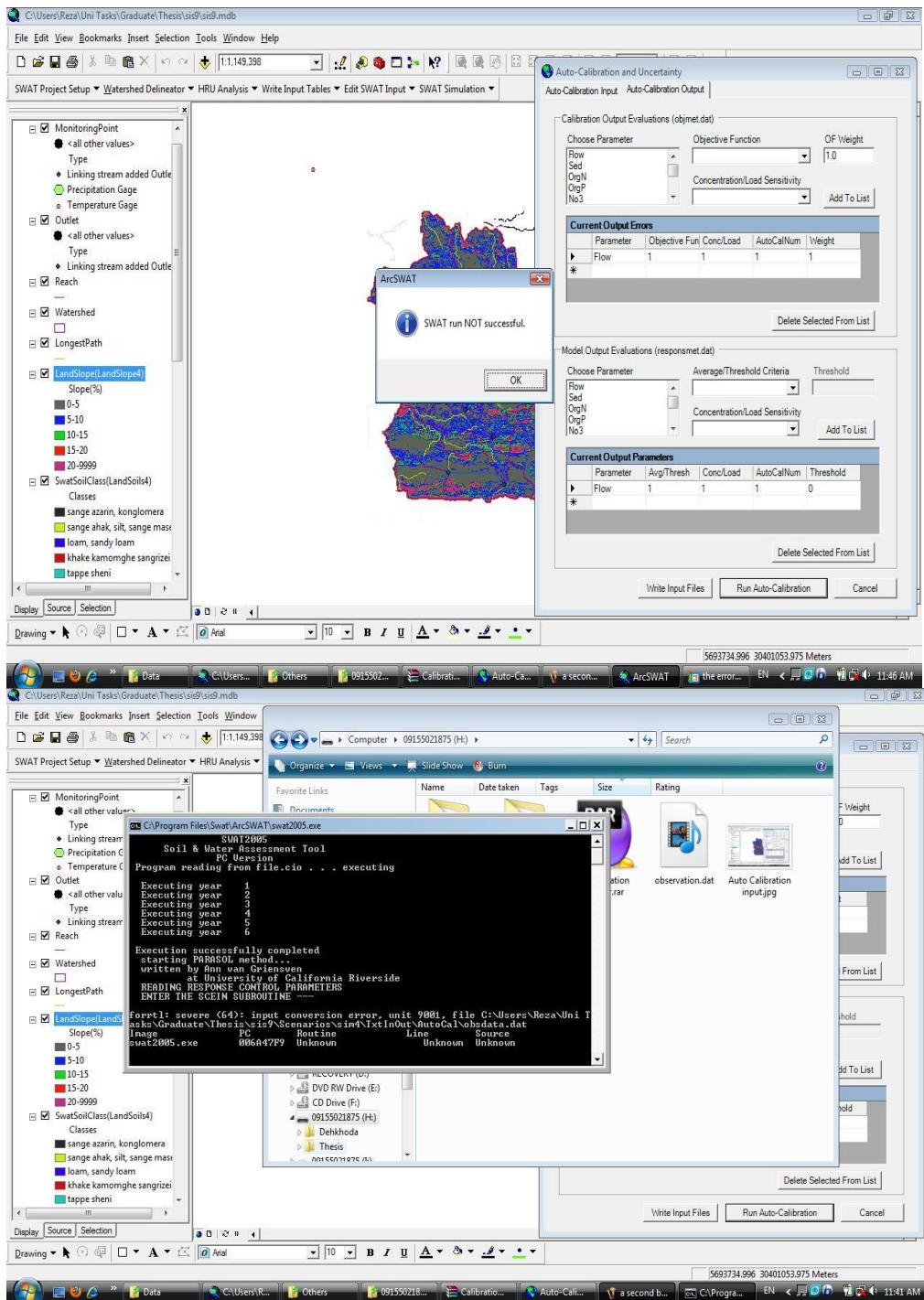
I was getting the first part of your error (" Error in file: occured in: Make pcp "), although not the second part. It sounds like you might have a column heading mislabeled or an extraneous column. Make sure you follow the correct setup of your input files - the user's guide explains this pretty well. Also, are you using .txt files or .dbf files to create your weather database? I found that the .dbf files do not work very well if created in excel 2003. I exported all of my weather data to Access and saved them as .dbf 5(V) files - and then did not modify them from that point on. It worked fine when I did this.

## **102-Auto calibration error**

### **Question :**

However I've got a successful run and sensitivity analysis from SWAT, but I have problems with auto calibration. Attached, please find the rar file I've prepared. it includes my flow observation file, auto calibration input and output windows and the error which appeared for less than a second on screen. I'll be grateful if you tell me my mistakes that caused this error and resulted in the window "SWAT run NOT successful".





## Answer:

I heard that ArcSWAT2009 had some problems in auto calibration, that the code needed to be fixed. Dr. Srinivasan suggested that if we want to run the

auto calibration we change the name of the swat2009.exe file to swat2005.exe. Did you try that already?

## **103-How to compile SWAT2005 on Linux esp Ubuntu 10.04**

### **Question :**

I need to compile swat2005 source code to run on a Linux system, Ubuntu 10.04 to be exact. I'm brand new to Linux. And as I review the documentation for gfortran, I feel swamped with questions, such as "Is the source code written in Fortran 95, Fortran 2003, or does it even matter?", and "Should I use gfortran that is always updated through Ubuntu repositories, or should I try to manually install an Intel Fortran Linux compiler?"

I would much appreciate it if someone could give me guidance on compiling in Linux - especially Ubuntu 10.04 - but any Linux compiling advice would be much appreciated.

### **Answer:**

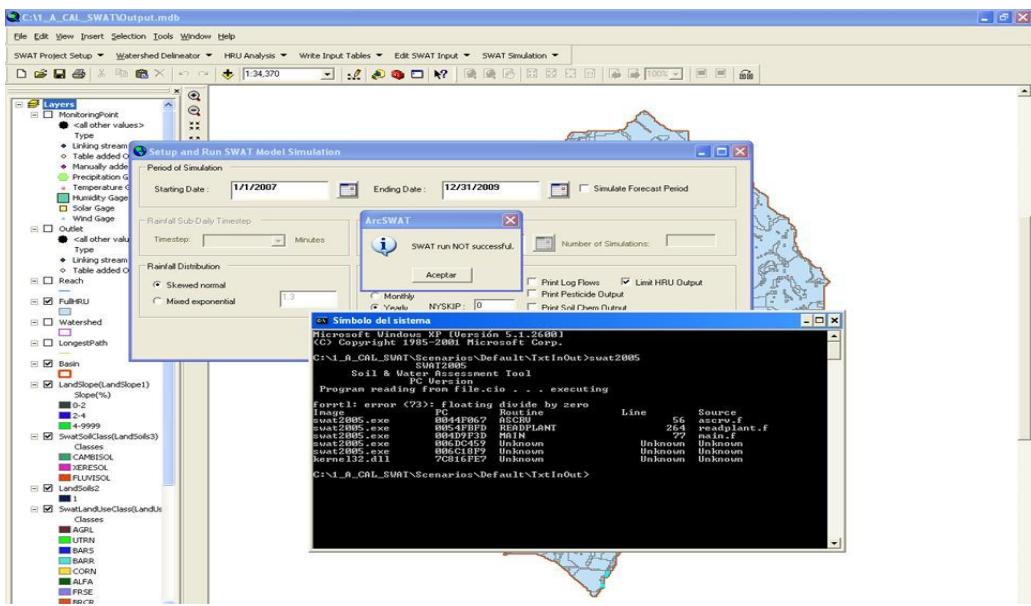
I think you should try with the Intel Fortran Linux compiler, but you need Ubuntu 9.04 due some library troubles.

Before building the code you should use the tool dos2unix to clean the source from escaping char and something like that.

## **104-Error in running SWAT**

### **Question :**

I received an error message as seen on the attached figure. SWAT run is not successful. What could be the possible reason and solution for this error.



## Answer:

If you added a crop to the database, you might want to check your new inputs. If you are not able to figure this out, please send me your crop database file.

## 105-Nutrient transport calibration

### Question :

I am using SWAT to simulate Nitrate and Phosphorus transport in a snowmelt driven catchments in Canada. I first calibrated (daily) catchments runoff, which was reasonable. But monthly calibration of nutrient transport always seem to produce to lots of nutrients, especially after snowmelt season in April and May. For example, simulated nitrate-N concentration during these months are about 30 mg/l, while observed values are less than 5mg/l. I am using the following parameters and ranges for the model calibration and keeping everything else as default.

CMN.bsn	0.0001	0.003
PSP.bsn	0.1	0.4
ERORG.hru	0	5
ERORG.hru	0	5
BC4.swq	0.1	0.7
BC2.swq	0.2	2
RS5.swq	0.05	0.1

RCN.bsn	0	0.5
N_UPDIS.bsn	1	30
P_UPDIS.bsn	1	30
NPERCO.bsn	0.01	0.3
PPERCO.bsn	10	17.5
SOL_NO3.chm	0	10
SOL_ORGN.chm	0	10
SOL_SOLP.chm	0	10
SOL_ORGP.chm	0	10

I have not used any fertilizer inputs. Does anybody have an idea why SWAT is simulating excess nutrients?

### **Answer a:**

I think the de nitrification levels are low in your model. Check this in your output.std. Try varying the CDN and SDNCO variables in .bsn. to set higher de nitrification. Be careful that SDNCO even when set to 0 in the interface is set as 1.10 and CDN when set to 0 is reset as 1.4 within SWAT code. A value SDNCO=1.10 implies that de nitrification starts when moisture levels are at 110% of field capacity. Try setting SDNCO to 0.6 - 0.9 and see if that helps.

### **Answer b:**

My understanding is that QUAL2E requires some amount of chlorophyll a in the stream to start with, or else its calculations somehow fail. So SWAT always adds some "starting" chlorophyll a to each stream reach, in case QUAL2E is turned on.

If QUAL2E is turned off, this chlorophyll just passes downstream without impacting nutrient loads.

However, if QUAL2E is turned on, then it interprets this chlorophyll as algae. When that algae decomposes it further presumes that the nutrients in that algae are released to the stream, according to the P and N content parameters (the fraction of algal biomass that is P and N -- you can set this).

The problem is, this is all "extra" P and N that are not related to the actual loads of P and N transported by the overland runoff (or any other flow) in SWAT. I.e., this extra P and N are not "real." Depending on your watershed, the added amount may be significant. In my last project, turning on QUAL2E resulted in a 20% increase of the P load. I felt this was unacceptable, and since then I just haven't used QUAL2E at all. The error can be reduced by reducing the P and N content of algae to negligible levels (like, from 0.015 to 0.001 or something like that, if I remember the values more or less for P). However, then your QUAL2E calculations of algal

growth and decay per unit nutrient level will be pretty screwed up. That's the current state as I see it now; the code has not been corrected to my knowledge. The fix would be to simply check to see if QUAL2E is turned on, and if it is, then the portion of the P load from the HRU corresponding to the amount of added algae (chlorophyll) should be subtracted from the other P-load components (ORG\_P, SED\_P, and SOL\_P) before being delivered to the reach. Reducing the size of the "seed" load of chlorophyll might also be appropriate.

## 106-Calculation of surface runoff

### Question :

I am little confused about the output of the interface. There would be three output files generated namely .bsb, .sbs and .rch. When considering the surface runoff, which file should I refer to and in that which column.

Actually, I referred to .bsb file and in that WYLD.is it correct? I am getting a huge error when compared with observed flow. I feel its because of ET value. Evapotranspiration loss is very less. could it be altered?

### Answer:

You can find surface runoff results in the following output files:[1] "sbs" file (renamed to "hru" in SWAT2005), column of "SURO", hru-based surface runoff [2] "bsb" file (renamed to "sub"), column of "SURO", summarized on sub-basin basis. "rch" is for results of in-stream variables, e.g., stream flow, sediment/nutrients loadings "WYLD" is total water yield from landscape, usually =surface runoff+ sub-surface runoffs for Evapotranspiration, SWAT accepts reference ET as weather input.

## 107-SWAT project problem

**Question :** I am facing problem at startup of project. Before I had the same problem with SWATX .Now, I am facing it with SWAT 2000.

As soon as I open a project it will terminate after the show up of main interface. I uninstalled and reinstalled both arc GIS 3.2 and the SWAT interface. It's still the same. Is it a problem with windows or SWAT program?

### **Answer:**

Are you using the Arc View 3.2 with AVSWAT2000 interface? I had the same problem when I used this version. I could solved doing this: as soon as you open your Project save it and before you close the Project, change the Window for Watershed View and save it, the program will ask you if you want to save it again, choose No.

I'm using the Arc GIS 9.2 with Arc SWAT interface (the same version as Nancy sent you the link) and I haven't had this problem anymore.

## **108-SWAT**

### **Question :**

I am looking for iSWAT (that allows system analysis programs to access SWAT parameters that are distributed over many input)

I will be happy if someone help me to download it

### **Answer a:**

You should look at SWAT-CUP:

[http://www.eawag.ch/organisation/abteilungen/siam/software/swat/index\\_EN](http://www.eawag.ch/organisation/abteilungen/siam/software/swat/index_EN)

### **Answer b:**

You can download i\_SWAT here:

[http://www.card.iastate.edu/environment/interactive\\_programs.aspx](http://www.card.iastate.edu/environment/interactive_programs.aspx)

## **109-Irrigation water**

### **Question :**

Does any know that, in SWAT 2005, if the irrigation water is allowed to percolate to shallow aquifer?

### **Answer:**

yes, because the irrigation water is just added to the field water balance

## **110-NOAA forecasted NCEP data**

### **Question :**

Are you aware of the Temperature and precipitation data forecasted by NOAA? Can you please let me know how to download those data?

### **Answer:**

I can be of some help if you give me just a little more information. What area are you looking for, possibly a lat/lon as well. There are a wide variety of products from regional US stochastic forecasts known as the MOS products as well as the National Digital Forecast Database:

MOS: <http://www.weather.gov/mdl/synop/products.php>

NDFD: <http://www.nws.noaa.gov/ndfd/>

And then there are the global products, that many groups provide including NOAA NCEP, ECMWF, UK Met Office.

In general, each group has a primary focus on their own region in which they provide text forecasts for, though most have a global product, often times in a gridded (GRIB1, GRIB2 or NetCDF) format that you have to interpolate to your points. I have worked with most if not all of the above, so if you let us know

what area, and specifically a lat lon I might be able to help guide you to a product that would be easily incorporated into real-time SWAT runs.

## **111-Help for climate change use in SWAT**

### **Question:**

I have average monthly data for the periods 1961 - 1990 and 2071 to 2100. My problem is how do I complete the missing data from 1991 to 2070 easily. I thought of using interpolation to fill missing data temporarily as the SPLINE I do not know if it is correct. Any idea will help me a lot.

**Answer:** Do you need the monthly data just to fill in the gaps? In that case you can use the monthly climatology (average) over those months. Otherwise, if you are looking for a specific scenario you could use IPCC data from [ipcc-data.org](http://ipcc-data.org). They also have a 20th century scenario that could work as a base.

## **112-Error in connecting with soil database**

**Question:** when I am trying load soil user table then error come like particular soil does not exist in your database. but I have checked it is there. and at other computer it is working. ( I have administrator rights.) I don't know why it is happening.  
I think it is not connecting with soil database.

**Answer:**

Check the "master path" in the project database within Microsoft access and check the location of the SWAT database to see if it matches up with your project. If not, you might wish to revise the path to reflect to the correct SWAT database storing the soil info relevant to your project. This once happened to me, and it worked after I revised the path.

## 113-Swat run NOT successful

**Question :**I have got a problem when I try to run SWAT2005. I was successful up to the end of set up swat run but when I proceed with run swat it displays swat run NOT successful. When I run the Dos Command, the following error detail is displayed. Would any one explain how to solve this problem?

```
SWAT2005
Soil & Water Assessment Tool
PC Version
Program reading from file. CIO . . . executing
forrtl: error (73): floating divide by zero
Image      PC      Routine      Line      Source
swat2005.exe   0045001F  ASCRV           57  ascrv.f
```

**Answer:**

This solution may or may not work. I was looking through the source code, particularly tracking the variables on line 57 in ascrv.f. It seems like this function is called for calculating some parameters related to snow. So the divide-by-zero error could occur when you set the sno50cov variable in .bsn to 0.95. If that is the case, you might want to vary this parameter and try again.

## **114-SWAT 2009 installation problem with 64bit windows 7**

### **Question:**

I have read that others have had the same issues but I have not read any solutions. I have a new CPU with Windows 7 and it is 64 bit. I attempted to install Arc SWAT 2009 but received an error - Microsoft .Net framework 2.0 could not be installed in \*a 64 bit operating system. Has anyone found a way to fix this?

### **Answer:**

right click on the exe file and install as administrator..

## **115-SWAT RUN NOT SUCCESSFUL**

### **Question :**

I have got a problem when I try to run SWAT2005. I was successful up to the end of set up swat run but when I proceed with run swat it displays swat run NOT successful. When I run the Dos Command, the following error detail is displayed. Would any one explain how to solve this problem?

Microsoft Windows [Version 6.1.7600]  
Copyright (c) 2009 Microsoft Corporation. All rights reserved.

C:\Users\vaio>cd\

C:\>d:

D:\>TxtInOut  
'Txt In Out' is not recognized as an internal or external command,  
operable program or batch file.

D:\>cd Txt In Out

D:\TxtInOut>swat2005  
SWAT2005  
Soil & Water Assessment PC Tool  
Program reading from file. CIO . . . Version  
executing

forrtl: error (73): floating divide by zero  
Image PC Routine Line Source

swat2005.exe

0045001F ASCRV

57 ascrv.f

D:\TxtInOut>

### **Answer:**

Did you add a new crop parameter to the database? This error is often due to one of the inputs in the plant database is not correct.

## **116-How to deal with error comes during model run**

### **Question :**

when I am trying to run swat it shows some error in Txt in out folder 00010001.sep file . Then I go to database and there I tried to see parameter of septic database. In my work I don't need these parameter. Even I uncheck soil chem. output but still it is coming. I think these kind of error ll come later also. how i can deal with such problem every time.

Please help me out of this error

### **Answer:**

Seems like a mismatch between SWAT executable and Arc SWAT version. The executable is looking for the newly introduced septic tank module files (.sep) while the input files in Txt In Out were created using a previous version of Arc SWAT which did not automatically produce these files. Check Write Input files drop down in Arc SWAT to see if you can write .sep files. If this option is not available, then you either may have to install an updated version of Arc SWAT or use a previous version of SWAT algorithm.

## **117-Auto calibration NOT successful**

### **Question:**

I am so sad that auto calibration failed after 7 days' running. I chose all the flow parameters for 32 sub-basins, 610 HRUs at one time. I think possibly the reason is that too many parameters and too many HRUs. Could someone give me some suggestions on how to do manual calibration? I did sensitivities analysis use observed flow data and got the rank of parameters. Is it necessary to choose the parameters

according to the rank? Is it necessary to re-divide the 300 km<sup>2</sup> watershed into less HRUs than 610?

**Answer:**

I'm sorry you're having trouble. I know it can be very frustrating to run auto calibration so many days and then get no result. But what do you mean when you say it "failed"? Were you auto calibrating in Arc SWAT? Or were you using SWAT-CUP2? What auto calibration option were you using? Also, howmany parameter were in you auto calibration. I would tend to choose parameters according to rank. You don't have to, but if you choose some parameter that the model is very insensitive to, and you have the convergence of that parameter to a stable value as part of the convergence (i.e., stopping) criteria, that could be a problem. I can help with manual calibration if you are willing to use R, which is free software. Otherwise, I don't have much to offer, and another thing, Before I launch an auto calibration, I break my connection to the Internet and turn the computer off and then back on again, or else make sure somehow that no update will be automatically downloaded and installed, that would cause computer to shut down and restart. And I make sure there's no automatic routine maintenance scheduled,which could lead to the computer shutting down and restarting. As for having 600 HRU's - that doesn't seem like that much. I wouldn't think it would be a problem, unless you have well below the recommended hardware requirements recommended for Arc SWAT.

**118-Average monthly basin rain is not the same as the first run result**

**Question:**

I have many SWAT projects in different areas. I got back to my first project today and rerun it to make sensitivity analysis. But, when I ran it without changing any input parameter, the average monthly basin rain is not the same as the first run result. I have not changed the input meteorological data. What can be the reason?

**Answer:** It could be possible because you have -99.9 in your precipitation data for one or more days. For these days, SWAT uses a weather generator which has some stochastic components associated randomness about it.

## 119-PCP\_SWAT

### Question :

I have problems with the customization for PCP\_SWAT procedures:

- 1) I got a PCPSWAT.dll file from Texax A&M swat workshop.
- 2) I need to customize my toolbars to add a \*.dll command
- 3) The path that I follow od Tools--->Customize----->Tab Command-----> Add from file..----> selection of the PCPSWAT.DLL FILE.
- 2) I tried it many times and just received a box with a message: "No object were added"; during the workshop we did not have any problem with this tools customization.

### Answer:

First, you need to check whether you have administer permission.

Second, get the latest pcp\_SWAT at <http://xzhang.pbworks.com/>  
Then you repeat the procedures you have before.

Please note that pcp\_SWAT only work with Arc GIS 9.x on 32 bit system.

## 120-Water Transfer issues in SWAT

### Question:

Does anyone have experience on water transferring issues in SWAT?

I am dealing a catchments where water is transferred from one sub basin to another subbasin using pipe for reservoir hydro power production

How to deal this issues in SWAT.?

In MIKE or HEC there are options for water transfer but I don't know how to do in SWAT. Does anybody has experience?

### Answer:

There may be multiple ways of simulating this but here is one idea. You could designate a suitable HRU within a receiving subbasin as a pothole. Potholes are depress ional areas within a sub watershed in which water can be stored for some time. A pothole can receive water from the main stream of any other subbasin using the irrigation

operation. If you have the necessary measured data, then this may be a viable option. Note that potholes also receive water from runoff. Depending on your study area, you could control this by adjusting amount of area that drains into the pothole HRU.

## 121-Weather generator stations

### Question:

I'm having three stations in my watershed, each one for precipitation, all weather parameters (except solar radiation), and solar radiation. I'll be using custom database and data collected at these stations will be used for calculating statistics. Since the stations are separate, should my custom database location file (not individual location files) contain all 3 stations? If so, for example, what values (statistical) need to be given in the database for a precipitation station which is not recording weather parameters?

### Answer:

You would need to update the user wgn table in SWAT master database (swat2005.mdb or swat2009.mdb) in the install folder. Description for all the statistics required in this table can be found in Input/Output manual.

Also, there is a software on SWAT website called pcpStat that can calculate some of the statistics automatically. It is under a link titled SWAT Input preprocessors on the following webpage:

<http://swatmodel.tamu.edu/software/links-to-related-software>

## 122-Weather Data Definition - Locations Tables

### Question:

I am attempting to use observed meteorological data in SWAT with a handful of gauges around my basin, and I'd like to use a custom table to pick those gauges. I am having formatting issues, however, and loading any custom table is not working. Even when I select the default SWAT weather generator table 'Statwgn.dbf' the error is "The table Statwgn does not have correct fields". I used this table as the basis for my own custom gauges and it will not load at all. I have been following the SWAT input/output documentation 'swat-io-2009' but those guidelines are not helping. I was wondering if anyone had a

workaround or a tried-and-true method for getting custom gauges to work in SWAT, or general help for using observed data with SWAT.

### **Answer:**

Is it possible that in opening the original Statwgn.dbf to look at it, you altered it in some way? If it doesn't work, then copies based on it won't either, of course. There are some issues with using Excel and dbf files, where you may not always get back what you see. Maybe the simplest thing is to obtain a fresh version of Statwgn.dbf and try again (after making a copy somewhere for reference).

## **123-Water Transfer issues in SWAT**

### **Question:**

Does anyone has experience on water transferring issues in SWAT?

I am dealing a catchments where water is transferred from one sub basin to another subbasin using pipe for reservoir hydro power production

How to deal this issues in SWAT.? In MIKE or HEC there are options for water transfer but I don't know how to do in SWAT. Does anybody has experience?

### **Answer:**

There may be multiple ways of simulating this but here is one idea. You could designate a suitable HRU within a receiving subbasin as a pothole. Potholes are depression areas within a sub watershed in which water can be stored for some time. A pothole can receive water from the main stream of any other subbasin using the irrigation operation. If you have the necessary measured data, then this may be a viable option. Note that potholes also receive water from runoff. Depending on your study area, you could control this by adjusting amount of area that drains into the pothole HRU.

## **124-Weather generator stations**

### **Question:**

I'm having three stations in my watershed, each one for precipitation, all weather parameters (except solar radiation), and solar radiation. I'll be using custom database and data collected at these stations will be used for calculating statistics. Since the stations are separate, should my custom database location file (not individual location files) contain all 3 stations?

If so, for example, what values (statistical) need to be given in the

database for a precipitation station which is not recording weather parameters?

**Answer:**

You would need to update the user wgn table in SWAT master database (swat2005.mdb or swat2009.mdb) in the install folder. Description for all the statistics required in this table can be found in Input/Output manual.

Also, there is a software on SWAT website called pcpStat that can calculate some of the statistics automatically. It is under a link titled SWAT Input preprocessors on the following webpage:

<http://swatmodel.tamu.edu/software/links-to-related-software>

## **125-Weather Data Definition - Locations Tables**

**Question:**

I am attempting to use observed meteorological data in SWAT with a handful of gauges around my basin, and I'd like to use a custom table to pick those gauges. I am having formatting issues, however, and loading any custom table is not working. Even when I select the default SWAT weather generator table 'Statwgn.dbf' the error is "The table Statwgn does not have correct fields". I used this table as the basis for my own custom gauges and it will not load at all. I have been following the SWAT input/output documentation 'swat-io-2009' but those guidelines are not helping. I was wondering if anyone had a workaround or a tried-and-true method for getting custom gauges to work in SWAT, or general help for using observed data with SWAT.

**Answer:**

Is it possible that in opening the original Statwgn.dbf to look at it, you altered it in some way? If it doesn't work, then copies based on it won't either, of course. There are some issues with using Excel and dbf files, where you may not always get back what you see. Maybe the simplest thing is to obtain a fresh version of Statwgn.dbf and try again (after making a copy somewhere for reference).

## **126-Water temperature**

**Question:**

Does anybody know whether SWAT has output for stream water temperature at gage locations? If having experience to work on this, that is better. I really need some information on this aspect.

**Answer:**

Yes, SWAT has output for water temperature in the file of "watout.dat" (default file name). Please check the "saveconc" command in the "fig. fig" input file.

## 127-About snow

**Question:**

I find that part of the precipitation is treated as snow in many HRU of my SWAT model during winter time. However, in my country, Taiwan, there is nearly no snow, especially in my study area where the topography is almost plain. I've checked the temperature data that I gave the model as input. The minimum temperature is about 5 Celsius. Where could I go wrong? Or what can I do to modify the model if I don't want snow in my model?

**Answer:**

Have you checked your snowfall temperature parameter (SFTMP)? It is located in your .BSN file. That would be the first spot I would check.

## 128-HRU distribution problem

**Question:**

Is it possible that some grid in the sub basin is not defined as one of the listed HRU in HruLandUseSoilRepSwat.txt? For example, in sub basin 1 in my case, there is one grid with soil type "A5" and land use type "Rice". However, there is no HRU defined by the combination them in sub basin 1. It seems that both the area for soil and land use exceed the threshold I setup for HRU distribution.

**Answer:**

Is it possible that you're looking at a .txt file that includes all land uses before you "filtered" them during HRU definition? There may be a very small area with that land use in Sub basin 1, but if you applied a land use filter it would be removed and would not show up in the final HRU table.

## **129-Short wave radiation and long wave radiation**

### **Question:**

Did you use the solar radiation data provided by NCEP-NARR for US? Why the long wave radiation is larger than short wave radiation in this dataset? To my understanding, the shortwave radiation almost take up all the solar radiation, because the Sun generate most energy in the short wave region. what data do you usually use for the solar radiation in SWAT simulation?

### **Answer:**

SWAT input is short-wave solar radiation. However, you'd better not use radiation data from NARR. It is about 30% overestimation, or even worse for some regions.

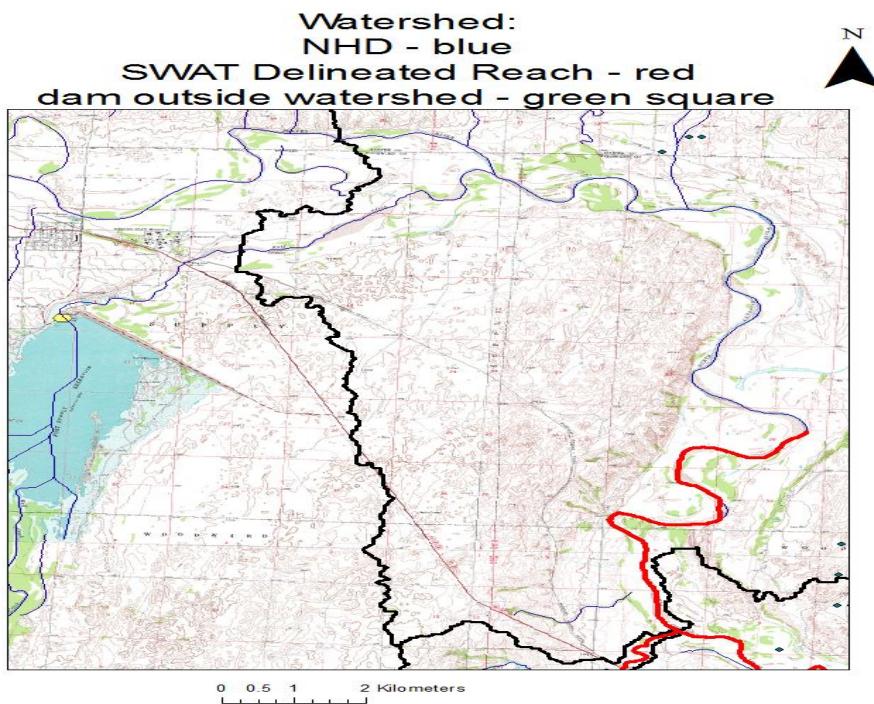
## **130-Editing reach file after watershed delineation**

### **CLARIFICATION**

### **Question:**

I've delineated my watershed, have entered land use, soils slope, weather, groundwater information, ponds, water use, etc. However, upon further review, I notice that I missed something in the watershed delineation; everything looks fine in my sub basin delineation but I want the main stem of the river in the first sub basin (furthest upstream) to extend further, preferably out to the dam that is upstream of the delineated watershed (see attachment). I have tried editing the "reach" file created during the watershed delineation process (using GIS), to no avail. Does this mean I need to start the entire project from scratch, or is there a method to get around doing so? I know it was stupid of me to miss it, but there's no use dwelling on that.

In the attached file, the NHD-plus stream network which I "burned in" is shown in blue, and the SWAT-delineated "reach" is in red. I would like to get the reach to extend upstream to the watershed boundary (black) which is just downstream of the dam (square). If it matters, I had previously checked the NHD+ file for continuity before burning it in (e.g. no lakes), and it checked out just fine.



### **Answer:**

I think you're doomed to have to re-delineate. I don't know a way to adjust reach lengths and sub basin areas (and other characteristics) after initial delineation. It's unclear to me how the upstream reservoir was excluded from the delineation in the first place -- did you manually delete those outlets? Anyway, I'd re-delineate, with enough resolution to get Arc SWAT to create channels as far upstream as you need; add an outlet at the dam; and delete the outlets above that point that you don't want.

### **131-Pond budget in the output file out put. std**

#### **Question:**

The out put. std file gives the overall water balance at the basin level in mm. I would like to know the pond/reservoir water budgets are averages over the whole basin area or just for the pond area.

For example, the basin area is 7000 km<sup>2</sup>, pond area is 2000 km<sup>2</sup> and the pond evaporation as given in the output file is 300 mm. If the water balance is at the basin level then evaporation over the pond will be  $7000/2000 * 300 = 1050$  mm or is it just 300 mm

### **Answer:**

I believe the value in the output. std is the total value. So your 300mm represents the total evaporation from all ponds within your simulated watershed. If anyone has discovered something different.

## 132-Map Window SWAT

### Question:

Is there any person who knows how we can enter WND, HMD and SLR files in MWSWAT?

Because I found that it just read PCP and TMP files and i couldn't find any way to enter these files.

### Answer:

Using files for weather, including wnd, hmd, and slr files is described in section 8.3.1.2 of the MWSWAT setup document that you can download from <http://www.waterbase.org>.

## 133-Weather Stations

### Question:

I have successfully imported daily precipitation and max/min temperatures into SWAT using the dbf listing the stations and using text files. Afterwards, when reviewing the contents of the precipitation and temperature folders, I notice that most of the stations now have a .dbf file and a .txt file, but some only contain a .txt file. Is it safe to assume that for those stations simply containing a .txt file that SWAT did not use such stations, and for those that have a .txt and a .dbf file, that those are the stations used by SWAT because they represent the closest stations to the individual sub watersheds?

### Answer:

I don't know if it is "safe to assume" that. To find out which weather stations each sub basin is using, go into your project's database (.mdb) using Access. You'll have all of your different tables, i.e.-bsn, sol, rte, sub, etc. Find SubPcp and SubTmp. These two files will list each sub basin you have, tell you what the distance

is to the precipitation or temperature station, as well as that station's name, which should match what you called those dbf or txt files.

## 134-Swat cup

### Question :

I was running swat cup suf2. I saw the default observed file ( 1977 and 1978). I guess q1 is for inflow and q2 is for outflow. Similarly s1 is sediment in and s2 is sediment out. But we have only flow out and sediment out monthly data. I am editing the observed file in following manner.

```
q_2
weight=      1
var_Threshold=      -1
wt_below_threshold=      1
wt_above_threshold=      1
pcnt_Error=      10
NO_Data=      24
1   q_2_1991.1      0.096
2   q_2_1991.2      0.0795
3   q_2_1991.3      0.302
4   q_2_1991.4      0.5595
5   q_2_1991.5      1.209
6   q_2_1991.6      0.2272
7   q_2_1991.7      0.279
8   q_2_1991.8      0.1025
9   q_2_1991.9      0.4498
10  q_2_1991.10     2.495
11  q_2_1991.11     0.2158
12  q_2_1991.12     0.5395
13  q_2_1992.1      0.6757
14  q_2_1992.2      0.7327
15  q_2_1992.3      0.6976
16  q_2_1992.4      1.269
17  q_2_1992.5      3.83
18  q_2_1992.6      0.8387
19  q_2_1992.7      0.1601
20  q_2_1992.8      0.0011
21  q_2_1992.9      0.6769
22  q_2_1992.10     0.2186
23  q_2_1992.11     0.254
24  q_2_1992.12     0.2531
```

Should I delete q1 and s1 and only edit q2 and s2.

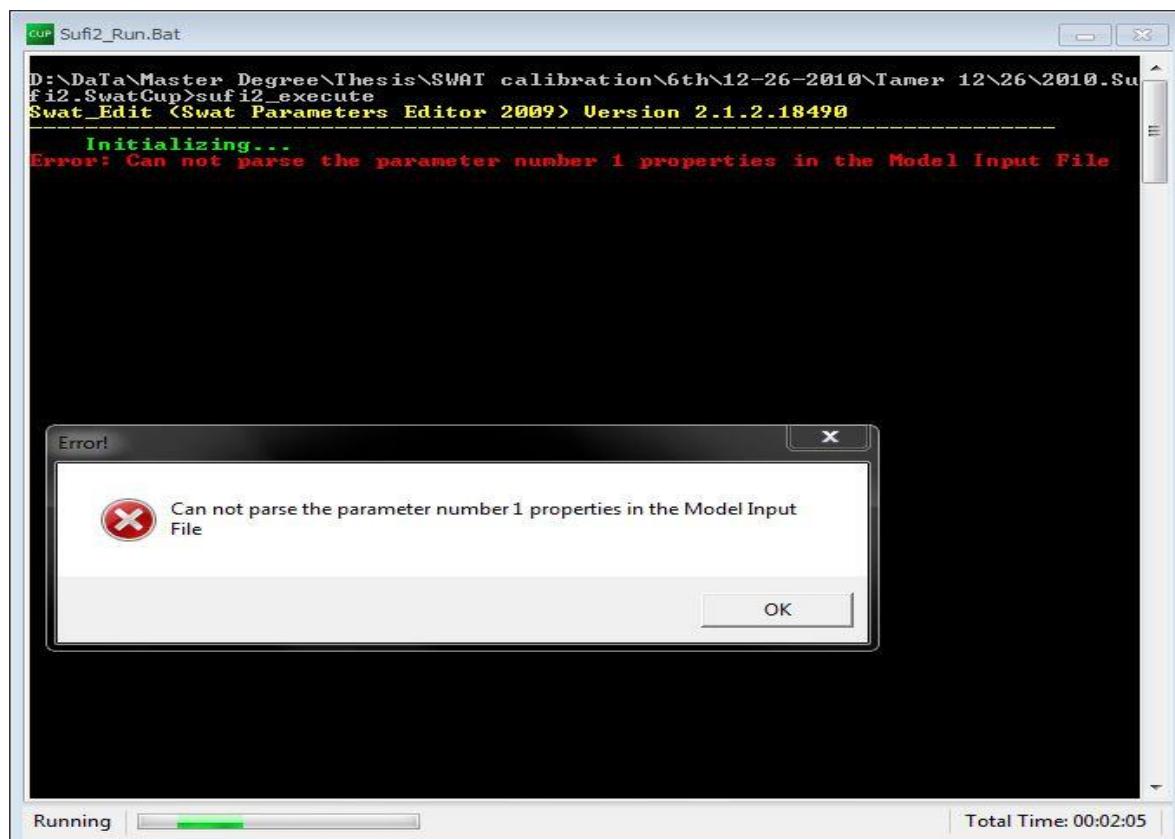
## **Answer:**

q\_1 is one outlet. q\_2 can be another outlet. Same with sediment. The developers recommend that you calibrate one at a time. In other words, get your hydrology right before you start calibrating sediment.

## **135-Error in SWAT-CUP**

### **Question:**

I am trying to calibrate my simulation with swat-cup but at the first of calibration it gives me the error that can not parse the parameter number 1 in the model input file. can anyone please help me with this?



**Answer:** I haven't used SUFI in a while, but I believe that it requires you to write an input file in which you define the ranges for each parameter that you want to include in the auto calibration. I'm guessing that might be where the error is. For example, if you are including CN2 in the calibration, it should probably look something like this: r\_\_CN2.mgt -0.25 0.25 Also, make sure your upper and lower limits are within the allowable ranges listed in, I think the file is called, AbsoluteSWATvalues.txt, or something like

that (I'm away from my files now, so can't easily check this name.) Also, make sure your parameter is actually listed in that file – more than likely it is.

## 136-Bare Soil

### Question:

I intend to do a simulation in a scenario with no land use, with the soil exposed. Does anyone have an idea of what parameters should I use?

**Answer:** Go to edit sub basin inputs then select management then finally check model as Bare Soil.

## 137-PSO in SWAT-CUP

### Question:

I am using PSO in SWAT-CUP, but it seems that it does not take into account the boundaries of the parameters. Any similar experience?

**Answer:** I got negative values for some parameters, even if the boundaries were all positive (using an "absolute" type of change for all the parameters). I guess this is due to the fact that sometimes the computed velocity becomes a relative large negative value, and then when the new position is computed (by using the equation b in page 96 of the SWAT-CUP user manual) it becomes negative. So, I think this may only be solved adding the user-defined boundaries as a restriction within the PSO algorithm implemented in SWAT-CUP...

## 138-Possible to use calculated water flow as input to SWAT-nutrient calculations?

### Question:

This is to ask if it is possible to use prior calculated water flow to continue modeling nutrient dynamics with SWAT. If one assumes that there exist prior modeled distributed 3-D water flow, including river flow, for the physical domain, but the model that was used for water

flow does not have a nutrient module, then it could be interesting to know if its possible to use SWAT to continue doing the nutrient dynamics calculations. It should be mentioned here, that the modeled distributed water flow gives water flow for all the sub watersheds in the domain and that the modeled water flow is distributed in several vertical layers (surface water, including river flow, surface flow, drainage, groundwater).

### **Answer:**

That is an interesting question. I think currently it is not really possible (but someone correct me if I am wrong). But it should be possible to tweak the source code to make it happen. Just makes your problem a bit bigger. What you want is that SWAT reads in the flow data in the nutrient module. You can probably let it do its own water balance calculations, but before it steps into the nutrient dynamics you feed it the other data. That would be interesting as that would also open the possibility of using observed flow data to do nutrient and other water quality parameters.

## **139-SWAT\_CUP glue\_obs.dat file**

### **Question:**

I'm running SWAT-CUP using the GLUE approach, and am editing the GLUE\_OBS.dat file prior to initial calibration. My watershed contains fifteen sub basins, and I'm running a monthly analysis and am solely interested in discharge. Would I be correct in assuming that the initial data in the Glue\_obs.dat file is not based on any results from the SWAT simulation and therefore I would replace the file in its entirety? I am asking this because the default looks something like this:

Number->data	
4	0.5913
5	1.6
.	
.	
.	
24	0.6
1	0.8
2	1.3
.	
.	
.	

```
.  
24 1.7  
1 0.4  
2 0.3  
. .  
. 24
```

So, the value in the "number" field cannot refer to months or to reaches. Additionally, I could not locate the values in the "data" field in the output.rch file. This leads me to assume that just random data is included in this file. However, I'm asking just to ascertain if others also receive the default Glue\_obs.dat input.

I have read the help file in depth, but I was unable to locate the answer to my question there. All the examples of the ...obs.dat files in the "help" file have numbers 1-12, which I assume refer to months, but include no number exceeding 12.

### **Answer:**

Your assumption is correct to replace all the numbers in the obs.dat files. The value in the number field refers to days, months, or years. In the examples they go from 1 - 24 because the data is monthly and the simulation length is 2 years. You can copy and paste your data from excel (or something else) into the SWAT-CUP interface. So if you have monthly data for 3 years your number field will go from 1 to 36 assuming you have data for january of year 1 and december of year 3. Skip the numbers for which you have no data... for example, if jan and feb and june are missing from your observations, it would be

```
3  
4  
5  
7  
8
```

... and on for the number field (with corresponding measurements of course). If your restart the number field SWAT-CUP interprets that as data for another output (see the examples that have maybe 5 variables and the numbers go 1-24 and then 1-24 again for next variable. And be sure IPRINT is 0 for monthly output.

## **140-ESCO in .bsn and .hru**

### **Question :**

May I ask you a question about the parameter ESCO. I found it existing both files of .bsn and .hru, but with different default values (0.95 in .bsn, and 0 in .hru). which value is used when SWAT running in default situation?

### **Answer:**

In this case the model will use the value in the .bsn and apply it for all HRU(s) if you want a specific value for each HRU then enter a non-zero ESCO value in the HRU files

## **141-Array bounds exceeded ?**

### **Question:**

In one of my SWAT projects, I included wind speed, relative humidity and solar radiation data to see their effect as compared to the generated wind speed, relative humidity and solar radiation data. The run completes successfully without wind speed and solar radiation, but, when I include wind speed, relative humidity and solar radiation, it says array bounds exceeded and fails.

### **Answer:**

Check the SWAT input files of wind speed, solar radiation, relative humidity that are created for Arc SWAT. Could be that you have an extra decimal in your original data for example and when Arc SWAT builds the input files for SWAT the values do not fit in the spaces that they should be, being out of the array. You can see the format of this input files in the Input and Output manual.

## **142-How to plot SWAT outputs in Arc GIS**

### **Question:**

I am studying the response of hydrology to climate change. I want to plot the hydrologic parameters under different climate scenarios like runoff, water yield and ET sub-basin wise. May any one tell me how to plot the SWAT outputs in Arc GIS sub-basin wise ?

### **Answer a:**

VIZSWAT is a great tool for making these types of graphs.

### **Answer b:**

You might also want to try SWAT Plot, a free open-source tool from <http://www.waterbase.org>.

**143-The 'Microsoft.Jet.OLEDB.4.0' provider is not registered on the local machine**

## Question:

I'm trying to perform some runs modifying some of the SWAT files in Map Window. Then in SWAT editor, I choose Edit SWAT Input -> Subbasin Data and it crashes with the following code "The 'Microsoft.Jet.OLEDB. 4.0' provider is not registered on the local machine." I've goggled a bit to find the reason but seems confusing and related to 64 bits machines, do you have any idea to solve this problem?. I'm running the 32 bit version of the code in a 64 bit machine.

## Answer:

I have found a way to solve the problem; it consists basically in forcing the SWAT editor 2005 to run as a 32 Bit application. In order to do this, I have used a program found in the OS named corflags.exe. I copied into the folder with the swatEditor.exe and ran the following line

corflags	swatEditor.exe	/32BIT+
----------	----------------	---------

Since then the swat Editor run as a 32 Bit and have no problem with the OLEDB.4.0 thing. Hope this helps you and the rest of the swat editor users.

## 144-Initializing Arc SWAT with grid weather data

## Question :

I am trying to initialize the SWAT model with grid weather data from a Weather Forecast Model – temperature, precipitation, relative humidity and winds. Since the SWAT model requires meteorological input from individual weather stations, I was wondering if there is a procedure of directly ingesting meteorological girded data into the Weather Data Definition. Can I assume that each individual model grid point is a separate station?

## Answer:

Each grid point will be considered a station. SWAT will assign the closest grid point to individual sub basins.

## **145-SWAT CUP**

### **Question :**

I'm done with sensitivity analysis in Arc SWAT. Now I'd like to go for auto calibration using SWAT-CUP. I prefer SUFI-2. I created project by locating Txt In Out folder and the program copied all desired files. But when I see file " Observed.sf2 ", I'm not able to find my data. Rather I could see data for year 1977-1978 (I think they are of example files given with SWAT CUP). But "file.cio" is correct (my data). Do I need to edit each and every data in all "Calibration files"? Or where do I need to put my observed data of discharge, sediment etc? I went through the user guide also, but could not get the answer. And one more thing, is the no. of simulations user defined?

### **Answer:**

What you have in your "Observed.sf2" now is example data. You need to input your own observed data into SWAT-CUP. I usually do this by editing the example Observed.sf2 file found in the [SUFI2.IN](#) folder with Microsoft Excel (other tools might be better). The dates of your observed data are represented by numbers going from 1 and upwards. As an example, if you are running two years in a daily time step, your data need to go from 1 to 730. In a monthly time step, it will be from 1 to 24. Missing data are not inputted (if you have a missing value on day 300, skip it, your data would go like this: 299, 301, etc.). You also have to edit the files Par\_inf.sf2, Var\_file\_rch.def and SUFI2\_swEdit.def. Yes, the number of simulations is user defined.

## **146-Phosphorus sub basin - reach**

### **Question:**

I haven't found an appropriate answer among posts. My question is following.

When I study SWAT code in detail, I can't find any variable, that is transferring phosphorus from sub basin to the reach (to be used in QUAL 2 E as concentration). I cannot see any link between them. Could you help me to find this variable or any link between sub basin and route blocks of the model?

### **Answer:**

I haven't seen a response to your question, so I'll try from memory. The three forms of phosphorus delivered from the land (HRUs and subbasins)

are, basically, (1) soluble P, (2) particulate mineral P, and (3) particulate organic P -- here I'll call them sol\_P, min\_P, and org\_P. The particulate forms include (I think) both "active" (= easily desorbed) and "stable" forms of P. In addition, groundwater can deliver P to the channel -- I'll call that gw\_P. When these 3 forms of phosphorus are delivered to the reach, they are converted into the two categories (which is what I presume Qual-2e requires) called mineral and organic P. Here I'll call them reach\_min\_P and reach\_org\_P. The output from the subbasin ( $\text{sol\_P} + \text{min\_P} + \text{org\_P} + \text{gw\_P}$ ) equals the input to the reach ( $\text{reach\_min\_P} + \text{reach\_org\_P}$ ). This conversion is confusing -- but I believe it's close to the following:

$$\text{reach\_min\_P} = \text{sol\_P} + \text{gw\_P} + \text{active\_min\_P} + \text{active\_org\_P}$$

$$\text{reach\_org\_P} = \text{stable\_min\_P} + \text{stable\_org\_P}$$

(You really should double-check that this is what the code is doing -- I'm operating from memory.)

This conversion results in the convention that reach\_min\_P fraction essentially equals the dissolved P content in the reach, and the reach\_org\_P fraction essentially equals the particulate P content in the reach (including P adsorbed to mineral particles). I've always been somewhat uncomfortable with a model such as Qual-2e that doesn't explicitly include a mineral-adsorbed particulate P fraction, since this fraction is commonly large in rivers in agricultural regions.

In addition to other landscape sources of P, the subbasin adds chlorophyll to its reach. If you don't turn on Qual-2e, this chlorophyll remains simply as chlorophyll and doesn't impact the P budget of your model. If you turn on Qual-2e, it commonly assumes this chlorophyll is from algae, and when it decomposes this presumed algae, it adds extra phosphorus to the reach, based on the assumed P content of algae. This is all in addition to the sol\_P, min\_P, org\_P, and gw\_P delivered from the subbasin to the reach.

## 147-No More Percolation

### Question:

I have already done some successful simulations with Arc Swat 2.1.6 version swat 2005. But, a few days ago, when I tried to re-do some simulations, the surface run off just get three times bigger. When I got to read the output, percolation was not happen anymore. So the amount that precipitate or was evaporated or was turned into surface run off.

I have not done any changes in the parameters. It was just one weekend and the results got this way.

### **Answer:**

I've never had exactly that happen, but when I tried to subdivide my soil layers so that there was 9 or 10, and kept all parameters otherwise the same, percolation became nearly 0. I found I needed to keep the soil layers to no more than 8.

### **148-Question about sufi2 in swat cup and modeling BMPs after calibration**

#### **Question:**

I have made a calibration with swat cup (sufi2) and now I want to make some scenario runs with some BMPs. How could I do this? Should I import the txtinout files to a new default simulation though the SWAT interface (if so, how?) or could I run scenarios through SWATCUP?

**Answer:** If you are just wanting to make individual runs now, I think you can do it this way: Leave the SWAT-CUP2 environment behind, and go to the project folder that you created when you were in SWAT-CUP2. In it, you should find a file named "[model.in](#)". Open it, and I think you'll see the parameters listed that you were auto calibrating, and some values with them.

You can add more parameters, your mgt parameters, and values you want to try. Then close the file. Double-click on the swat\_edit.exe, and you'll see all the parameters changed accordingly in the files. Then click on swat2005.exe,

and you'll have a new set of output files. The parameters that you want to change need to be listed in another file in that same project folder and called

Absolute\_SWAT\_Values.txt. Chances are they will be. If they aren't, you can try adding them under the first section (the .gw section) of that file.

### **149-SWAT-CUP error, finishes its run soon and the result is the same for any number of iteration**

**Question:** I have used SWAT-CUP to calibrate my projects over large areas. But now over an other region, it is not working for me. It finishes its run soon and the summary results are the same for any number of iterations (simulations). The SWAT run was completed successfully with out any error but the Swat Cup error is attached. Anyone who can help me please??

```

CUP Sufi2_Run.Bat
10
 10 parameters in 3941 files modified successfully.
    SWAT2005
      Soil & Water Assessment Tool
      PC Version
      Program reading from file.cio . . . executing

forrtl: severe (24): end-of-file during read, unit 111, file F:\fish\Research\CUP\final\paara.Sufi2.SwatCup\000010001.ops
Image          PC             Routine            Line          Source
swat2005.exe   006A0539  Unknown           Unknown        Unknown

F:\fish\Research\CUP\final\paara.Sufi2.SwatCup>SUF12_extract_rch.exe
reading observed rch file
RCH111 0 -3.62E-04 0.7462E-01 0.6529E-01 0.0000E+00 0.7462E-01 0.3419E-06 0.3
410E-06 0.1967E-05 0.9416E+01 0.5909E+01 0.1983E+02 0.8919E+01 0.9104E+02 0.9279
E+02 0.0000E+00 0.6266E+01 0.0000E+00 0.0000E+00 0.2825E+02 0.3332E+02 0.0000E+00
0 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+05 0.0000E+00 0.0000E+00 0
.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E
+00 47
1948 1/12
1948 2/12
1948 3/12
1948 4/12
1948 5/12
1948 6/12
1948 7/12
1948 8/12
1948 9/12
1948 10/12
1948 11/12
1948 12/12
1949 1/12
1949 2/12
1949 3/12
1949 4/12
1949 5/12

```

Finished | Total Time: 00:01:26

**Answer:** It seems the setup in your extracting file has problems. to make sure the reach numbers correct and extracted variables in a right arrangement. SWAT-Cup help manual has a example, you can compare and see if problems are there.

## 150-Do I need to have Arc GIS to install SWAT2009?

### Question:

I download SWAT2009, but after click the exe file, nothing happen. Is that because I don't have Arc GIS 9.3? SWAT2009 is different from Arc SWAT, right?

### Answer:

The file "swat2009.exe" is the executable program that actually does all the watershed-process calculations. The "SWAT" program really is the same as the "swat2009.exe" file (or the swat2005.exe file, depending on which version you're running). For it to run, it requires a very detailed set of text files giving all the input data (subbasin areas, HRU areas and characteristics, climate data, etc.).

This set of input files is very complicated to put together -- that's what Arc SWAT helps the user do. Arc SWAT is an extension to Arc GIS that allows the user to easily enter the spatial data needed by SWAT. Arc SWAT will also call up the SWAT program (swat2009.exe), run the program, and help the user extract output from the model. Hence Arc SWAT is the "interface"

between the user and SWAT that allows the user to input data, run the program, and process output.

Once the input files are created, you can run SWAT without using Arc SWAT (copy the swat2009.exe file to the TXTINOUT folder and double-click), and there are good reasons to do this at times. But most model runs will still more easily run in Arc SWAT, or MWSWAT, and in any case you'll need to use one of these interfaces to get started with your data input.

## 151-Auto-calibration of sediment

### Question:

During the past month I made many attempts at using the auto calibration tool in SWAT to calibrate sediment. I performed all of my runs in a project directory, outside of the Arc SWAT interface. I used SWAT versions ranging from 2003 to 2009. I tried calibrating stream flow and sediment parameters simultaneously and separately. When calibrating separately, I input calibrated stream flow parameters to ensure that the simulated hydrology matched closely the measured hydrology. I tried calibrating sediment concentrations, sediment loads, monthly time step, and daily time step. I tried both simple and complex delineated projects. I have checked and rechecked object, parasol in, fig, file CIO, change par, and observed data files and everything seems to match up with the instruction materials. I tend to get wonderful results in calibrating the stream flow, but the sediment output is always at least one if not two orders of magnitude too low. Although the sediment auto-calibration may come to a completion, I never am able to see an answer that shows that the procedure is converging on a solution. I would also mention that I actually tried "working backwards" by creating an observed data file for sediment and setting the upper and lower limits on SPCON, SPEXP, CH\_COV and CH\_K2 to force the auto calibration to arrive at a set of parameter values that would more or less match the "observed data file." I performed this a few different ways and just calibrated for sediment (full weighting), having already input appropriate parameters governing stream flow.

Is there someone who has successfully used the auto calibration tool to calibrate sediment, and can show conclusively that the optimization search provided a parameter set that produced simulated results that are similar to the measured input file?

## **Answer:**

I haven't explored auto calibration much -- so my comments are more directed at mechanism within SWAT, and not how parameters may be adjusted automatically.

(1) First -- I don't see CH\_EROD in your list of parameters. The channel will not erode anything unless  $CH\_EROD > 0$ . I see you do have CH\_K2, which is channel permeability, NOT erodibility -- which could mislead those familiar with USLE parameters, since "K" is the erodibility factor in the USLE, by convention. For channel erosion to occur, both CH\_EROD and CH\_COV must be  $> 0$ . (If this fixes your problem -- count yourself lucky that the fix was so simple!)

(2) But in a broader sense, I think it is important to get a feel for where the sources and sinks are. In contrast to your findings, I've generally found that my subbasin sediment yields are too high -- which (to me) is not surprising for a USLE-based erosion estimate without an applied sediment delivery ratio (SDR). I'm aware that the MUSLE is not supposed to require an SDR, but I haven't found that to be true, at least not yet.

In contrast -- you say your sediment yields are much too small. Is this because (a) your subbasin HRUs are yielding too little sediment? or (b) your channel is trapping too much? Check how much sediment is being trapped in the reaches -- is it a reasonable amount? Is it reasonable that the reaches trap \*any\* sediment -- especially since many of our agricultural rivers seem to be widening and/or incising, and are sites of net erosion, not deposition?

My concerns are that in a model such as SWAT, with no limits on the amounts of channel erosion or deposition, it is entirely feasible for field erosion to be overestimated, with a counterbalancing over-trapping of sediment in the channel, allowing a model calibrated for the wrong reasons.

It would make it look like we're loading our channels with sediment, and that they are net sinks of sediment. This may well be true in some parts of the country, and perhaps in earlier times of the 20th century. But in the agricultural parts of Minnesota and Iowa, it appears that streams are currently more likely to be net sources of sediment, rather than sinks. (This may be related to tile drainage, or increase in soybean acreage -- see papers by Keith Schilling et al. at U of IA. So, Nebraska may well be different.)

## **152-Computational capacity of SWAT2005**

### **Question:**

One of the lakes (modeled as unregulated reservoir) in my swat model has a capacity of 1.8e13 cubic meters. The model consistently gives an output value off by a factor 100. The output file shows that lake volumes are reduced by a factor of 100 and the outflows are high, approximately by factor of 100. There are other ponds in the system for which the values are acceptable. Any remedies to overcome this. One solution is to split the lake, but I prefer to keep a single lake.

**Answer:**

I forgot Swat's default maximum size for reservoirs, but I think it was unrealistically small for many lakes. You could enter a new maximum in the resrng table, if you want to enter the volume in the Arc SWAT interface dialog box. Or, if you change the value directly in the res table itself, I think SWAT will accept it.

To slow outflow -- increase NDTARGR (if that's the option you mean by being unregulated).

(And -- just to check, you're aware that reservoir volume in SWAT is measured in ha-m, which are different from cubic meters by a factor of 10,000...)

## **153-Arc SWAT in Windows 7**

**Question:**

I am struggling to work with Arc Swat 2005 and my system is 64bit and windows 7 operating system. its giving me so many problems. is any one successfully install and run Arc SWAT in similar type of machine?.

**Answer:**

I am using SWAT2009 in windows 7. It is better to use SWAT 2009 and u will be ok.

## **154-Sensitivity analysis -Calibration and Uncertainty INPUT DATA**

**Question:**

I have problems with the Sensitivity analysis -Calibration and Uncertainty processes. The simulation period is between 1991-2005 thus I downloaded data with mean daily values of USGS gages but just data from 1996-2005 is available. Then I saved it in a \*.txt file. Next I input this data following this path: SWAT Simulation- Sensitivity Analysis Input tab - then I checked the

"Use observed data" and input the USGS values (\*.txt) in the "Observed data file name".

Finally after follow the instructions I clicked "Run Sensitivity Analysis" button and I got the following message:

"Unhanded exception has occurred in a component in your application.

If you click Continue, the application will ignore this error and attempt to continue The system cannot find the file specified":

This are the format of the file (mean gage data) that I input (USGS):

agency_cd	site_no	date time	04_00060_00003	04_00060_00003_cd
5s	15s	16d	14n	10s
USGS	02492360	1996-08-27	85	P
USGS	02492360	1996-08-28	55	P
USGS	02492360	1996-08-29	60	P
USGS	02492360	1996-08-30	58	P
USGS	02492360	1996-08-31	56	P
USGS	02492360	1996-09-01	45	P
USGS	02492360	1996-09-02	43	P
USGS	....	....	...	.
...	....	....	...	..
...	....	...	...	..
USGS	02492360	2005-12-29	69	A
USGS	02492360	2005-12-30	63	A
USGS	02492360	2005-12-31	58	A

### **Answer:**

I don't think your observed data input file is in the right format. If you are doing daily readings for flow, copy the format in the file observations9394.txt located in the files section of this Google group.

More information about the format of the input file can be found on pg 31 of the document swat2005-unc-sens-calib.pdf also located in the files section of this group.

## **155-Nutrient transport calibration**

### **Question:**

I am using SWAT to simulate Nitrate and Phosphorus transport in a snowmelt driven catchments' in Canada. I first calibrated (daily) catchments' runoff, which was reasonable. But monthly calibration of nutrient transport always seem to produce to lots of nutrients, especially after snowmelt season in April and May. For example, simulated nitrate-N concentration during these months are about 30 mg/l, while observed values are less than 5mg/l. I am using the following parameters and ranges for the model calibration and keeping everything

	else	as	default.
CMN.bsn		0.0001	0.003
PSP.bsn		0.1	0.4
ERORGP.hru		0	5
ERORGN.hru		0	5
BC4.swq		0.1	0.7
BC2.swq		0.2	2
RS5.swq		0.05	0.1
RCN.bsn		0	0.5
N_UPDIS.bsn		1	30
P_UPDIS.bsn		1	30
NPERCO.bsn		0.01	0.3
PPERCO.bsn		10	17.5
SOL_NO3.chm		0	10
SOL_ORGN.chm		0	10
SOL_SOLP.chm		0	10
SOL_ORGP.chm		0	10

I have not used any fertilizer inputs. Does anybody have an idea why SWAT is simulating excess nutrients?

### Answer a:

Are you simulating stream water quality processes -- i.e., do you have Qual2E turned on? If so, try turning it off and see if your nutrient values don't drop.

### Answer b:

I think the denitrification levels are low in your model. Check this in your output.std. Try varying the CDN and SDNCO variables in .bsn. to set higher Denitrification. Be careful that SDNCO even when set to 0 in the interface is set as 1.10 and CDN when set to 0 is reset as 1.4 within SWAT code. A value SDNCO=1.10 implies that denitrification starts when moisture levels are at 110% of field capacity. Try setting SDNCO to 0.6 - 0.9 and see if that helps.

## 156-Calculation of surface runoff

**Question:** I am little confused about the output of the interface. There would be three output files generated namely .bsb, .sbs and .rch. When considering the surface runoff, which file should I refer to and in that which column. Actually, I referred to .bsb file and in that WYLD.is it correct? I am getting a huge error when compared with observed flow. I feel its because of ET value. Evapotranspiration loss is very less. could it be altered?

**Answer a:** I don't have the output files or user documentation in front of me, but I believe the SURQ parameter is found in both the .sub (subbasin) and .std (standard) output files. If you want runoff at the subbasin level, refer to the .sub. SURQ is not equivalent to WYLD (water yield). WYLD is your net flow out (flow inputs minus outputs). WYLD calculations should consider ET. You can vary the ET calculation method from Penman/Monteith, Priestly/Taylor, or Hargreaves. You may want to try all three and see what looks best with your observed data.

### **Answer b:**

You can find surface runoff results in the following output files:

[1] "sbs" file (renamed to "hru" in SWAT2005), column of "SURO", hru-based surface runoff [2] "bsb" file (renamed to "sub"), column of "SURO", summarized on sub-basin basis.

"rch" is for results of in-stream variables, e.g., stream flow, sediment/nutrients loadings "WYLD" is total water yield from landscape, usually =surface runoff+ sub-surface runoffs for Evapotranspiration, SWAT accepts reference ET as weather input.

## **157-SWAT project problem**

**Question :** I am facing problem at start up of project. Before I had the same problem with SWATX .Now, I am facing it with SWAT 2000. As soon as I open a project it will terminate after the show up of main interface. I uninstalled and reinstalled both Arc GIS 3.2 and the SWAT interface. Its still the same. Is it a problem with windows or SWAT program?

**Answer:** Please check that you are installing the SWAT2005 version from the link below <http://swatmodel.tamu.edu/software/arcswat>

## **158-i SWAT**

**Question:** I am looking for i SWAT (that allows system analysis programs to access SWAT parameters that are distributed over many input) I will be happy if someone help me to download it

**Answer:** You should look at SWAT-CUP:  
[http://www.eawag.ch/organisation/abteilungen/siam/software/swat/index\\_EN](http://www.eawag.ch/organisation/abteilungen/siam/software/swat/index_EN)

## **Answer b:**

You can download i\_SWAT here:

[http://www.card.iastate.edu/environment/interactive\\_programs.aspx](http://www.card.iastate.edu/environment/interactive_programs.aspx)

## **159-Calibration**

**Question:** Could please help me to create a observed flow data file, which will be asked during auto calibration in AVSWATX.

There is an example file provided with the interface, accordingly I have prepared it for my catchment area. I have 29 sub- basins in my working area and I have gauged data only for one sub-basin. so, for all the missing data I have given a value of -99.

When I load this file, It will run for one simulation and later throws an error message as "auto calibration process not completed". I am not understanding what the problem is. Please help me to fix this issue.

I am attaching the file with this mail.



observ.txt

## **Answer:**

There is an excel file on this forum. It can generate the observation file automatically.

## **160-precipitation and writing the table**

### **Question:**

I have 10 rainfall stations in my watershed. I want to change the precipitation value at each station and run many times for different value of precipitation. Is it possible to change the precipitation and run the model without writing all tables?. Can we simply change the precipitation file and run the simulation?

### **Answer:**

From my experience, I believe that if you change values only in the pcp1.pcp file and you execute from DOS you'll be OK. I'm not sure what happens if you try from within Arc SWAT or other interface.

## **161-Alfalfa reference ET in SWAT2009**

**Question:** We have found that the calculated alfalfa reference ET in SWAT 2009 is 18% less than that calculated by SWAT 2005. Does anyone know the reason for this?

**Answer:** I cannot speak specifically about alfalfa, but I did find that the annual ET between SWAT2005 and SWAT2009 decreased by nearly 10%. Until the source code is released (as well as the theoretical documentation) for SWAT2009, it will be difficult to identify the reasoning behind it (could be changes in subsurface water routing, allowing for more infiltration as that is where I saw the biggest jump in the annual water budget between the two versions).

## **162-How to use SRTM data in Arc swat**

**Question:**

I am a new user of Arc swat. I want to delineate watershed from DEM. I have downloaded SRTM data, but the arc swat wants the data in grid format. I have tried converting the data in Arc GIs... using save as grid.. but it is not working.

**Answer:**

I think SWAT directly use SRTM DEM, i did my work using SRTM data directly without any editing. U may change the selection of DIM format option while u work in SWAT directly.

## **163-Initial conditions**

**Question:**

Anyone has idea how swat determines the initial conditions of stream stages? I know we can specify the soil water content and groundwater levels. Can we specify the initial stream stages too?

**Answer:**

One thing you can do is when you go to run SWAT, in your Printout Settings, set your NYSKIP to 0, and if you have it set to daily, you can get an idea of how low your flows start. When I did this, it does look like the streams start dry. As CJ said, this is why you need to have a warm-up period of at least 2 years (although I usually do 4).

## **164-Change of projection**

### **Question:**

I develop my DEM in geographic coordinate system and later wanted to change it to projected coordinate system (Asia- Everest India-Nepal.prj - Lambert Conformal Conic). But I failed as it is showing that map is already defined projection. My question: if projection once defined, can we change it to some other projection system? It should be. However I am not able to do it.

### **Answer:**

Are you using Arc GIS?

Try "project raster", not "define projection".

## **165-Weather stations**

### **Question:**

When we input more than 1 rainfall stations in the SWAT weather generator by what process does it calculate the overall rainfall of the watershed? I read the manual but couldn't find it.

### **Answer:**

The weather generator in SWAT is not for calculating overall rainfall from multiple stations. It's used to replace missing weather data.

Only one station is required for each sub basin, and the algorithm for estimating missing data is shown in the SWAT manual.

## **166-How to best compile swat source code files**

### **Question:**

The uniqueness of the watershed I am working on led me to make a minor modification to the SWAT source code. The modification doesn't add any calculations, but, when I compile it with the new Intel Visual Fortran Compiler 11.1, it actually takes slightly longer to run on my computer using Win32 architecture - 60 seconds instead of 56 seconds. I can live with that, but I'm thinking the new compiler should actually be able to shave off some time. Worse still, when I compile with the new Fortran 11.1 compiler on a 64-bit desktop, it runs MUCH slower on that desktop (over 2 minutes), though there should be a way,

I think, for it to run faster. Run times are important to me because I'm doing extensive uncertainty analysis. Anyone have any ideas? I tried to follow a handout from a SWAT workshop on compiling using Fortran 6.6C, but the software has changed so much since then.

### **Answer:**

From my limited-understanding attempts at compiling with the Intel compiler, with lots of trial and error, here are a few of my conclusions:

- (1) the "release" set of compiler options results in very fast code, and hydrology seemed OK, but sediment and maybe other water-quality variables were corrupted in some of the output files (floating-point overflow errors). The Reach output was corrupt, but I think the HRU and Sub output might be OK.
- (2) the "full debug" set of compiler options produced very big and slow code
- (3) the run-time option to check array and string bounds seems to be the critical factor that makes the code big and slow. Try turning this off.
- (4) the "library" option for "debug multithreaded" seems to be the critical factor in avoiding the overflow errors I noted above.

So if I'm just running for hydrology, I use an executable created with the "release" compiler options. If I'm looking at sediment and nutrients, I recompile, starting with the "release" version but then add step (4) above.

## **167-Simulation forecast period**

**Question:** I'm going to simulate forecast period. Would you please guide me to create .cst file.

1. Please send an example .cst file
2. How can inter this file to the model.

**Answer:** You can find an example of CST.CST file in the group attached files

## **168-SWAT sensitivity bug/error**

**Question:**

Following the user MANUAL my sensitivity run gives an error (see below) at simulation 113 of 270!. I choose flow parameters only and I tried the runs with and without observed data but both gives the same error. That was for

13years simulation period. Initially, I thought it could be lower and upper bounds, or the methods(1,2,3). But, it is interesting to notice that when I change my simulation period to 2years,with the same settings as above, then sensitivity runs will finish successfully. One would conclude from this simple experiment that SWAT built in algorithm for sensitivity analysis cannot handle long term simulations!. This make if difficult for me to figure out what's going wrong.

simulation	113		
changing parameters			
Executing year	1		
Executing year	2		
Executing year	3		
Executing year	4		
Executing year	5		
forrtl: error (72): floating overflow			
Image	PC	Routine	Line
swat2005.exe	0064441A	WATQUAL	Source 436 watqual.f
swat2005.exe	0059A74E	ROUTE	156 route.f
swat2005.exe	0046B2F3	COMMAND	130 command.f
swat2005.exe	005DBB0C	SIMULATE	191 simulate.f
swat2005.exe	0057C8E4	RERUN	110 rerun.f
swat2005.exe	005D4FCE	SENSMAIN	58 sensmain.f
swat2005.exe	00458713	AUTOMET	25 automet.f
swat2005.exe	004DA2CB	MAIN	128 main.f
swat2005.exe	006DC459	Unknown	Unknown Unknown
swat2005.exe	006C18F9	Unknown	Unknown Unknown
kernel32.dll	7C816FE7	Unknown	Unknown Unknown

### **Answer:**

My guess would also be upper and lower bounds. If it runs into trouble in a specific year for a specific simulation. I haven't run the sensitivity analysis for a while: is there any output to tell you what the value was that it chose for your parameters? What is happening in year 5? Is that a different year to the other years? Rainfall/ET wise? Or water quality wise? You can run 2 years, can you run 5 years? Try adjusting the upper and lower bounds to a narrow range and see if it runs for 13 years.

## **169-Writing input files**

### **Question:**

I am modeling out side US , I tried to correct my data bases and input files but still I can't escape from those errors

is there any limitation on number of years I should consider since I have about 21 years of meteorological records(tmp , pcp, wnd ,hmd .....)  
with many missing values.?

### **Answer:**

I think that swat do not accept "missing" values...

Maybe you can use your data to generate monthly means... I think missing data must be set to -99.9...

In manual you can find how to set up your input data files.

## **170-Overestimating runoff for some rainfall events**

### **Question:**

I'm using Arc SWAT to simulate stream flow in Cheney Lake Watershed located in South-Central Kansas. I'm trying to calibrate SWAT model for stream flow using USGS stream flow gagging station. I've adjusted runoff and base flow parameters, and my daily Nash-Sutcliffe coeff is 0.34, monthly is 0.56, and yearly is 0.80. For some rainfall events, SWAT overestimated runoff peaks by a factor of 4 or 5 and even more for some events. I've decreased CN2 and SOL\_AWC, and ESCO parameters to decrease the simulated runoff for those specific events, but my other simulated runoff events that were predicted well before got reduced. My daily nash-sutcliffe coeff increased to 0.63, if I remove those overestimated runoff events. Is there any way to reduce the runoff peaks only for specific rainfall events?One more question, I have rainfall data from 1/1/1996 to 12/31/2008 and I am using rainfall data from 1/1/2002 to 12/31/2008 for calibration and 1/1/1996 to 12/31/2001 data for validation. Can we do it in this way?

**Answer a:**Are your crops/vegetation Transpiration working all right?

That is a major factor. Otherwise you are just shifting water from one part of the water balance to another.

Is there a physical process in the watershed that you are missing? What could happen different during the big runoff events? Maybe SURLAG to allow more evap during smaller events? Mmmm tricky one. Clearly it is some non-linear response in the rainfall runoff relationship that is not captured by SWAT. Maybe intensity?

**Answer b:** How large are your daily precip values? I've had difficulty with SWAT vastly overestimating flows (and sediment and phosphorus

loads) when daily precip values exceed about 60 mm or so. You could "censor" your precip data (i.e. allow a maximum value of 50 or 60 mm/day), which will reduce the few large peaks you have -- assuming they were caused by very large precip events (and not snowmelt or some other source).

It is unsatisfying to alter "real data," which includes your precipitation record. You might question whether the precipitation data are representative -- there are errors in reading from time to time, and what's measured at the gauge may not really apply to the rest of the watershed. It would be better, of course, to identify if there is a physically-based mechanism that you're missing in your model, and/or if SWAT has some instability in flow calculations under such conditions.

**Answer c:** I would check your precipitation dataset. I had a situation where I was overestimated some of my storm events; however, I had the luxury of having 5 precipitation stations within my 250 square mile watershed. What I found was that even though a sub watershed used the closest station to its center, the event may not be representative of the whole sub watershed. As a result, I often had to replace some daily precipitation values from one station with another due to the isolated nature of the storm event. While I don't recommend doing this without sufficient evidence to suggest replacing the data, it would explain why your model is able to be calibrated with the exception of certain peaks. If all your peaks are overestimated and your water budget components match what you conceptualized, then possibly look at your ET method may help. Several of us have noticed that the newer versions of SWAT2005 produce higher water yields. I decided to go back and use an older version of SWAT2005 (the October 2008 code associated with Arc SWAT Version 2.1.3).

## 171-SWAT use for irrigation command..

**Question :** I am facing the difficulties while creating the stream network. I am giving the details of difficulties felt while using SWAT.

1. Whether it is necessary to take a mask of larger size than the command area? When I take a big mask (very large area than actual command area), the stream network is continuous.
2. I want the actual canal network in the command to be formed by SWAT then only I can proceed for further analysis.

For this, I have digitized main, distributor and field channels separately in the same shape file and burnt this in SWAT. The SWAT forms main canal

correctly, but not the secondary and tertiary canals. However, this formation is also intermittent, and thus, I can not get the total command as a whole. This command has the canal network of LBC and RBC on both sides of the dam. The SWAT forms this network by considering the DEM. Here might be the problem, because these are artificial streams which may not follow actual elevation all the way.

### **Answer:**

1. It is not necessary to take a mask, it just reduces ur area to be processed, its a separate issue that when u take such area, how it processes that depending on the threshold values.
2. Detection of canal and drainage network depends on the mesh size of DEM and threshold value decided by the user. so check out for your DEM's resolution.

In this case, only digitized network can help, which DEM you are using, try to get ASTER DEM, its free for 30 m resolution

## **172-ERROR WRITE ALL**

**Question:** I am trying to run AVSWAT-X in Arc view 3.2. When I came at the stage of  
WRITE ALL , i get stuck with following errors:

- \*1) Error in SWAT3\_WriteFig at 30729  
A(n) Nil Object does not recognize request +
- 2) Error in SWAT3\_Figoptions Dialog. call at 239  
A(n) Nil Object does not recognize request clone
- 3) Error in SWAT1\_Write All Input at 2609  
A(n) Nil Object does not recognize request not

**Answer:** It often has to do with a wrong edit in one of the databases. Did you change any of the entries in the databases? Or it might be related to errors in your weather data.

## **173-Monthly data calibration in SWATCUP**

**Question:** I met a problem when calibrate my swat model with monthly data, the simulated result totally different from the observed data. But I can

do the daily calibration with good results. Is there anyone telling why I can not get the monthly calibration by the Swat? I am wondering maybe the monthly run need a lot of years data to warm up. but not sure. any one can help me with this problem?

**Answer:** I got it. the initial run is daily. I should use the monthly run for calibration. Sorry for the trouble to you guys.

## 174-How to change land use

**Question :** I am the beginner using SWAT2000. I m doing my P.G.I learnt how to run the model. My topic is on critical watershed analysis. In my area there are eight land use patterns. Now I want to change some of the land use from forest to wasteland. How can I change it ? I read the manual but I didn't get it.

**Answer a:** Well, I'm not sure this is the right way, but in case you get no other response: One way might be to go into the TxtInOut folder. For each hru for which you want to change the land use, open the .hru file and manually change it. You might also have to change it in the .sol and .mgt files, but I'm not sure. You might have to experiment a bit. If you have a lot of hru's to do this to, it can be a pain, but I don't have any other ideas.

**Answer b:** SWAT2009 (the latest version) lets you do land use change. The new version can be downloaded from the SWAT website.

## 175-Future simulation via SWAT

**Question:** I want to do the future simulation on SWAT. I have made the CST.cst file as per the details given in the SWAT manual. But after executing the SWAT model, at the SWAT output my output for the future section is showing 0 i.e. rainfall, GW, SW etc. all are showing 0 value. Why is this happening?

**Answer:** Do u mean the data in STD file, if so yah you are right but u can get the data from other files like wout, sub, rch

## 176-Land Cover

**Question:** I have a dub about the land cover, Before defining the HRU we introduce a land cover information by means a GIS map. But, is this information used in the modeling process? If you do not modify the management files, the program consider No Crop Growing in all he HRU. So the information of the GIS Land Use Map is not been considered.

I think that only the information introduced in the .mgt files (the Initial Land Cover, and the different operations...) are considered in de model, in other case there is no crop. Is this correct?

**Answer:** No, Swat will make some assumptions about vegetation cover for each entered land use type, without the need to explicitly add that crop (or other vegetation) by editing the management operations. While it may start with "no crop growing" at the start of each year, it generally will plant something early in the year and harvest/kill it later in the year, based on heat units. While this may see odd for perennial vegetation (forests and some rangelands), it seems to be the default way Swat operates.

## 177-Fertilizer application inputs

**Question:** I am trying to input fertilization application into SWAT. And set Elemental Phosphorous application as 80 Frt\_kg, but the values P\_App from output Hru were still zero, and phosphorus outputs from sub basins didn't change. Did I miss sth. when I modified the management?

**Answer:**

Did you rewrite the .Mgt file after you made the fertilizer application change? You should also check the fertilizer application rate in the output.std file after you make the change and run the model to confirm a change has really been made in the model.

## 178-Running Parasol of swat2005.exe from dos command

**Question:** I have run swat2005.exe from the DOS command. But I would like to take it a step further and run the Parasol auto calibration (the files of which are compiled within swat2005.exe) from the DOS command, rather than from within Arc SWAT or other GIS software. Would I need

to modify one or more of the files within the TxtInOut folder first, and then simply run swat2005.exe from the DOS command as usual, and it would then automatically exercise the Parasol option? Any help would be much appreciated.

### **Answer:**

Running PARASOL on a different computer than the one I am actively using for SWAT work is a common practice for me since the PARASOL run can take a week or two to run. What I do is set up the PARASOL run through the Arc SWAT interface in Arc GIS as usual. I start the PARASOL run and hit ctrl+c to stop the run. I then go into the TxtInOut folder and copy and paste the newly created "Autocal " folder onto the other computer. You also need to get the SWAT2005.exe file from the Arc SWAT program folder and copy/paste that into the Autocal folder as well on the other computer. Then, you just double click on the SWAT2005.exe file on the other computer, and the PARASOL program will run just fine.

## **179-Long peak flows**

**Question:** I am trying to calibrate a watershed in northwestern Minnesota adjacent to the Canadian border in the Red River Valley. The watershed is extremely flat (large portions less than 0.5% slope, almost all less than 1%), and the watershed has large areas defined as wetlands, with rangeland and forest being the other primary land uses. My problem lies primarily in my peak flows. The USGS gaging station shows peak flows taking about 1 month to return back to base flow levels, with snow melt peaks taking 2 months or even longer to return to base flow levels. I've verified through local officials that this is indeed the case. My SWAT model has peak flows that return to base flow levels in a week or two.I've tried adding ponds and wetlands to the sub basins hoping to hold the water (even going overboard in some cases). I have SURLAG and LAT\_TIME adjusted trying to extend those peaks. I've tried playing with the groundwater variables, but this just results in base flows that are too high. Am I maybe missing something in adding my ponds and wetlands? I've changed some of the parameters such as NDTARG, but to no avail. I'm hoping someone has some suggestions/experience in working on watershed similar to this. I've worked through other watersheds in

this area, but none of them were quite as extreme on the duration of peak flows.

### **Answer:**

From my reading of the theory, and from digging through the code:

Ponds were coded to be managed in the same way that Reservoirs are managed. And, Reservoirs (with the target release option) in SWAT are managed for water supply -- i.e., their primary purpose is to hold as much water as possible at all times to assure a water supply for as long as possible.

The exception are "flood months" when some storage is advisable to help reduce the possibility of catastrophic floods.

Consequently:

(a) during "non-flood" months, Reservoirs (and Ponds) the target volume is the "emergency" volume, thereby holding as much water as possible for water supply. The Reservoir either spills nothing (when volume < emergency volume), or it spills everything above that volume, immediately (= that same day). The result is very spiky outflow. NDTARG has no effect.

(b) during "flood" months, the target volume is allowed to drop below emergency, to being somewhere between the normal and emergency volumes, depending on soil moisture. If the soil is really wet and a large runoff event could occur, you want as much storage as possible to reduce flooding, so the target volume will be down at the normal volume. If the soil is dry, then you don't need to guard as much against flooding, so the target volume is set higher (up to halfway between normal and emergency) -- because the underlying goal remains to keep as much water in the Reservoir as possible.

The Ponds and Wetlands of most sites, including NW Minnesota, are not so managed -- i.e., they're not managed at all. The idea that water levels would be low in Ponds when the soil is wet is fairly backwards of what would normally happen. And, during all "non-flood" months (which most of us would interpret as being normal or typical months), the target volume will be set to the emergency volume, and your NDTARG will be ineffectual. So, set your "flood months" to be essentially the entire year, and set your emergency much higher than your normal volume, to allow significant storage, so your NDTARG will have something to operate on.

Wetlands function more simply. I don't think there's a choice of flood vs. non-flood months. I think volume decreases from maximum to normal with a hard-coded NDTARG of 10 days (i.e., you don't have the option of

changing this value.) You should've seen an effect from them. I'm guessing, also, that your PND\_FR and/or WET\_FR may be quite large, like 0.5 or so (could be 1.0 for some sub basins).

Be aware also that in the current code, seepage from ponds and wetlands is lost from the system and doesn't contribute to base flow. I don't know a lot about the groundwater flow system in that area -- though I know the local USGS office has done some modeling. I am somewhat familiar with the conceptual model of recharge on the beach ridges and discharge at the toes of their slopes -- I've visited the calcareous fens in those areas. But as a general concept of recharge through the clays of the Agassiz basin, with subsequent discharge -- that is less clear to me. I would think a significant portion of your base flow would actually be release from large wetland systems (if your model includes parts of the Red Lake peat lands, or at least some marshlands to their west). So I think getting Ponds and Wetlands to work in SWAT is probably the right thing to do.

But for what water you do have contributing to recharge in SWAT: the GW\_DELAY parameter can have great influence on the seasonality of base flow contributions. A long (300+ days) GW\_DELAY will give a nearly flat base flow over the course of a year, whereas a short (5-10 days) GW\_DELAY will give pronounced seasonal swings in base flow.

## 180-Missing value -99

**Question:** I have three question about weather input data.

The first question: is it right? -99 is the missing value used for all weather variables no matter it is precipitation or temperature, wind etc? The second question: sometimes the whole month or year's data could be missing. if we replace them all with -99, how the SWAT will run the input situations and get reliable outputs for us? Is there a limit requirement that if the missing values are so frequent that the data are not applicable? The third one: among the five input weather variables - ppt, temperature, wind speed, radiation, and relative humidity, which ones are more important so that we have to use measured data instead of weather generator data to get better results?

**Answer:**

1. Yes, -99 is the correct entry for any missing values.
2. This is a complicated question that depends on the size of your study area, how many weather stations you have, your time period, what

you want to study, how many sub-basins the simulated weather affects, etc. The simulated weather is based on historical averages, so it can not represent actual storm events. But if you are studying annualized data, simulated weather might be OK. Simulated data in the dry season has less impact than in the wet season.

3. Most people say that the most important inputs are precipitation and temperature.

Also, be aware that the weather generator data built into SWAT will only work in the United States. If you are outside of that area you must create your own database of weather generator locations and data, as detailed in the SWAT2005 i/o documentation. The quality of the generated weather depends on the quality of the monthly averages used by the weather generator.

## 181-Fertilizer application

**Question:** I have some questions about fertilizer application inputs. Hope someone could give me some suggestions. The simulation period is 52 years, and I am trying to model lake water quality change for the past 50 yrs. So I want to input fertilizer application, which was increasing from 1951 to 2002. I noticed the 'Edit Management Parameters"->'Operations', but what does the 'Year 1' mean? The start year? Should I set it as 'Year 1989' or sth. else like it?

**Answer:**

In the Operations, Year 1 refers to the first year of the SWAT run. You can add additional years as you wish. Say you want to rotate 3 years worth of crops. You would add Year 2 and Year 3, and then for each of those years you would have to put in planting, tillage, fertilizer, and harvest or harvest/kill. If you have 3 Years worth of management operations, and your overall model run is for 9 years, then SWAT will repeat the rotation after Year 3. In other words, in the 4th year of the model run, it will use Year 1 again for your management operations. You can refer to the SWAT Input documentation and look under the .MGT chapter for more of this information. For your example, if you want 50 years worth of increasing fertilizer use, I believe you're going to have to continue to add Years to match your data. I'm not sure if there's an easier method, but I'm sure someone else will answer this post as well if that is the case.

## **182-Unable to get seepage contribution to shallow aquifer**

**Question:** I am modeling a watershed having wetlands covering a significant portion of each sub basin, and with on average about 20% of each sub basin draining into the wetlands. I carefully entered the wetland parameter values into the .pnd file for each sub basin using Arc SWAT. (I did leave WET\_MXSA and WET\_MXVOL at 0, as these are indicated as optional, but did fill in values for WET\_FR, WET\_NSA, and WET\_NVOL.) However, even when I set the parameter WET\_K, the effective hydraulic conductivity at the bottom of the wetlands, near its maximum value of 1 mm/hr, I seem to get no contribution of the wetlands to the shallow groundwater table on any of the days. According to my calculations by hand, I should be getting at least a few mm on some days. Is there anyone out there who has obtained groundwater flow from wetlands, and who can tell me how they did it?

### **Answer:**

Your observation is correct. After a careful examination of the SWAT2000 / SWAT2005 code, Dr. Jim Almendinger (St. Croix Research Station, Minnesota) and the folks he works with determined that there was a glitch in how the water is routed from the ponds and wetlands through the shallow aquifer system. The way the code currently exists the water is lost (similar to what happens to the deep aquifer fraction). This poses a problem to systems that are heavy in wetlands / ponds and rely on return flow from those systems, such as those in Minnesota. From what I understand, Jim and company are working on a fix and will pass this onto the folks at Texas when they have all of the bugs worked out.

Currently it seems as if folks have been bypassing this issue by not allowing too much water to disappear (wetland K = 0).

## **183-PARASOL and SUNGLASSES**

**Question:** There are two optimization methods to use for auto-calibration

PARASOL and SUNGLASSES which one is better. which is better to and mostly used.

### **Answer:**

Of the two I would go with Parasol because it includes the SCE-UA algorithm, which seems to be very widely used and respected. It

sounds like you are using Arc SWAT? If you are, and you are like me, you might find some of the blanks to fill in for Parasol unclear, and not documented. I sorted these all out, at least to my own satisfaction, by referring to a 1992 article by Duan. I don't have Arc SWAT handy right now, but if you are unsure of those blanks, and you name them for me, I can make some recommendations on the values to provide.

## **184-Calibration parameters different than sensitivity parameters**

**Question:** I selected the parameters in the following for the sensitivity analysis:

- CH\_COV : Channel cover factor
- CH\_EROD : Channel erodibility factor
- CH\_K2 : Effective hydraulic conductivity in main channel alluvium (mm/hr)
- CH\_N2 : Manning's "n" value for the main channel
- CN2 : Integer Initial SCS runoff curve number for moisture condition II
- NPERCO : Nitrogen percolation coefficient
- PHOSKD : Phosphorus soil partitioning coefficient
- PPERCO : Phosphorus percolation coefficient
- SOL\_AWC1 : Available water capacity of the first soil layer (mm H<sub>2</sub>O/mm soil)
- SOL\_K1 : Saturated hydraulic conductivity of first soil layer (mm/hr)
- SOL\_LABP1 : Initial soluble P conc. in 1st soil layer (mg/kg)
- SOL\_NO31 : Initial nitrate conc. in first soil layer (mg/kg)
- SOL\_ORGN1 : Initial org N conc. in 1st soil layer (mg/kg)
- SOL\_ORGP1 : Initial org P conc. in 1st soil layer (mg/kg)
- SOL\_Z1 : Depth to bottom of first soil layer (mm)

- SURLAG : Surface runoff lag time (days)
- USLE\_C : Minimum value of USLE C factor for land cover/plant
- USLE\_P : USLE equation support practice factor

and for auto-calibration step, I am planning to add more flow parameters, is this action affects the reliability of model results. Can I use calibration parameters different than sensitivity parameters? Can I use some additional parameters in auto-calibration.

### **Answer:**

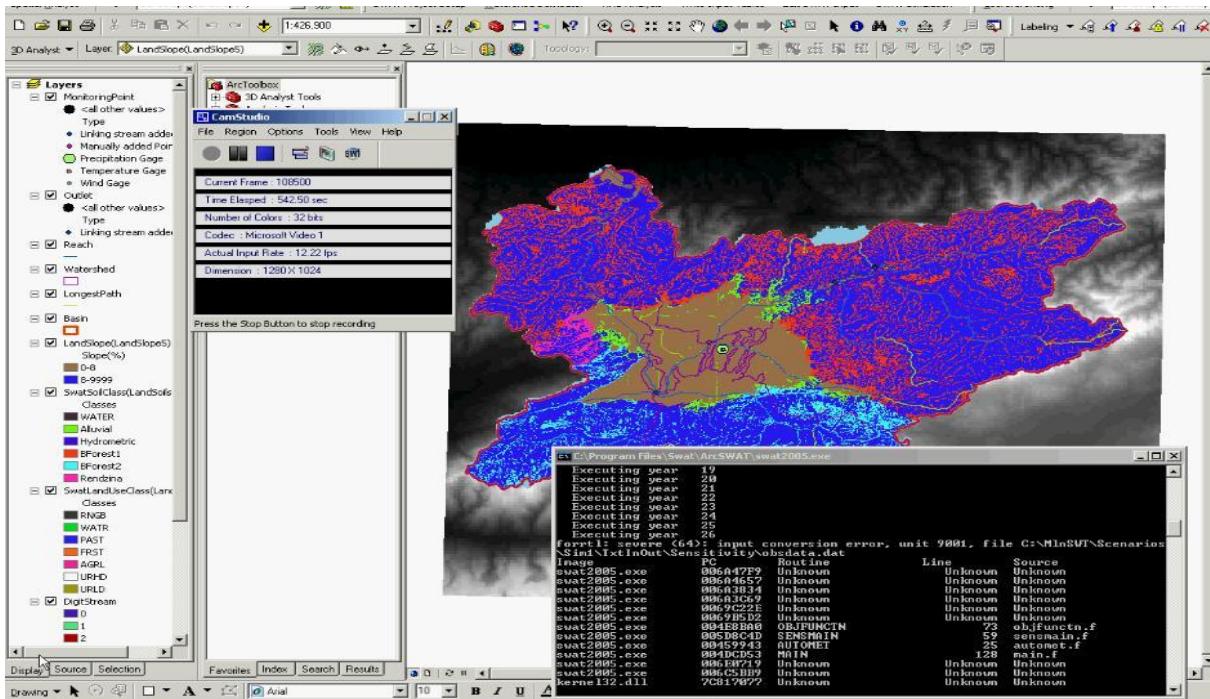
I think that normally you would do the sensitivity analysis before calibration so that you could find out which parameters to included in the calibration. The sensitivity analysis will likely show that making large changes in some of the parameters will not change your output much. (These parameters would fall at the bottom of the ranking list, if your doing the sensitivity analysis using Arc SWAT.) This allows you to reduce the number of parameters in the auto-calibration, so that the auto-calibration will find the optimal set of parameter values found will more likely be the GLOBAL optimum, and will be found more quickly. In general, the more parameters, the longer to find the global optimum, especially if parameters are included that don't have much impact on the output. Whatever algorithm you use for auto calibration (for example, Parasol, which includes SCE-UA), it will likely waste time trying to make sense out of parameters that don't really impact the output much.

Now, if you want to include parameters in the auto calibration that weren't included in the sensitivity analysis, I would re-do the sensitivity analysis first with them included. I think it'll save you a lot of time in the long run. If for some reason you cannot include them in the sensitivity analysis, then I would first exclude any that you feel would not impact the output much. If you don't know of any, then I guess you have no choice but to throw all of them in. Depending on the algorithm you use, you might doing the auto-calibration once with one seed, then again with another seed, to see if you get the same results. By the way, at the Arc SWAT workshop I attended, it was recommended that the modeler first calibrate the model based on hydrology only because stream flow is usually known with much more certainty than

nitrogen, sediment, or other constituents. This allows you to keep the number of parameters for the auto-calibration small. Then, once you get a good water flow calibration, keep the water parameters fixed or allow them to change very little as you add the constituent-related parameters.

## 185-Sensitivity error

**Question :** During sensitivity analysis after 1st of 440 simulation I received an error as attached. What could be the reason for this.



**Answer:**

There looks like there is something wrong (format, odd character) in the 26<sup>th</sup> or 27<sup>th</sup> year of your observed data.

## 186-About calibration and sensitivity analysis

**Question :** I have 10 sub watersheds. Can I use observed data of only 1 sub watershed for calibration/sensitivity analysis? And also can I use -99 for the missing data, as we do for weather data?

**Answer:**

It depends on the location of the sub watershed. If it is at the outlet of the entire watershed, then yes. It's best to calibrate for multiple

sub watersheds so that you're capturing the spatial intricacies of the watershed. Are you using the automatic calibration program within SWAT? As for your other question, I don't remember off-hand, but I think -99.00 is what you use as an input when you have missing data.

## 187-SWAT CALIBRATION

**Question :** I m working on Rainfall-Runoff modeling using Arc-SWAT 2005. I have to calibrate the model for runoff. At the time of default run model simulated runoff is very high as compared to observed runoff. Now i m calibrating model using curve number (CN2), available soil capacity (SOL\_AWC), channel manning's n( CH\_N), alpha bf factor (ALPHA\_BF), surface lag (SURLAG), soil evaporation compensation factor (ESCO). But after calibration runoff is not reduces as much as required .So which parameter shall I use to reduce surface runoff other that these parameters.

**Answer:**

You also should work with base flow parameters: GW\_DELAY, GW\_REVAP , REVAP\_MN, GWQMN.

## 188-Changing the Land Use File in SWAT

**Question :** I am currently working a simulation that is requiring me to change the

land use file and then run SWAT. Thus far I have been able to change the .TIF file. Here is the method for that:

1. Convert the original land use .TIF file to .ASC.
2. Open the .ASC file in Excel.
3. Use Matlab or manually change numbers.
4. Save the spreadsheet with headers and footers as .txt (delimited)
5. Change the file extension to .ASC.
6. Reformat, using Map Window, the .ASC to .TIF.
7. Load the new .TIF land use in Step 2 of the SWAT for land use data.

The problem is at step 7. I add the new .TIF file, but get the general error message. Does anyone have any insight into this? Basically how to change a current .TIF file so that I can use it for another run?

**Answer a:**

Why so difficult, why don't you just change the text input files from SWAT rather than using ARCGIS?

You can easily write a script in Matlab to change all the text files.

### **Answer b:**

You don't need to rewrite the files in Matlab, if you don't want to. Change the information in the master database using the interface tools for update .mgt files and then re-write the mgt files. BTW-> once the overlay and HRU selection is completed the GIS portion is over in SWAT. The model does not reference back to GIS layers and relies only on the text input files, so changing the text files is sufficient in running different land use scenarios.

### **189-Conversion to Grassland Land use BMP?**

**Question:** I have calibrated a SWAT2005 model for flow and sediment and now I am running some BMPs. One of the BMPs is to convert 80% of the agricultural land to grassland (Alamo Switch grass). All parameters are the same except the crop properties and the CN which is much lower for the grassland. Conceptually I would expect to see a decrease in flow and sediment from the watershed outlet with this BMP. When I make the grassland conversion I note that there is a decrease in the HRU contributions of flow and sediment (which is what I would expect). The problem is that in the main reach there is an increased groundwater contribution (due to the additional base flow). This increase in flow in the main channel (albeit small) is impacting my sediment load since nearly 60% of my sediment comes from the channel (High channel Erodibility) so any increases in flow impact increase the sediment load.

Has anyone else come across this problem or know how to solve it. I tried changing some of the Gw parameters for the grassland HRUs as well as changing from Alamo grass to another type of grass. While I did see changes in flow, they were relative to the original calibration.

### **Answer:**

(1) SWAT appears to be functioning correctly (i.e., as designed) from your description -- greater infiltration with switch grass, therefore greater recharge and consequent base flow, in turn causing greater channel erosion. Perhaps this is actually true in the modern system, that channel erodibility is actually high because of the decades of being loaded with soil erosion, and it is now being mobilized with any increase in flow. I'm a little surprised, though, that with perennial ET from the grassland your overall water yields, and thus overall flows, are not actually lower than with the cropland. I

would've thought cropland would cause both more runoff and surface erosion, and also more overall flow and consequent channel erosion.

(2) We at least know that the "end member" of your scenario, when the entire landscape was native prairie grassland, certainly did NOT have larger sediment yields from bank erosion than today.

(3) Probably this really just demonstrates that the channel erosion algorithm in SWAT is not very appropriate for modeling the real source of non-field sediment, which may be ravines and bank failures. I can't think of a current tool in SWAT to handle this type of erosion. Perhaps there needs to be a new module at the "base" of each sub basin, like a Pond or Wetland, called a Ravine that receives a certain fraction of flow from the sub basin and erodes proportionally, but only during runoff events.

## 190-Overestimation of runoff peaks in AVSWATX

**Question:** I am working on AVSWATX model for calibration of runoff from small watershed of 960 ha. (9.6 km<sup>2</sup>).

In runoff calibration temporal pattern is matching with observed runoff. But peaks of runoff are overestimated.

Can anybody help me in this about parameter which I need to look into?

**Answer:**

Try this:

[http://swatmodel.tamu.edu/media/1315/swat-calibration-techniques\\_slides.pdf](http://swatmodel.tamu.edu/media/1315/swat-calibration-techniques_slides.pdf)

## 191-US weather data

**Question:** I found that SWAT has built-in WGN parameters for over 1000 stations in US (see Statwgn.dbf in the SWAT2005.mdb). But I did not find the daily weather data in the database. From these parameters, we know that these stations could provide all the weather elements (precipitation, temperature, wind speed, relative humidity, and solar radiation) SWAT needed. So can anyone let me know where I can download the daily weather data for these stations?

**Answer:**

The National Climatic Data Center (NCDC) in Asheville, North Carolina, is the fundamental repository of weather data in the USA. If you're operating from a computer in the USA within an ".edu" domain I believe you can

download data for free. Otherwise your access is limited and you can purchase CDs (or perhaps DVDs now) of daily weather data from their "cooperative" network of stations. There are thousands of stations in the co-op network -- far more than the few hundred in the SWAT database. The stations in SWAT are just those with well-characterized weather statistics, so that the weather generator in SWAT can make reasonable estimates of missing weather data. Most of the co-op stations have only precipitation and maybe temperature, but at least these are the most important for SWAT.

The NCDC data sets are well done but a little messy from a SWAT user point of view. Data earlier than about 1948 are not included -- not a problem for most of you, but those of us interested in century-long impacts of climate and land-use change will need to dig a little deeper.

The data also tend to be in a compressed UNIX format ("Z") which can be uncompressed with a free utility like "7zip" but not the standard Windows XP un-zipping tool. Each month's data is given on a single line with daily values occupying 28-31 columns to the right, and you'll need to transpose the data for SWAT to be able to use it. Also, there are missing values, and gaps in time, that you'll need to identify and fill.

All in all, processing NCDC data for SWAT takes some effort. For a few stations you can do it all by hand in Excel. Otherwise, Srini and Zhang have some tools available; I'm not sure if they're posted on the SWAT site or whether you need to take their advanced data processing workshop. I've written some VBA scripts for Excel that worked fine for me (but I wrote them, so I could de-bug them as necessary along the way...). These scripts are available on my web site:

<http://www.smm.org/scwrs/tapwaters/>

Scroll down to the "SWAT Tips, Tricks..." etc. section and click on the "Climate data processor" link. I've included instructions and example data sets for using the scripts.

## 192-SWAT for Groundwater recharge quantification?

**Question:** I'm on a quest to finding if it is possible for SWAT to quantify groundwater recharge?.. If it is, how do I possibly do it. What are the data needed?

### **Answer:**

Try the gw\_rchgm variable in output.hru

## **193-Runoff calibration in AVSWATX**

**Question:** I am calibrating runoff from watershed of size 900 ha. (9 km<sup>2</sup>) using AVSWATX.

I am getting values closer to observed values for daily runoff. But they are in one day advance of actual runoff.

can anybody tell me how to delay the runoff by one day in calibration?

Kindly reply with parameters to be changed and their ranges.

### **Answer:**

try the surface runoff lag (SURLAG) variable in .bsn file. Also, you could vary the manning's coefficient for overland flow (OV\_N)

## **194-SWAT-2005 input & output P497**

**Question:** In SWAT-2005 input & output documentation, there is a long account from P497 to P529 (the end) related to Sub watershed Discrimination, what's main purpose and function of this part in the document? What do we do with it?

### **Answer:**

I got your email on the question in regards to the documentation I was using for calibration, and wanted to get back to you on that here. If you go to the "Files" part of this user group and go in there you should find this PDF document:

swat2005-unc-sens-calib.pdf

This is the background documentation that I have been using.

## **195-Some Questions**

**Question:** I have some questions :

1- How Can I make an observed.txt file in excel ? Excel only can make Tab Delimited file and when I use this kind of file , Sensitivity Analysis gives error .

2- I choose outlets in watershed delineation process . But I don't know how I can use them in sensitivity analysis . Do I have to use their ID when selecting sub basin numbers for sensitivity analysis ?

### **Answer a:**

use the excel option of formatted text (space delimited option) .prn to save the file and rename the extension to txt if you want it... set the column width to 5,5,14 for year, Julian day and flow not sure what you are asking about watershed outlets and sensitivity analysis. You need at least one location (either sub basin outlet or watershed outlet) to perform sensitivity analysis for all the sub basins above that point of selection.

**Answer b:**

1. You can save in Excel as a \*.prn file and type "observed.txt" (with the quotes) as the file name. That will save the file as a space delimited. You still have to add a single space before the years column 2. Figure out which sub basin outlet you have data for. That is the sub basin you use. My outlet is on sub basin 1, so I use sub basin 1 for sensitivity and calibration

**Answer c:** to make the observed.txt file in excel, first you have to assign the correct column with and then save it as .prn file, after this you can change the extension of the file to .txt. The outlets will form sub basins, to assign the outlets in the sensitivity analysis you have to use the number of the sub basin that correspond to this outlet.

## **196-Changed to address of the project**

**Question:** I have built a project in SWAT2000 on the following address:"C:/avs2000/aharchay" I have copied database and the project files and I want to execute the model on another computer on the this address: "D:/avs2000/aharchay. Which files should be changed to address the new path for the all files of the project.

**Answer:**

I've been using SWAT2005, but I'm guessing it's probably the same process. You'll need to go into your project's .mdb file, and open your Master Progress table. When you have this table open, you'll need to update the Work Dir and Swat GDB columns with the correct address.

## **197-Using multiple rainfall gages**

**Question :**I would like to use three precipitation gauges for my SWAT precip file; however there is not 100% overlap between the files. My main

rainfall file covers 1940-present, but one starts in 1962. If I fill in the earlier values with -99, my assumption is that the values will be generated randomly, and will not be correlated to rainfall elsewhere in the watershed - is this true? Or is SWAT smart enough to use the existing data in lieu of modeled data? Of course, I could duplicate the period in question manually, but I'm not sure what's the most appropriate way to proceed.

### **Answer:**

From what I understand you are correct regarding your assumption about the missing data being generated randomly. It would be wise to manually fill in the data with the nearest station. Precipitation inputs have a large uncertainty associated with them (spatial variation in rainfall, measurement methods and timing, etc) so the manual fill-in method might be your best route. You could use NEXRAD data; however, many studies have shown that you are often better off using precip stations instead.

Typically I will load my precip into the model, run it, and evaluate things from that point. If I have periods with large simulated peaks but no measured data I will go back and take a look at the station (as well as any others in the greater radius) to look for discrepancies.

3. am using the arc swat for watershed modeling. in the window of the watershed delineation the stream definition - based on the threshold area - the range of the area is showing as (0 - 0).

Whether you have converted your DEM from lat-long to UTM coordinate. It once happened for me b'cos I had converted them to UTM equivalent (meters unit)

## **198-Climate change**

**Question:** I am working on SWAT, I want to apply SWAT model for the Climate change , is it possible.

### **Answer:**

You need to define separate weather files for both present( or baseline) and projected scenario and use them as you do normally from SWAT weather input ( save a backup !!!). While doing so change the weather generator files as well in the projected scenario( analyze the data to enter the parameters for projected scenario as well). If you are modeling CO<sub>2</sub> change also, change the parameter CO<sub>2</sub>HI in crop database as well ( like present scenario 380

ppm/ projected may be depending on the scenario e.g. A2a 867 ppm ( 2071-2100)

## **199-How to determine runoff of whole watershed**

**Question:** I am working on watersheds having area of 100km<sup>2</sup>.I run the model by discrediting the whole watershed in to 8 sub watershed and obtained the result. the sub watershed number 8 is the last watersheds. I want to know that runoff obtained from last sub watersheds that is 8 is the runoff of whole watersheds or only the 8 sub watersheds. if so please tell me how can I calculated the runoff of whole watersheds.

**Answer:** Assuming sub watershed 8 is your most downstream sub watershed, it will represent the discharge leaving the entire watershed. However, be careful where you pull your information from. If you get your discharge from the .RCH file then the flow from sub watershed 8 consists of average daily stream flow (base flow + overland runoff) from the entire watershed. If you are looking for surface runoff output, the SURQ within the .SUB files contains that that sub watershed only (not the entire watershed). Refer to the output section of the SWAT2000/2005 manual.

## **200-NCDC data**

### **Question:**

Does anyone have any tips for getting NCDC weather data formatted correctly for use in SWAT?

### **Answer a:**

To answer my own question, I found a program on tamu.edu called extract.exe that appears to do the job

**Answer b:** I wrote some VBA routines within Excel to convert NCDC data into Arc SWAT format. The scripts deal only with precipitation and temperature. You can download these from my SWAT-related website: [www.smm.org/scwrs/tapwaters/](http://www.smm.org/scwrs/tapwaters/)

Go down to the "SWAT Tips" section and click on the "Climate data processor" link to download the Excel files, example data, and instructions. The code itself has lots of comments, which might be valuable should you want to see how it works (and if you need to fix something). I won't say the scripts are elegant or easy to use -- I don't know much about VBA

programming. The scripts do attempt to identify and fill time-gaps in the data with missing values (SWAT will choke unless all the temporal gaps are filled) And, you can have it fill in missing data with values from another selected nearby station -- though it does this one station at a time and depends on you to pick the station. I also had it point out values that were potentially anomalous, but you have to decide what to do with these, manually.

## 201-Implementing multiple growing seasons into SWAT

**Question :**I'm using SWAT to model Jamaica, and I'm wondering if anyone knows of a way to incorporate multiple growing seasons into one year. It's warm all year round, and so we are always growing something, however, the default SWAT settings only allow for one growing season per year. Any insight at all into this would be highly appreciated.

### **Answer:**

I'm using Arc Swat, so the particulars of my instructions may be somewhat different in Swat Editor. Under 'edit subbsain inputs' you want to edit the management parameters (.mgt). On the 'operations' tab you can schedule multiple plantings and harvests within one year.

## 202-SWAT2005 as multi-core program

**Question :** My computer is quad core processor. One of weakness of SWAT for auto calibration is to take long time. I found out just 25% of my cpu was occupied by SWAT running because SWAT is single core program. I want to save my time to auto-calibrate SWAT model by using 100% of my quad core CPU. To this, SWAT should be multi-core program. Is there anyone who compile SWAT supporting mult-core processor?

**Answer a:**it is not as easy as compiling on a multi-core machine. someone has to write a MPI version of SWAT for it.

**Answer b:**Oddly enough, It would not be too hard to make parallel within the subbsain routine, which loops over all the HRUs. There is some accounting that takes place at the end that would need to be performed after the loop, which means some of the local variables would need to be made global and made into hur based arrays. On a humorous note, I have thrown in the -parallel option and performed a benchmark between the parallel version and non-parallel for the intel compilers on OSX and Linux. The

parallel version now burns all the systems resources, and takes a few more seconds real time to run than the non-parallel version:

- Parallel Version
  - real 0m35.406s
  - user 0m56.901s
  - sys 0m3.933s
- Non-parallel version
  - real 0m32.558s
  - user 0m28.122s
  - sys 0m2.951s

Building a viable parallel version might be a fun project for us to do while having some beers at a future meeting?

## **203-User soil and land use table for global grids from waterbase.org**

**Question:** : I am new to Arc SWAT and I am trying to develop a model for a watershed in west Africa. I was able to download land use and soils grids from waterbase.org. Can someone help me to relate the values in these grids to SWAT soil and land use codes?

**Answer:** Generally, you could find the instructions in the manual which can be download from the Arc SWAT website, and you could also find instructions in the Arc SWAT Help file. Setup a new project and put the DEM into it. 1. Before treating with the soil and land use maps, input the soil type / land use and the parameters accordingly into the soil / land use database in the Arc SWAT menu (Edit SWAT Input - > databases -> User soils | land cover/ plant growth) first.

2. Run the Land use/soil/slop definition in the menu HRU analysis, fill each type with the mouse or load from the relation table files. The Arc SWAT Help file has given a good description on it.

## **204-Error with "harvest only operation" swat 2.3.3. beta version**

**Question :**

I was unable to run SWAT successfully because of some error relating to all my Alfalfa HRU, in particular the "Harvest only" operation which gave me an error message when I tried to edit it. So I removed all the "harvest only" operations and SWAT ran successfully!

I would like to know if this is a bug related to my beta version downloaded in April 2009. Can I do anything to fix it? If I install the latest June version, will this compromise my current project (i.e would I need to re-create it)?

**Answer:** Well, for anybody who might encounter this problem, here is what I found: the problem with the harvest only operation occurs only when you save your rotation (including harvest only operation) as a schedule then upload the saved schedule to another HRU. If you manually enter each harvest only operation for every relevant HRU, then SWAT runs successfully.

## 205-Tutorial

**Question :** I wonder if anybody there could respond. As a beginner I am trying the tutorial. When I try to process the weather data definition I get this message. " Not found "hop0pcp" Station data file. I am reasonably certain that I followed the manual.

**Answer a:** you must copy the file in the folder new# o whatever then you solve the problem.

**Answer b:** Did you used the name hop0pcp in the precipitation station DBF file? The name used in the precipitation station file should be the same to the precipitation data file.

## 206-Potential Heat Units

**Question :** Does anyone know of a program or a way to calculate potential heat units outside of SWAT? The auxiliary program on the SWAT website works, but is missing a lot of other crops. For example, I would like to calculated the RHUs for tomatoes in a certain part of California. Does anyone know a way of doing this?

**Answer:**

Check swat website under software, there is a phu or potential heat units program.

## **207-Out xx.out file - save conc.**

**Question :** a small question about the output files created by the option : save conc.

Are the results suppose to be the same than the corresponding subbsain in the output.rch?

For example for the same subbsain : Sed\_out of the output.rch shouldn't be the same than Send of the ouxx.out file ? I compare this two columns (with unit conversion that this comparison requires) but find some slight differences or even big ones which can go up to 5 Tons. Any clue why. Which file should I use to study water quality and sediments and nutrients loss in my Watershed. Do you know a documents explaining this file a little bit more than the Input/Output manual file?

**Answer a:** I am modeling a small (500 ha), mixed land use watershed in Minnesota and am having a problem where about 100 kg per year of phosphorus that has been transported from the landscape settles in the stream (Calculated from the .rch file as  $(ORGP\_Inkg - OrgP\_Outkg) + (MinP\_Inkg - MinP\_Outkg)$  ). This is nearly half of the phosphorus exported from the landscape in low-flow years. I have the stream water quality inactive and the Algae/CBOD/Dissolved Oxygen simulation inactive. I experimented with the SPCON and SPEXP parameters and they did not alter the settling. Has anyone else noticed this and does anyone have any idea which parameters control this channel phosphorus deposition?

### **Answer b:**

I'm pretty certain that you're right, that SPCON and SPEXP control sediment deposition only, which is entirely separate from phosphorus deposition in SWAT (they are of course coupled in reality). If I recall, P deposition in channels in SWAT is controlled principally by a settling or deposition parameter within Qual2e -- and if Qual2e is turned off, then P isn't lost to the channel. In the old AVSWAT interface to swat2000, I noticed that the radio buttons to turn on/off the stream and lake water-quality routines appeared to be reversed -- but you probably know this, and in any case this should've been fixed in the new Arc SWAT interface. It'd be worth checking your txt in out input files to make sure Qual2e really is inactivated (there's a parameter that serves as a flag in one of the control

files). Again, I suspect you checked this. I suppose excessive transmission losses could result in P losses in the channel. Seems unlikely. I suppose I'd check the subbsain output of P, to see if it matches the total input to the channels in the Reach file (you'd have to be careful not to double-count what is being passed down channel). Simplest would be to look at a few headwater subbsain separately, to see how subbsain outputs matched reach inputs, and then reach outputs.

But -- unless Qual2e is accidentally turned on, I don't have an answer. The channel should not be depositing phosphorus unless you activate Qual2e and have a positive settling rate and a non-negligible phosphorus content per algal body. Please -- if others spot something I've missed, let us know.

## **208-What is the system requirements of Arc SWAT 2.1.4a**

**Question :** I have read the web of SWAT model, it tell me that the system requirements of Software (Arc SWAT 1.0 for Arc GIS 9.1 version) is Microsoft Windows XP, or Windows 2000 operating system with most recent kernel patch, but I want to know the system requirements of Arc SWAT 2.1.4a with Arc GIs 9.2. Does it support windows2003 server or other? Could you tell me the system requirements of the future edition of Arc SWAT?

### **Answer:**

I'll paste this directly from the Readme file from Arc SWAT 2.1.4a. In order to install Arc SWAT for Arc GIS 9.2, you MUST have:

- 1.) Microsoft Windows XP or Windows 2000
- 2.) Arc GIS 9.2 with SP6 (build 1500)
- 3.) Arc GIS Spatial Analyst 9.2
- 4.) Arc GIS Dot Net support (usually found in: C:\ProgramFiles\ArcGIS\Dot Net)
- 5.) Microsoft .Net Framework 2.0
- 6.) Adobe Acrobat Reader Version 8 or higher. Acrobat Reader may be downloaded for free from:

<http://www.adobe.com/products/acrobat/readstep2.html>

## **209-Rainfall Data format in SWAT**

**Question :** I had a problem during the Weather Data Definition input data into SWAT software. For instance, I cant upload those data (rainfall data, temperature data, relative humidity data, solar radiation data and wind speed data) into SWAT software. The errors shows 'The table does not have correct fields'. Due to this errors and what should I do now? What is the correct format of input data in SWAT? At this moment, the format was OID, DATE, PCP. I really do appreciate on your comments.

### **Answer a:**

I ran into a similar problem with any dbf or text file input. Never figured it out, I had to use the data installed with SWAT. I am using Arc 9.3 on a 64bit Vista System. I am using the SWAT beta version that is still being developed for Arc 9.3. Any ideas on fixes would be appreciated.

**Answer b:** The pcp data is actually not uploaded. the table containing the name of the pcp file is uploaded. the correct format is ID, Name (string max 8 characters), XPR, YPR and elevation. the name field must contain the exact name of the table where pcp data is located. this format is same for temperature, solar radiation, humidity and wind speed as well. for pcp file, the format is date and pcp (f5.1).

## **210-Minimum area of watershed to run swat**

**Question :** My watershed area is 950 ha. Is the model is having some limit of minimum area to run, calibrate and validate the model?

**Answer:** I don't know that there is a lower limit on the size of your watershed. However, I do think you need at least two subbasins.

## **211-Reservoir**

**Question :** I want to know , how can I increase the sediment inflow in reservoir, the sediment occurring in the watersheds is not going in reservoir. I am working on area of 11153km<sup>2</sup>. the reservoir is in lower part, the sediment coursing in the catchments is not going to reservoir , it is settling in the upper part.

**Answer:** If sediment is settling out in the Reaches, and you do not want this, then set the channel sediment parameters to stop this. I believe the two

relevant parameters are SPCON and SPEXP. Read the theory manual to understand how they work. If I recall, increasing SPCON reduces sedimentation. In any case, change SPCON and/or SPEXP to stop channel deposition. Then the sediment should be routed all the way downstream to your reservoir. There, reduce NSED to what is needed to trap the amount of sediment you want in the reservoir.

## 212-Batch-run

**Question :** We have different climate scenarios as inputs for SWAT, and we were wondering if there was any way to set SWAT to run all of the scenarios one after the other automatically so that it will run them all within a few nights.

### **Answer:**

You can write a dos batch file. if you have the different scenarios in different sub directories.

For example: in a text editor (notepad) write:

```
cd \path\to\first\scenario  
\path\to\exe\swat2003.exe  
cd \path\to\second\scenario  
\path\to\exe\swat2003.exe  
cd \path\to\third\scenario  
\path\to\exe\swat2003.exe  
cd \path\to\fourth\scenario  
\path\to\exe\swat2003.exe etc.  
pause
```

Save this as "batchrun.bat" in the main directory and double click or run from a dos window. Alternatively you can use another program to post process and call swat. I have done that using R

## 213-Flow out problem with output.rch?

**Question :** I have a problem about the output.rch results, the flow in and flow out is much lower than the observe value. Version is 2.1.4a. I just compared the results run by AVSWAT2005 and this one. It seems that the parameters in output. sub are ok, such as the PRECIP, PET, ET, SW, PERC, SURQ, GW\_Q and WYLD. But in output.rch file, the flow\_in&out were much different with each other, the flow out of the outlets in AVSWAT is more than 300, but in arc swat is only 1. so there must be something wrong. dose anyone think that something wrong with

the default value when writing the files in arc swat. I tried to run another 2 watersheds, also the same problem. So anyone can help me? In addition, the pollutants loads seems Ok, so it is weird. Very low flow but with so much pollutants.

**Answer:** Have you ever noticed what are the values of these parameters they are mm/day which accounts the area and probably, you are trying to match the results with m3/sec or m3.day so lookout for values again. well, this is also a issue that has been discussed some 1 and half month before on this discussion board over the values that has been estimated nearly 40% (up or down) so please try to check that discussion hopefully you'll get your answer there.

## 214-HRU Threshold Failure

**Question :** I'm getting a series of errors when creating HRUs in the HRU Definition step of Arc SWAT 2.3.1 for Arc Map 9.3. When setting land use, soil and slope threshold levels to 5%, 5% and 5% respectively I get an unexpected program error number 457. The perplexing thing is if I set the threshold levels to anything above 30%, 30% and 30% the HRU definition step runs perfectly but I get very few HRUs. Even more frustrating is a coworker in a different office is able to create HRUs using the same watershed data with threshold levels set to 5%, 5% and 5%. Could there be any settings either on our network or my local machine that would cause this error? Any suggestions would be greatly appreciated.

### **Answer:**

A couple of questions/thoughts.....first, is your coworker using Arc Map 9.3 as well? Second question, are you both using the same lookup tables for your soils and land use? If your answer is no to either question, I'd consider matching what your coworker is doing. I had a similar error on the HRU Definition step, and the error was in the soil lookup table. You need to make sure every soil type listed in your lookup table is also in the user soil database table (SWAT2005.mdb), as well as making sure every number representing a soil is listed in your lookup table .

## 215-Zero flow

**Question :** I just encounter the big problem -- "zero flow", there are 89 subbsain in my project, my study area is in New York State, ,292mi2. I

checked about my input files and I cannot find anything wrong. land use is NCLD2001, the soil is Stats go in Swat. The weather data is daily PCP and TMP from 4 stations. and I just write the default files and then run the model. Is there any parameter important and must be revised in writing file step. after run the model without calibration, more than 50% of subbsain, flow in and flow out in output.rch are zero. the average month data is about13 cms, but the simulating data is only 1cms. Is it normal? I used AVSWAT before in al arge basin before, and I also did the same thing, but the result is normal, no zero data, maybe because the daily flow is about 700 cms. anyone knows is there something wrong with my project or it is normal, just did the calibration thing. If something wrong, any clues about how to deal with it?

### **Answer:**

What unit is your precipitation in? You should be in millimeters. If you are in inches, that could be giving you too little rainfall. I guess checking the precipitation file is where I would start checking first. Even without calibration, I would think you'd get more flow than that.

### **216-[no subject]**

**Question :**I am a post graduate student and I am using AVSWAT 2000 model for my thesis work. I have reached upto simulation stage without errors. During model run I obtained an error message which is ' Can't convert string to number: Number Null 0101'. If anybody knows the solution for this problem, please help me.

### **Answer:**

Formats of some of your dbase files may be faulty. You can prepare the files first in excel. Format the cells as per the instructions in the user manual. Then save as dbase.

### **217-How many times will auto calibration run?**

**Question :**I am doing the auto calibration now, selecting 12 parameters. So how many times will auto calibration run? There is no display in Dos. For my sensitivity analysis took 65 hours, so I wondering how long is the auto calibration step?

### **Answer:**

Another user asked the same question, so here is what I had mentioned to that person before: I recently ran auto calibration for 4,337 runs (it took a few weeks), and that was for 13 parameters. SWAT is trying to find the best combination of your 12 parameters, so it is going through and changing each parameter to find your best combination. It is not like sensitivity where you can count your parameters and figure on X number of runs. SWAT will keep calibrating until it is not improving your results. Patience is definitely a key, and you need to make sure you leave yourself enough time for a project. If you absolutely need to stop the model, I believe hitting Control+C will terminate the program, although you won't have any results. One thing that helped is to not use the computer when you are running auto calibration. It will process faster if you don't have other applications running. Also, perhaps you will want to shut off auto-updates if they are enabled until your model is done.

## **218-SWAT Source Code!!**

**Question :** Is anyone having the source code of SWAT, it will be great help to me if you share this.

### **Answer:**

On the SWAT website

[http://www.brc.tamus.edu/swat/soft\\_model\\_2005soft.html](http://www.brc.tamus.edu/swat/soft_model_2005soft.html)

Not too hard to find

## **219-About out put.hru with arc swat 2.1.4a**

**Question :** I use arc swat 2.1.4a, and everything is ok except the out put.hru file. It cannot be written correctly, only a few items and no results for most of the parameters. But in the release note, it said that this bug was fixed in 2.1.4a. so anyone has the same problem? and how to fix that?

### **Answer a:**

I have come across this same problem; I see that several people have submitted postings regarding this issue but no solutions have ever been offered. I am wondering how you were able to fix this. My results show only one hru and the data is blank for most fields. I would appreciate any suggestions.

### **Answer b:**

When you go to Run SWAT, and the window "Setup and Run SWAT Model Simulation" is up, look under the Printout Settings part of the window. Is "Limit HRU Output" checked/selected? Normally I believe it is. The HRU file, generally speaking, is a very large file. If you want to see this data, you need to uncheck that box.

### **Answer c:**

Even if that box isn't checked, the out put.hru still does not write out properly from 2.1.4a. I have a very simple FORTRAN program (attached) that formats my output.hru so I can manually create a database file from it, but it would be much better if this bug was fixed.

## **220-Create weather generator**

**Question :**I am new using SWAT and I have some problem with the weather generation. Maybe seem very simple for some but I have a data of 20 year and I do not how to integrate to the model. I created the dbf tables as it is mention in the user manual, but I do not know where to put all my information.

### **Answer a:**

You should import the dbf file into the swat2005.mdb database file. Use it to replace the user wgn table in the database. The swat2005.mdb file is in your swat installation file. You can go to the database file then you will find it.

### **Answer c:**

I have attached a complete set of weather data input files (Bosch\_weather\_example.zip) for your reference. As you can see, you need to have both station location files for each parameter (temp, wind, precip, etc) and a series of station data files for each parameter. Follow the formatting I have very closely and be sure file names are similar to what I have used as well. The reason the solar radiation station data files are .dbf files rather than .txt is that the data came from a different source and it was easier to do it that way. You can see, thus, that the station data files can be in either .txt or .dbf formats. I think these example files as well as a reading of the 3 pertinent manuals (Arc SWAT interface, Input-Output, and Theoretical doc) should answer all of your questions.

## 221-PCP falling on the water surface

**Question :** If an HRU (e.g. channel) is defined as water surface (WATR), would you please let me know how the precipitation falling on the water surface calculated in SWAT2005?

From the subroutine [subbsain], we know that if the HRU is WATR, only evaporation from the HRU is calculated and no land surface hydrological process is needed. So I am wondering where is this part of rainfall going? Your any suggestion would be appreciated.

### **Answer:**

From looking at my output tables, it appears SWAT handles the WATR land-use type in the following way:

(1) in output table hru:

(a) The HRUs with WATR land-use type do not contribute to flows (SURQ,

LATQ, GWQ, etc.). It's unclear to me if the net atmospheric exchange (P - ET) is stored anywhere in the model; my guess is that it is ignored.

(b) The effective water yield (WYLD) for the subbsain is calculated as follows:

i) as the area-weighted WYLD of the other HRUs (i.e., EXCLUDING those with WATR as land use), or

ii) if all HRUs in the subbsain are of WATR land use, then WYLD = 0.

(2) in output table sub:

(a) the WYLD of the ENTIRE subbsain is taken to be the area-weighted WYLD as describe above. I.e., the WATR HRUs are assumed to generate flow at the same rate as the area-weighted WYLD determined from the other HRUs.

Flow generated by the subbsain is calculated as subbsain area \* WYLD.

To summarize -- at the subbsain level, the areas of WATR are now not "ignored" -- but presumed to generate flows at the same WYLD that was determined from the other HRUs. (3) in the output table rch:

(a) You should be able to confirm that subbsain area \* WYLD equals the flow into the reach from the subbsain. (If you've got upstream reaches, you'll have to subtract their inputs to see what the subbsain is contributing.) I'm not entirely happy with the way SWAT deals with WATR. If you've got small areas of WATR and just want to ignore them, then what SWAT does is reasonable. However, I've got large areas of WATR -- many of my subbsain are 50% or more WATR. I will be explicitly adding

many of these areas back into the model as reservoirs or ponds -- which will help generate flow from these areas (and as effectively impermeable areas, they certainly contribute to flows). However, it also means that the areas will be contributing flows in two ways: once as a reservoir or pond, and ALSO at the same area-weighted WYLD determined by other HRUs in the subbasin. So there's some "double counting" going on.

## 222-Modeling Phosphorus

**Question :**I am modeling P transport into a reservoir, located at the outlet of a watershed. I have a question regarding the output of SWAT for P. Is the parameter Mineral P in the output files refers to soluble or active mineral P. I would really appreciate your help.

**Answer:**

SWAT uses the module Qual2E (or a newer variant) to model nutrient processing by streams. My understanding is that, traditionally, in this model MINERAL\_P is interpreted to be the inorganic, soluble P (SRP, or ortho-P, considered to be the same here). And, ORGANIC\_P is considered be everything else -- principally particulate P, whether organic or inorganic. I'm skeptical, because I don't find whether Qual2E explicitly modeled adsorption / desorption of P from mineral particles -- which one would think ought to be an important form of P in rivers. In addition to MINERAL\_P and ORGANIC\_P, Qual2E also keeps track of chlorophyll -- which is from algae, and Qual2E assigns a P content to that algal load. So technically, this is another part of the P load. However, when a reach delivers its load to a reservoir, the reservoir receives the MINERAL\_P and ORGANIC\_P load -- but I don't think it keeps track of the Chlorophyll load. I could be wrong here... but in general I would carefully track your output to test whether the model is correctly passing P between reaches and reservoirs. Currently --- I just do not use the stream water-quality routines (Qual2E). In this configuration, the model keeps good track of P coming off the landscape and what gets routed downstream, both through the reaches and through the reservoirs (and what may be deposited in reservoir sediments).

## **223-HRU Definition error**

**Question :** I am running across an error during the HRU Definition step. I'm defining my threshold values in percent for land use/soil/slope, and when I go to click on Create HRUs, I get an error. The first box that pops up is "SWAT\_HRUs: SWHT WWHT", which is obviously referencing two of my land uses, spring and winter wheat. So I click OK on that, and my next error box tells me an error occurred in the application with the following:  
Error Call Stack Sequence: cmdOK LU Soils functions' Line: 475 Error Number: 457 Description: This key is already associated with an element of this collection.

There is not much winter wheat (WWHT) located in the watershed, so I tried just eliminating that land use. When I did this, I still received the error, except it is now referencing "SWHT WETL" in place of "SWHT WWHT". I've run a project before with basically the same data sources in a different watershed, and I had not run across this problem before. I have tried using both Arc SWAT 2.0 and the latest Arc SWAT 2.1.4a (starting new projects in both versions), and neither version has yielded a different result. I've also checked my Arc GIS version and Microsoft .NET versions. I don't notice anything out of the ordinary in my datasets and lookup tables, but I'm not sure about what small details I might need to look for. Any guidance would be greatly appreciated!

### **Answer:**

in my case the problem was that the look at table of land use some symbols were written in lowercase by changing all upper case (both look at table that database) is not presented the problem.

## **224-Overlating to land use and soil map**

### **Question:**

I am working on AVSWAT 2000. I have created a DEM of the basin. then the DEM has been added to AVSWAT. when the land use data is to be added an error message comes as "the selected shape theme do not overlay the watershed zone". the DEM was created in arc info GRID format with geographic co-ordinates as same as the land use and soil maps. so, what could be the reason?

### **Answer:**

Check to make sure your spatial data sets are all in the same map projection -- just using the same datum (GCS84, for example) isn't enough. And just because the images may appear to overlay in Arc View also isn't enough, because (I think) Arc View will display a data set in the same projection as other the other features in your data frame, even when a data set has no projection specified.

## 225-SWAT Calibration help needed

**Question :**I am a PhD student in Louisiana State University, doing research on SOC stock and sequestration potential in Louisiana, Identifying Critical Non-Point Source Areas of Pollution to Bayou Courtaleau. I simulated the discharge and compared to the measurements from USGS gauge station as attachments. The red lines are the simulation results in attachments. The trends of simulation results are very close to the measurements, however, they are much lower than the measurements, especially in those low values.

Any body can give me some suggestions to this situation?

Which parameters of SWAT could work for the calibrations?

### **Answer a:**

Look at the SWAT website at the SWAT Calibration Techniques file for some pertinent information.

[http://www.brc.tamus.edu/swat/pubs\\_calibration.html](http://www.brc.tamus.edu/swat/pubs_calibration.html)

### **Answer b:**

To add on to the document that Nate referred to, you could also consider running a sensitivity analysis if you haven't already done so. On the SWAT website under Software, there is also a Base flow Filter program that can help with a couple of parameters as well.

## 226-Regarding rivers

**Question :**It is really urgent This question is bugging me that what should we do for rivers which are flowing in the study area. As rivers are common part of soil map as well as lulc so LULC- should we classify them as WATR SOIL- Should we give all the parameters 0 as given in example3 for water.

### **Answer:**

You can use any soil parameters for water land use, swat will ignore the soils and will compute only Evaporation. But putting zero is not advisable.

## 227-Runoff and Eva transpiration on SWAT - Part I

**Question :** I have some questions regarding Runoff and Evap transpiration on SWAT. By what I saw on the "Theoretical Documentation", when the method for estimate runoff is the SCS, on the Ia (initial abstractions) term is included the precipitation intercepted by the plant canopy, and so it wasn't calculated (I'm wrong?). But if I use others methods than the Penman-Monteith for calculate the potential evap transpiration, I need to calculate the transpiration. And this is done with the equation:

$$*Et = (E'o \cdot LAI) / 3.0 \quad (0 \leq LAI \leq 3.0)$$

$$Et = (E'o) \quad (LAI > 3.0)$$

\*

Where  $*E'o*$  is the remain evaporative water demand, given by the equation:

$$*E'o = Eo - Ecan*$$

Where  $*Eo*$  is the potential evap transpiration and  $*Ecan*$  is the evaporation of the free water on the canopy. To calculate the sublimation and evaporation of the soil, the equations depend on  $*E'o*$  value too.

So, here is my question. If using the SCS method for calculating Runoff, the amount of water intercepted by the canopy is already present "implicitly", what value will be used for the  $*Ecan*$ , so that the SWAT can get the value for the  $*E'o*$ ? Or the value for the  $*Ecan*$  will be calculated, regardless of the Runoff calculation method chosen?

### Answer:

Here's what I think: in the CN method, canopy interception is implicitly included in the Ia term, but is not explicitly specified. Regardless of the runoff calc method chosen, The Ecan is a function of the parameter CANMX, daily precipitation, LAI and PET.

Ea is calculated at HRU level. The final watershed or sub basin Ea is the weighted sum of HRU Ea, where the weight is fraction of watershed or sub basin area in HRU.

## 228-SWAT based on grid cells

**Question :** I am interested in using SWAT with remote sensed data. Although SWAT was not designed for running with a discrimination scheme

based on grid cells, I would like to ask the SWAT user community, if anyone has personally had experience with setting SWAT up in this fashion or has specific references or publications on this topic.

**Answer:**SWAT has been used with raster data as you describe. There are a couple of issues with this approach including computational efficiency. If each cell is treated as a sub basin you windup with too many sub basins for a manageable model. Either the spatial extent or the cell size must give. The current version of SWAT does not allow sediment and runoff from once cell (HRU or sub basin) to enter the next cell in overland flow, so you may not get the results you are looking for (we are working on that). If you use relatively large cells as sub basins I have seen the approach work.

There are some scenarios that may be well suited for grid simulation. If you are concerned strictly with upland loads you may choose to simulate only unique combinations of soils, land use, management, and slope in your watershed and ignore the routing all together. This decreased the computation time by a couple of orders of magnitude. I have used this approach for the identification of critical source areas. I do have a report I can share with you about this.

## 229-Error in SWAT2005

**Question :**Swat2005 run, and I get the following error: Program reading from file. CIO...executing forrtl:severe(59):list-directed I/O syntax error, unit 1, file \...\file. CIO

Routine	Line	Source
GETALLO	144	getallo.f
MAIN	70	main.f

I have reviewed the file and cannot find any errors.

### Answer a:

I think that the problem may be in the "format" of the file. You edited this file (file. CIO)? In the Input/Output manual you can see the format. But you can make this file from a GIS (like Arc View or Arc GIS) with the appropriated tool (like AVSWAT), and them compare the file created with the tool with your file. One time I got an error because of the format of a file (I think it was a SOIL file).

**Answer b:**From the error message that you posted, it appears as if SWAT

crashing when trying to read the NTTOT variable located in file. CIO. I don't know why exactly it is crashing there, but NTTOT appears to be the source of your error.

### **Answer c:**

You've to check all your soil input parameters, it is an error there that probably you've not entered those soil conductivity parameters

## **230-Help needed**

**Question :** My SWAT model was ok when there was 2 rainfall station. As I increased no of station for precipitation, it is creating problem. it is not working for simulation period from 1997 to 2000. However it works perfectly from 2000 to 2008. It does not run even for few days below 2000. I checked all the data. Input are perfect. It does not show any error. It says model set is successful but as I run it neither gives error nor it says swat run not successful. The black screen just displays and does not end. What could be the reason?

### **Answer:**

After adding precip data, did you ensure that the simulation period was changed? Open file. CIO and check the beginning day of simulation. Perhaps, it is still set for year 2000.

## **231-How SWAT understand the "sub basin"?**

### **Question :**

I think that this is the first time that I send a message to the group. I apologize if my questions are "stupid", but I start to study this model only recently and have a few questions to ask you...The first question that assault me is how the SWAT model see the "sub basin". I don't think that SWAT calculates the "path" of water on the sub basin until it reach the channel, but instead, uses some type of "simplification", like transform the sub basin in a single "hill slope", based on the mean declivity of the sub basin, for example. Is it true? How the SWAT "see" the sub basin for the different calculations, like runoff, infiltration, lateral flow, ...?

### **Answer a:**

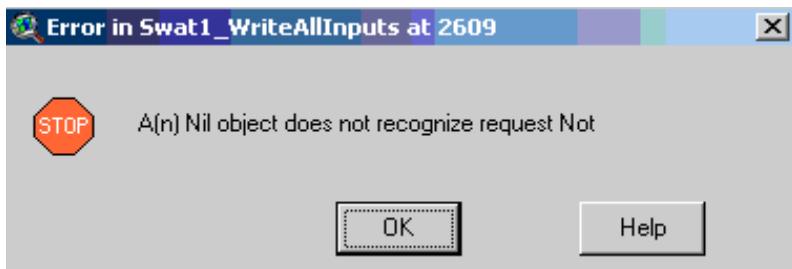
The SWAT theory manual does a good job of explaining most of the basic concepts and many of the details -- you have a lot of reading ahead of you. But briefly, SWAT uses the HRU concept. In each sub basin, SWAT lumps all areas of the same land use, soil type, and slope into a single aggregate unit called a "hydrologic response unit" (HRU). I envision an HRU as a very large field, bordered on its downstream edge by the stream channel. SWAT does all its calculations of infiltration, runoff, sediment transport, nutrient transport, plant growth, etc., for each HRU. A sub basin may have any number of HRUs -- it depends on how many unique combinations of land use, soil, and slope there are in the sub basin, and how much detail you allow SWAT to see (you may tell SWAT to ignore combinations that are very small, for example). So -- if your sub basin has 5 HRUs, I would envision it as 5 large fields, each sloping uniformly down to a stream channel, which receives runoff, sediment, and nutrients from each HRU. These components are then fully mixed in the channel and passed to the next downstream sub basin. The HRU concept allows SWAT to use fairly mechanistic equations to calculate runoff and transport of sediment and nutrients. But of course the real world does not (usually) consist of uniformly sloping fields leading directly to stream channels. So models should be calibrated to real monitoring data to "scale" (or "fudge" as some would say) the model output to match the measured data, to try and account for all factors not explicitly modeled. I tend to think that understanding the HRU concept is key to understanding how to interpret results from SWAT -- and should serve as a constant reminder to not over-interpret results.

**Answer b:** This is the exact information that I was in need to start to understand how SWAT works. I've already read about the HRU, but couldn't (until now), understand how the model work with it.

### **232-Urgent Help Needed !!**

Can anyone please help me out of the problem, shown in \*attached file\*herewith.





## Answer b:

[http://groups.google.com/group/swatuser/browse\\_thread/thread/517cc1fa...](http://groups.google.com/group/swatuser/browse_thread/thread/517cc1fa...)

Maybe it will help you

## 233-Shape file soil map preparing

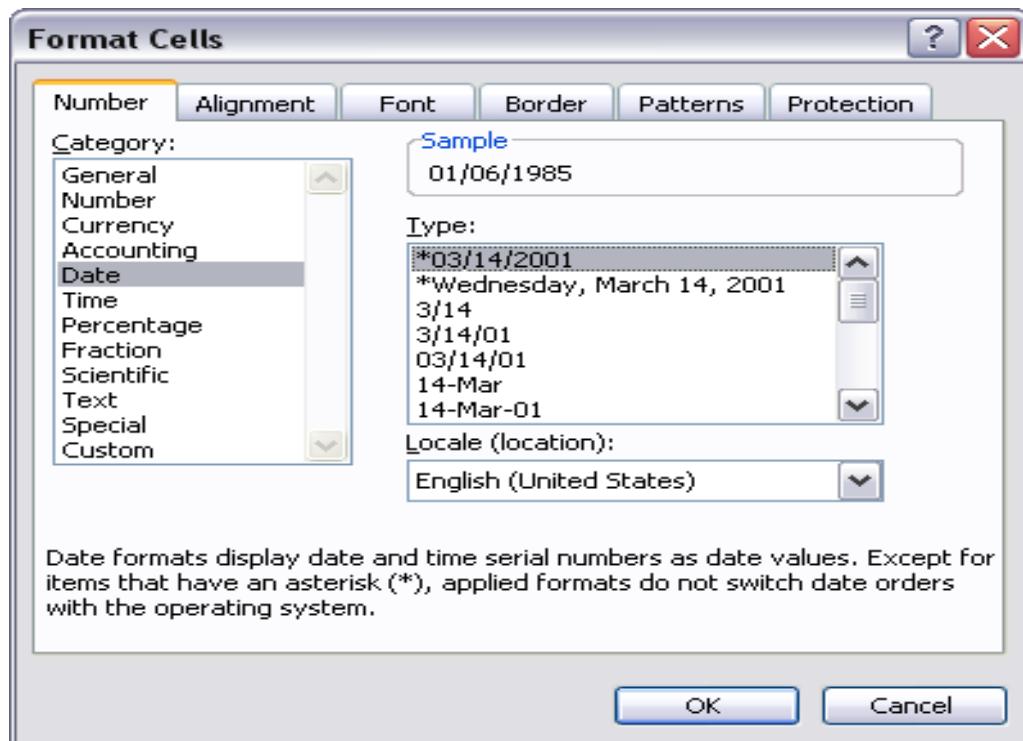
**Question:** I used to adopt the fao soil map for my SWAT model. Unfortunately, some part of my watershed is not covered by the soil map as its resolution is too low. I get a 1:1Million soil map now. Originally it is in coverage format. I converted the format into shape file and clipped the area for my watershed. The attribute table include three columns---the area, the parameter and the soil code. When I load the shape file soil map for my hru analysis, the system says that there are no valid field in layer #1. I changed the original field name from soil code into MUID (which is shown in the swat example database). But the problem is still there. Is this related to my user soil database? Or is it because of my shape file soil map format?

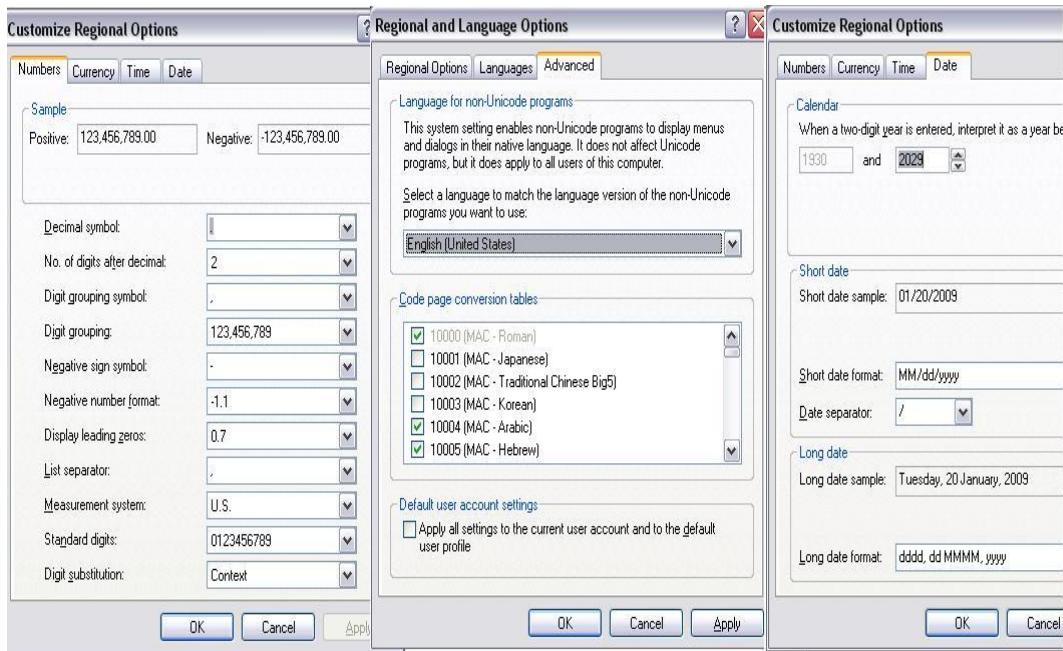
**Answer:**

The problem has been solved by converting the shape file polygon into GRID raster. The soil database has also been organized in a proper way. Some soil items in my soil table were set in a wrong way. the Soil depth in different layers should be cumulative value. For instance, one kind of soil has three layers, the first layer is 100mm, the second layer is 100mm, and the third layer is also 100mm. But the Sol\_Z values in the soil table should be 100, 200, and 300 respectively. Thank you very much for all who helped me with this mistake. Have a nice weekend.

## 234-Error occurred in MAKEPCP

**Question :**Some users and I have had a big problem in importing weather daily data in Arc SWAT. One of users stated it is related to regional settings in control panel in windows. But I checked different settings and error still exists. In excel 2003, my date format is as below ( image is attached ) :Also, In control panel I have a setting like this :Error .JPG Please someone help and solve this problem.





### Answer a:

There is small difference between my and yours in Regional settings.  
Check. here is link to picture.

[http://swatuser.googlegroups.com/web/mistake.bmp?hl=sl&gda=GsQ9ID0AAAD3aKmJ\\_GayRFLB3cDI4luAQ7I0wcltlghiHjpwBUYv0NzCkrr8J4EKfLQkEbYRrGXlNv--OykrTYJH3IVGu2Z5&gsc=LC3QtxYAAAAyGs5zS4V1Afug145Q7rUi g-kXU5InE09W2o0GCSVgCQ](http://swatuser.googlegroups.com/web/mistake.bmp?hl=sl&gda=GsQ9ID0AAAD3aKmJ_GayRFLB3cDI4luAQ7I0wcltlghiHjpwBUYv0NzCkrr8J4EKfLQkEbYRrGXlNv--OykrTYJH3IVGu2Z5&gsc=LC3QtxYAAAAyGs5zS4V1Afug145Q7rUi g-kXU5InE09W2o0GCSVgCQ)

### Answer b:

If the problem is due to regional settings then this will also persist in Excel too so to solve this problem, there are two options

1. Either prepare your database in txt format and check whether that is running or not
2. Prepare database in Open office. org's excel or In visual fox pro hope this will work for you.

else you can prepare these files in separate system and workout them there. Let's see whether it will work or not.

## 235-Source Code Compilation

**Question:** I cannot compile SWAT source code and I receive many errors ( see the file attached for errors ). The source code I use is the one from

SWAT website. I'd like to ask whether there is any other source code ( newer and capable of being compiled ) on the web? Or is there anyone how can share his/her source code which he/she has been able to compile?

**Answer:** When I tried to compile the source code of SWAT 2005 downloaded from the website (2005-dev\_code.ZIP) I got several compilation errors. I overcame these problems in the following way:

- 1) commenting the first line of 'main'),
- 2) creating a new workspace with all the files
- 3) building swat2005

Then I did some test modifications to the source code and they were reflected in the executable.

## **236-Interpret error message of unsuccessful run?**

**Question:** Trying to figure out what's not working (SWAT2005) in a rather simple application ...DOS error message includes:

forrtl: severe (161): Program exception - array bounds exceeded

Routine: READSOL Line: 108 Source: readsol.f  
Routine: READSUB Line: 307 Source: readsub.f  
Routine: READFIG Line: 155 Source: readfig.f  
Routine: MAIN Line: 106 Source: main.f

Can someone interpret the above and point me towards the source of the error?

### **Answer a:**

Start with checking your soil files or your soil input. The program indicates that for one of the inputs in the soil files the format is wrong, or you are missing a value or the soil files have not been

### **Answer b:**

it indicates about soil file probably you've not inputted the parameters correctly or exceeding them so check your parameters and if you don't have proper parameters then use "Soil Water Characteristics Tool" By Saxton (USDA Agr. Research Services)

## **237-ArcSWAT2.1.4 Water Yield**

**Question:** I just updated from Arc SWAT 2.0.0 to Arc SWAT 2.1.4. Without changing any parameters, the water yield for my watershed increased by nearly 30%. There don't seem to be any changes mentioned in the release notes that would affect water yield. Has anyone else noticed this difference?

### **Answer:**

I have noticed small changes in hydrology when making some switches between versions, but never 30%. I think the changes might be due to parameter naming changes or even min and max values for particular parameters being adjusted. Did you alter any of the database tables in SWAT2005.mdb when you were using the previous version? Those changes would have been overwritten with the newer version installation. Another precaution I have been taking when updating to newer versions is opening and closing all input parameter tables (point source, reservoirs, .Mgt, etc) and then rewriting all input tables. This may fix some issues with previous versions.

## **238-APEX Model Download**

**Question:** Please someone guide me from where I can download APEX Model if it is a free software. I cannot find it on the web or in USDA website.

**Answer:** Last I had heard, APEX isn't available on the website yet. They were still testing the product although it had been available by request for others to try out as well. Contact R. Srinivasan (his email is listed on this user group) and perhaps he will provide it for you or he will let you know when it will be available.

## **239-SWAT run NOT successful**

**Question:** I had the problem with SWAT run. This problem happened to me even with the example data from Arc SWAT installation. Please help me have a look at the attachment.

I used my own system to set up SWAT run, it was completed very well. But when I was doing the SWAT run, the SWAT2005.exe just flashed with the familiar black screen, then a pop-up displayed 'SWAT run NOT successful'. Is there anybody who know the reason of this problem and how I can solve it? Thank you very much. My thesis deadline is also due soon, I

am very anxious to conquer the error. Any help and suggestion will be highly appreciated.

**Answer:** Please try to rewrite your input file from the edit database menu. For my case, I rewrote the management file first. Then set up the run and do the swat run. No problem got. When I used my laptop, this problem happened to me again. I tried to rewrite the mgt file. But it didn't work. Then somebody suggested to rewrite the crop. data It worked again.

## 240-Dealing with wetlands

**Question:** I am modeling an agricultural watershed in which 10% of the area is covered by wetlands and approx. 90% of the watershed contributes flow to these wetlands spread evenly all over the area. I have 51 sub-basins and for each of these sub-basins I have calculated the WET\_FR, WET\_NSA and WET\_NVOL. My preliminary assumption is that WET\_NSA=WET\_MXSA and WET\_NVOL=WET\_MXVOL, and I have set WET\_K as 0.5mm/hr. Flow generally occurs from April-October months so I have set IFLOD1 as 4 (April) and IFLOD2 as 10 (October). My trouble is that I am not seeing any difference between having and not having wetlands in my model. For both cases, there is no difference in aggregate monthly flow values for entire study area as well as for individual sub-basins. I tried changing WET\_FR from 0.6 to 0.06 and WET\_NSA from 400 ha to 4 ha along with WET\_VOL from  $380 \times 10^4$  m<sup>3</sup> to  $3.8 \times 10^4$  m<sup>3</sup> and there was only a 10% reduction in flow. Can anybody share their experiences dealing with wetlands in the new version of SWAT? I am using the Arc SWAT ver. 2.0

**Answer:**

(1) I expect that if you start with NVOL = MXVOL, then the wetlands will spill all runoff they receive immediately, rather than letting the outflow to follow a target number of days (NDTARG) to reach normal volume. (With Reservoirs and Ponds, you can set the NDTARG; with Wetlands, I think it is just set to 10.) So, without any storage function to the wetlands, you wouldn't see any modulation of storm peaks. Try making MXVOL much larger than NVOL and see if that changes anything.

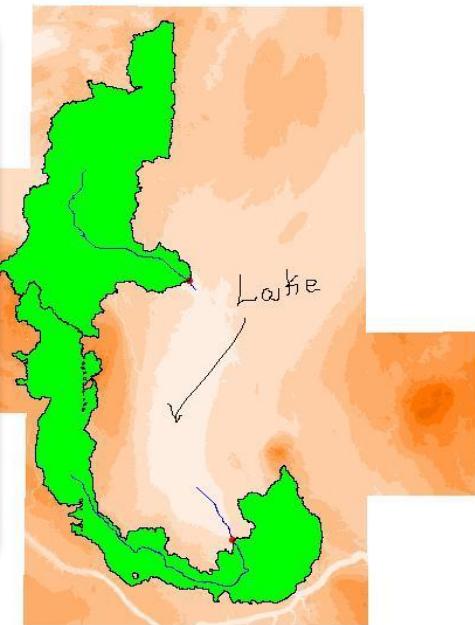
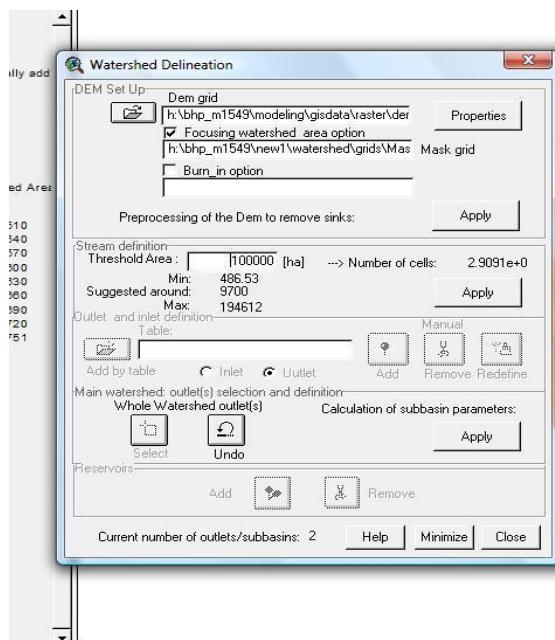
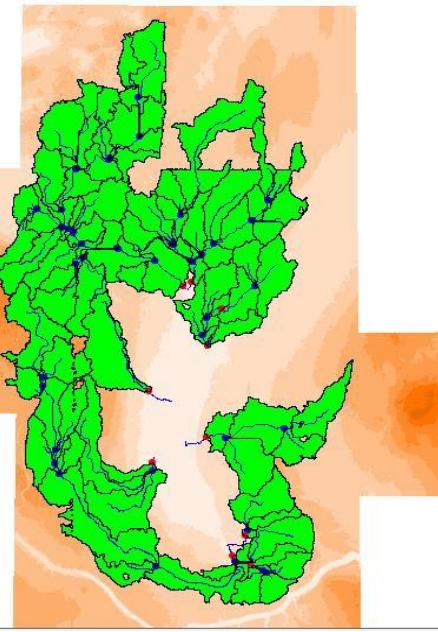
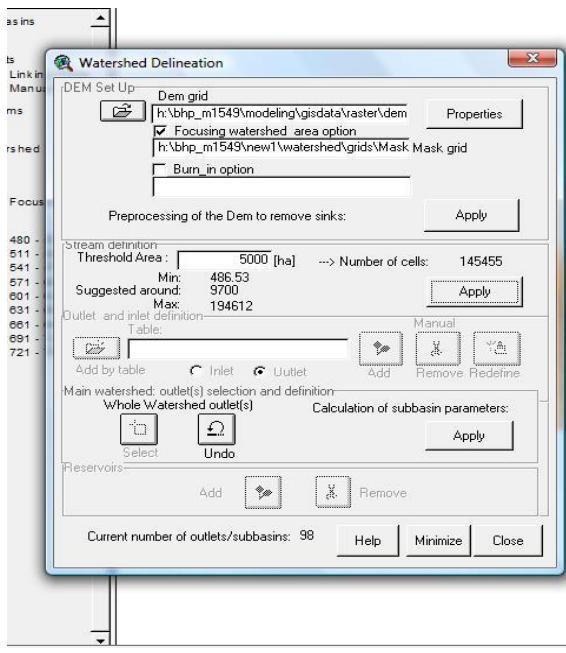
- (2) If you need the extra control of setting an NDTARG, then use Ponds rather than Wetlands as your modeling tool; they are functionally very similar.
- (3) In the standard release of SWAT, any infiltration from surface- water bodies (Ponds, Wetland, Reservoirs, Channels) gets trapped in shallow aquifer storage. There is a beta version of SWAT that addresses this issue, but I don't know how widely available it currently (or if it's revised algorithms have been incorporated into the "standard" version of SWAT). In any case, if  $WET\_K > zero$ , you will be losing water from your system -- when one would think this water should contribute to base flow. So beware of such losses, as they can significantly alter your water balance. I presume this is where your "10% reduction in flow" went to. Otherwise, why would you expect a reduction in flow?

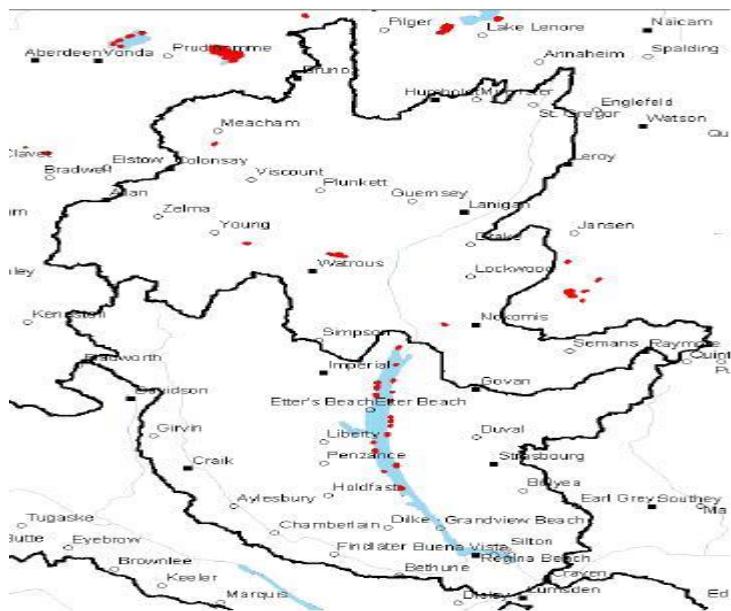
## **241-Lake Representation in AVSWATX**

**Question:** I seek some help regarding SWAT model. I am working on surface water quality and quantity modeling of a long lake (approximately 233 km<sup>2</sup>) which is in the middle of a watershed. I would like to request you for a suggestion about how to represent the lake in AVSWATX model.

I have tried in many ways and could not get determine how to represent the lake in the AVSWATX. Attached are my trials and the actual lake watershed boundary that i should get at the end of my watershed delineation.

Please suggest/help me about how to represent lake in AVSWATX.





**Answer a:** I think your DEM is not complete. If you enter the line of the rivers and the lake in the "burn in option" maybe resolve this problem.

**Answer b:** I am curious as to where you are locating your outlet(s)? Are those all watershed outlets located around the lake, or are they sub basin outlets? If they are watershed outlets, the model is going to stop modeling at those watershed outlets, thus leaving the lake downstream as not modeled. If that is the case, make sure to have one watershed outlet for your entire watershed including the lake, and make sure it is downstream of the lake. You should be able to locate sub basin outlets at those locations I do believe.

## 242-Application in CRP fields

**Question:** Can SWAT be used to estimate sediment load from a watershed of nearly 50 acre size? Another confusion I have is I want to simulate erosion from CRP (Conservation Reserve Program) fields but I can't see this land use type in SWAT land use database. Is it possible to estimate soil loss from this land use type?

**Answer:**

To run SWAT on a specific area, I would create a Mask over that area, which would be done during watershed delineation. I'm not sure how well SWAT would do on an area that small, but that is how I would go about it. Perhaps you should look into APEX, which is a tool that the SWAT creators

are finishing up that is designed to simulate areas at the field/farm scale. I would get a hold of Srinivasa to see if you can get APEX (last I heard it is being tested at this point). In order to simulate erosion from CRP land, you need to know what exactly is planted on that CRP field. CRP could simply be land that is planted to grasses, or it could have several tree rows, in which case you could call it a small forest depending on tree type (in other words, is it deciduous or coniferous?). You won't find a land use of CRP because CRP does vary from land owner to land owner. You will need to identify more precisely what is planted on those CRP fields, then assign those plant types for that specific field. You could contact the local NRCS/FSA field office for the area you are modeling, and perhaps they could guide you as to what the most popular plantings are for CRP in that particular watershed, or if you have the time and energy, you could maybe get them to provide a more detailed distribution, but some of that information is protected, so there would be some hurdles you would have to navigate to get more precise data. You'd have to decide if that is worth your time and effort.

## **243-Question on auto-calibration not stopping**

**Question:** I have a question in regards to the auto-calibration routine with SWAT. I'm running an auto-calibration with SWAT for my model on 5 parameters. I set up the auto-calibration following the procedures outlined in the Advanced SWAT training I attended in the spring of '07, adjusting the necessary files to calibrate to high and low flow files I set up. I executed the auto-calibration routine last Monday, and it is still running. So, I am wondering why it is not stopping. From my estimates, it should have run 60 trials (for 5 parameters). Then, I hypothesized that it would run double that for calibrating to high and low flows when the routine was running past 60 trial runs. I checked it this morning after the weekend and it is still executing and is currently at 255 trial runs. Could anyone offer some advice in regards to this? I am wondering what my options are...can I manually stop the program without any problems, or should I let it keep running (which I don't know when it will stop)? Any advice would be greatly appreciated!

**Answer:** The time the Auto calibration takes depends on the number of parameters you set for calibration, simulation period and the number of HRUs. So currently you can wait until it ends, then you will have some basic concept of its operation.

## 244-SWAT-2005 input & output documentation

**Question:** In SWAT-2005 input & output documentation, there is a long account from P497 to P529 (the end) related to Sub watershed discretization, what's main purpose and function of this part in the document? What do we do with it?

**Answer:** I got your email on the question in regards to the documentation I was using for calibration, and wanted to get back to you on that here. If you go to the "Files" part of this user group and go in there you should find this PDF document: swat2005-unc-sens-calib.pdf This is the background documentation that I have been using.

## 245-Mdel crushing

**Question:** I am using the model to model a watershed in Kenya and when was running the simulation the model crushed and gave the following error from the file CIO,

```
C:\AVSWATX\nyando_test1\scenarios\default\txtinout>swat2003
                                                SWAT2003
Soil      &      Water      Assessment      Tool
          UNIX           Version

Program reading from file. CIO . . . executing
forrtl: severe (161): Program Exception - array bounds exceeded
Image          PC          Routine          Line          Source
swat2003.exe   0050CE6C  READFILE          497  read file.f
swat2003.exe   004A9365  MAIN              75   main.f
swat2003.exe   00673CB9  Unknown           Unknown Unknown
swat2003.exe   00656B69  Unknown           Unknown Unknown
kernel32.dll   7C816D4F  Unknown           Unknown Unknown
C:\AVSWATX\nyando_test1\scenarios\default\txtinout>
I would appreciate any assistance give please.
```

### Answer a:

I have the similar problem now.  
Microsoft Windows XP [Version 5.1.2600]  
(C) Copyright 1985-2001 Microsoft Corp.

C:\Documents and Settings\yu>cd /d d:\ex\scenarios\default\txtinout

D:\ex\Scenarios\Default\TxtInOut>swat2005

SWAT2005

Soil & Water Assessment Tool

PC Version

Program reading from file.cio . . . executing

forrtl: severe (24): end-of-file during read, unit 10, file D:\ex

\Scenarios\Defa

ult\TxtInOut\000140002.mgt

Image	PC	Routine	Line	Source
swat2005.exe	00671069	Unknown		Unknown Unknown
swat2005.exe	00670EC7	Unknown		Unknown Unknown
swat2005.exe	006700A4	Unknown		Unknown Unknown
swat2005.exe	006704D9	Unknown		Unknown Unknown
swat2005.exe	006678F5	Unknown		Unknown Unknown
swat2005.exe	004A81E5	HRUALLY	251	hruallo.f
swat2005.exe	0047B648	GETALLO	321	getallo.f
swat2005.exe	004C70B5	MAIN	70	main.f
swat2005.exe	006AC679	Unknown		Unknown Unknown
swat2005.exe	006919E9	Unknown		Unknown Unknown
kernel32.dll	7C816FD7	Unknown		Unknown Unknown

## Answer b:

for my case I just started again isolating the problem one by one to see where the problem could have been. Finally, I found the problem was in the HRU'S. I had used multiple HRU's and I think the threshold I had set for land use and soil was the problem. Or so I guess. I used the dominant land use with fewer sub basins>equals to hru's for dominant land use)and it worked. Your case may be different but you can check the hru's, your soil and land use maps also.

## 246-Code Issues

**Question:** Please check this out in module IrrSub.f

!! cnv	none	conversion factor (mm/ha => m^3)
!! j	none	HRU number
!! k	none	counter
!! vmm	mm H2O	maximum amount of water to be applied
!! vmma	mm H2O	amount of water in source
!! vmmd	m^3 H2O	amount of water in deep aquifer
!! vmms	m^3 H2O	amount of water in shallow aquifer

```

!!  vxi          |mm H2O    |amount of water specified in
irrigation operation

!!  vol          |m^3 H2O    |volume of water to be applied in
irrigation

vol = vmm * cnv      (irrigation water volume)

" subtract irrigation from shallow or deep aquifer

If (ipot(j) <> j) Then
  vol = aird(j) * cnv
End If

Select Case (irrsc(j))

Case (3) " shallow aquifer source

For k = 1 To nhru
  If (hru_sub(k) = irrno(j)) Then
    cnv = 0
    vmma = 0
    cnv = hru_ha(k) * 10
    If (vmms > 0.01) Then vmma = vol * (shallst(k) *
cnv / vmms) ?*
    vmma = vmma / cnv
    shallst(k) = shallst(k) - vmma
    If (shallst(k) < 0) Then
      vmma = vmma + shallst(k)
      shallst(k) = 0
    End If
    shallirr(k) = shallirr(k) + vmma
  End If
  Next

Case (4) " deep aquifer source

For k = 1 To nhru
  If (hru_sub(k) = irrno(j)) Then
    cnv = 0
    vmma = 0
    cnv = hru_ha(k) * 10
    If (vmmd > 0.01) Then vmma = vol * (deepst(k) *
cnv / vmmd)

```

```

vmma = vmma / cnv
deepst(k) = deepst(k) - vmma
If (deepst(k) < 0) Then
    vmma = vmma + deepst(k)
    deepst(k) = 0
End If
deepirr(k) = deepirr(k) + vmma
End If
Next
End Select

```

As you can see, in the line ?\* vmma is the amount of water which is held in the source ( here, shallow aquifer ) after irrigation. But , (shallst(k) \* cnv / vmmms) = 1 . vmmms is source water storage before irrigation and vmma is storage after irrigation. So, We miss have such a code :vmma = shallst(k) - vol \* cnv

Am I right?

**Answer:** From my view, there is no problem with the code. The variable VMMA in the line you marked " ?\* " is the irrigation water applied instead of what you mention above. And SHALLST(k) is the amount of water in shallow aquifer after irrigation. Please double check.

## 247-Inequality in Source Code and ARCSWAT Access File

**Question:** This is a part of HRUALLO Module which counts number of agricultural operations :

```

case (1) !!plant operation
    plt = plt + 1
case (2) !! irrigation operation
    ap_i = ap_i + 1
case (3) !! fertilizer operation
    ap_f = ap_f + 1
case (4) !! pesticide operation
    ap_p = ap_p + 1
    if (mgt1i > 0) pstflg(mgt1i) = 1
case (5) !! harvest/kill operation
    hkll = hkll + 1
case (6) !! tillage operation
    ap_t = ap_t + 1
case (7) !! harvest only operation
    cut = cut + 1

```

```

case (8) !! kill operation
  kll = kll + 1
case (9) !! grazing operation
  grz = grz + 1
case (10) !! autoirr operation
  ap_ai = ap_ai + 1
case (11) !! autofert operation
  ap_af = ap_af + 1
case (12) !! sweep operation
  ap_s = ap_s + 1
case (13) !! impound/release operation
  ap_r = ap_r + 1
case (14) !! continuous fertilization
  ap_cf = ap_cf + 1
case (15) !! continuous cutting
  ap_cc = ap_cc + 1
case (16) !! continuous irrigation
  ap_ci = ap_ci + 1
end select

```

and Attached image is mgt type table in ARCSWAT access file. as you can see, we don't have operation number 16 and also, Other numbers are not similar with source code.

	OBJECTID	OP	OP1	OPNUM
	1	End of year rotation flag		0
	2	Plant/begin. growing season	Plant	1
	3	Irrigation operation	Irrigation	2
	4	Fertilizer application	Fertilizer	3
	5	Pesticide application	Pesticide	4
	6	Harvest and kill operation	Harvest & Kill	5
	7	Tillage operation	Tillage	6
	8	Harvest only operation	Harvest only	7
	9	Kill/end of growing season	Kill only	8
	10	Grazing operation	Grazing	9
	11	Auto irrigation initialization	Auto irrigation	10
	12	Auto fertilization initialization	Auto fertilizati	11
	13	Street sweeping operation	Street sweepir	12
	14	Release/impound	Release/impou	13
	15	Continuous Fertilizaton	Cont/Fert	14
*	(New)			

## **Answer:**

You better have another read of the FORTRAN file (I haven't looked at it), but I very much doubt the "case" numbers are equal to the management operations. More likely the case numbers are somewhere linked to the management operation number. Even though SWAP is an open source program I would not straight away assume that the code is wrong. You need to check the code very carefully and try and find out what it exactly is doing.

## **248-Soil Moisture Prediction Problem**

**Question :** I am using Arc SWAT at semiarid mountain basin of Idaho. Here precipitation is mainly snow and during winter (Dec-Mar) with Hot dry summers. I am getting good results in simulation of stream flow but the when I check the model predicted soil moisture I realized following issues

1. Model predicted soil moisture content was going to zero at the end of the dry summer. In this environment soil water storage reaches at its minimum (wilting point) towards the end of the summer and ET virtually ceases as no water remain available for plants but the soil moisture measurements shows that there is always a minimum moisture level in soil (logical also at wilting point). So my question is that why model is predicting zero soil water storage at the end of the season?
2. I have also compared the absolute change in observed and predicted soil water storage since the beginning of water year (by comparing the point measurements at multiple depths with the HRUs in which these points are located) and again results are OK and model was simulating seasonal pattern in soil water storage reasonably well.

So can someone tell me why soil moisture content is reaching zero and how I can fix it so that it wont go below a certain level (wilting point).

## **Answer:**

Wilting point soil moisture is concern to the plant uptake. Plant will not be able to extract water beyond that limit. But Soil moisture content will keep going down by the end of hot dry summer as evaporation continue from the soil surface (soil becomes more dry and dry) . Soil evaporation compensation factor (ESCO), responsible for extracting water from lower soil layers for satisfying evaporating demand for plant uptake.

## **249-Format observed data file (auto calibration)**

**Question:** I urgently need to see an example of how to format observed data file to enable me use the auto calibration process of Arc SWAT . How can I go about preparing this file. I have only just run the SWAT model.

**Answer:** Look at swat-unc-sens file available in arc swat group.

## **250-The global variable \_dicBasisn no longer exists**

**Question :** I'm starting to work with SWAT and after the installation when I open the interface an error come out "The global variable \_dicBasisn no longer exists". Have anyone idea about that? please if someone know how to fix it would be very helpful.

**Answer:**

I've too faced this problem and banged again and again mouse clicks to just shut off this dialog box later on, I've installed the setup again, but this time I've chosen my administrator account to install and let the user be only myself (i.e. administrator) now this dialog box is not coming

## **251-3 Years of Working on SWAT , 3 Years of Changing Input Files!**

**Question :** I have been working on SWAT model for 3 years. Most of my time has been spent on changing SWAT input files and getting "SWAT run not Successful." ! I think this model is in a format which needs a completely free-time user to change its files in a random way to ( maybe ) eventually run it! No one of SWAT developers responds to the users about many problems it has. I already used my data files and could run it. Now I cannot run it by the same data files! No one can suggest any reason. I cannot find any error in files. Many of my friends which are working on this Model have many problems although they are completely follow the manuals and instructions.

A model is beneficial when most of user time can be spent on Principles and Concepts, Not Procedures. Not input files. Not Interface Problems. We use models to improve our time efficiency. Not to spend more time to ONLY make input files without any time remained for result analysis.

### **Answer a:**

Unfortunately I do agree with you on this one. Indeed we cannot ask too much from a freely available (and open source) model, but the risk is also that spending too much time on silly input format issues, the user base will shrink (i) in privately owned businesses and/or (ii) in developing countries, where one cannot spend too much time on Interface Problems (as you rightly said) because sooner or later, time is money.

This is pity because I do like the Swat approach and general architecture.

### **Answer b:**

If you are unfamiliar with Arc SWAT or AVSWAT, I suggest you check those out. They are programs with easy to follow graphical user interfaces to help you write your input text files. These programs takes in your input GIS (elevation, hydrographic, land use etc), climate and management data and writes out all your input text files. You can then proceed to run SWAT within the Arc SWAT/AVSWAT graphical interface or just use swat2003.exe separately with just your text files. I am using AVSWAT and it's worked very well for me.

**Answer c:** What you describe in the last part of your message is exactly what I intended (but failed) to do, as described in the other thread I wished to initialize (consistency between executables and sources, 2003-2005) see also the snapshot '2003\_2005.PNG' in the file section of this forum. In our case we are using an hourly time step, but I don't think this is the problem, and there is a change of platform (Windows->Linux) between configuration (AVSWAT) and production (compiler for Linux executable, either Fortran or GFORTRAN). If I can find a solution to this very particular problem before the project I am working on is finished, I'll post it on this forum.

## **252-Consistency between executables and sources (2003,2005)**

**Question :** I found several clues of the following problem on this forum but no definitive answer, unless I missed something big. Due to operational

constraints (process automation), we are interested in running SWAT on a Linux platform. The configuration is done under Windows using the latest SIG interface (AVSWAT), but all the (ASCII) input files are then copied onto the Linux box (via an archive of the Txt In Out directory), taking care of end-of-line coding issues. The SWAT Fortran sources were downloaded from the SWAT website to the Linux box and compiled using either Ifort or Gfortran. The executable is then run under Linux with the configuration developed under Windows.

This process was okay with older versions of SWAT and/or its Arc View interface but seems to be broken now. Switching back to windows executables, I discovered the following:

- the Windows executable that can be downloaded from the SWAT website is a "swat2003.exe"; running this one gets me into trouble (2003\_2005.png), actually with the same kind of problem that occurs with my local Linux compilation; I was able to get rid of this particular one but then the output is not satisfactorily either (flow rate is 0....)
- the executable that is distributed with AVSWAT is a "swat2005.exe"; with this one I get successful termination of the computation and physically sound results, which is not surprising indeed since the configuration I am using was developed using AVSWAT itself (by some one else, I am no SWAT specialist, just in charge of process automation)

It really looks like the current "swat2005.exe" is ahead of the sources that can be downloaded from the website. Am I wrong?

If not, can we get the sources that correspond to the "swant2005.exe" release that's distributed along with AVSWAT?

If yes, is there a simple way around this problem? Has somebody succeeded in running an AVSWAT (=>swat2005) configuration on Linux?

### **Answer:**

There a big mistake in my post: the issue is raised when using Arc SWAT, and not AVSWAT, the configurations of which I was able to run on Linux provided a few adjustments in the Fortran sources regarding I/O formats.

Please replace "AVSWAT" by "Arc SWAT" everywhere in my proceeding post.

## **253-PCPSTD**

**Question :** I calculated PCPSTD program ( in user wgn.dbf ) by using 2 different programs written for SWAT. Both results are different than those from PCPSTATE program releases in SWAT website. So, My question is that : Do I have to include all zero values in PCPSTD calculation or not? Also, I don't have any measured values for Solar radiation. How can U calculate Monthly Solar Radiation in SWAT database? Is it required by the model?

**Answer:** Well, solar radiation can be calculated using Arc GIS 9.3 extensions by any DEM, but it gives some values which I could not rely. so please check it again if you'll use it

## **254-SWAT2005 manual**

**Question :** In the Arc SWAT interface user's guide I found many places advices to refer to "the Sensitivity, Auto-Calibration, uncertainty and model evaluation in SWAT2005 manual". I have seen in the SWAT website only SWAT2005 Theoretical Documentation and SWAT2005 Input/Output File Documentation. In these documents I couldn't find any thing about the mentioned issues.

Do you have any information about SWAT2005 manual?

**Answer:** Check the files in swat user Google group. It is posted there.

## **255-Flow In vs. Flow Out and Sed\_In vs. Sed\_Out**

**Question :** I have a small question about Flow In vs. Flow Out; Sed\_In vs. Sed\_Out in the out put.rch file. My understanding is:

(1) Flow In vs. Flow Out: Flow In for a particular reach is the sum of water yield from the local sub basin, water stored in this reach, and Flow Out from upper reach yesterday.

(2) Sed\_In vs. Sed\_Out: Sed\_In for a particular reach is the sum of sediment yield from the local sub basin, sediment stored in this reach, and Sed\_Out from upper reach yesterday.

**Answer:** However you need to add point sources also to flow in and sedin. Flow out and setout also includes any losses or gain such as channel seepage, evaporation, sediment deposition or scouring

## **256-Hourly rainfall data**

**Question :** If anyone of you have ever used HOURLY rainfall data? My question is after giving the Weather Station (ID, Name, XPR, YPR) location file (Dbase file) and giving the NAME as the name of the file containing GAUGE location data (ID,name,XPR,YPR, ELEVATION) (dbase file), I am not able to figure out where does SWAT asks for the file containing the values of rainfall? Where should I give the file containing hourly rainfall data.

**Answer:** Keep the hourly rainfall data file in the folder where you have placed GAUGE location data file. SWAT should automatically pick it up (if the NAME matches with filename of the hourly data).

## **257-Defining the reservoir in the model**

**Question :** I want to define a reservoir at the outlet of watershed .it needs a .dbf file for monthly outflow data namely "resmono.dbf". There is no example referring the format of this file and the explanations in the user manual is not clear as I followed the instruction but by entering the .dbf file to reservoir module but an error message appears: " attempt to edit read-only field Mores.". I have attached .dbf file input to the model and the snapshot of error.

**Answer:** I have not created such a file, so I do not have an example file to share with you. I do have a couple considerations to keep in mind, however. First, since you are putting the reservoir near the outflow, be sure you use the reservoir outflow when determining the outflow of the watershed rather than the reach outflow for the sub basin nearest the watershed outlet. SWAT models the reservoirs after the sub basin in which they are located such that outflow of the upstream sub basin (where reservoir is located) drains into the reservoir which in turn drains into inflow of downstream sub basin or out of the watershed. Second, if the reservoir is managed with inflow similar to outflow such that there is not much water level fluctuation, I would suggest using target release option rather than monthly outflow data because you are forcing the model to use a nonrealistic average condition for each month. Then you don't have to worry about the format of the input file.

## **258-Hourly Rainfall Data format in SWAT input file**

**Question :** I have followed the example case very well and was able to simulate that one successfully. But my requirement is that I have to use HOURLY precipitation data. Would anyone of you please tell me what is the format of the HOURLY precipitation (rainfall) data? I searched the I/O user document as well but could not find this format. Any help will be highly appreciated. I want to look into the hourly discharge in the streams in my watershed. Also is it possible to use other weather parameters as SIMULATED one as given by the interface?

**Answer:** Check ex inputs directory under arc swat/databases directory

## **259-Is this an error in SWAT source code?**

**Question :** Is there anyone notice that the description of phosphorus cycling in HRU in the "SWAT2005 Theoretical Documentation" is different to the equation in the source Fortran code?

In "SWAT2005 Theoretical Documentation" page 204, the movement of phosphorus between the solution and active mineral pools is defined in equation 3:2.3.2:

$$P(\text{sol} | \text{act},\text{ly}) = P(\text{Solution},\text{ly}) - \text{minP}(\text{act},\text{ly}) * (\text{pai}/(1-\text{pai}))$$

And When  $P(\text{sol} | \text{act},\text{ly})$  is positive, phosphorus is being transferred from solution to the active mineral pool. When  $P(\text{sol} | \text{act},\text{ly})$  is negative,  $0.1 * P(\text{sol} | \text{act},\text{ly})$  is being transferred from the active mineral pool to solution.

However, in SWAT2005 source code (see below), I found that in when  $P(\text{sol} | \text{act},\text{ly})$  is positive,  $0.1 * P(\text{sol} | \text{act},\text{ly})$  is being transferred from solution to the active mineral pools. I can not find that original Phosphorus cycling paper. But I feel that maybe the correct code is :if ( $\text{rmn1} < 0.$ )  $\text{rmn1} = \text{rmn1} * .1$

---

In "pminrl.f":

```
!! sol_actp(:, :)|kg P/ha    |amount of phosphorus stored in the
active mineral phosphorus pool
!! sol_slop(:, :)|kg P/ha    |amount of phosphorus stored in
solution
rmn1 = (sol_slop(l,j) - sol_actp(l,j)) * rto
if (rmn1 > 0.) rmn1 = rmn1 * .1
rmn1 = Min(rmn1, sol_slop(l,j))
```

$\text{sol\_solp}(l,j) = \text{sol\_solp}(l,j) - \text{rmn1}$   
 $\text{sol\_actp}(l,j) = \text{sol\_actp}(l,j) - \text{roc} + \text{rmn1}$

**Answer:** linye8 SWAT2000 code is consistent with the theoretical document: if ( $\text{rmn1} < 0.$ )  $\text{rmn1} = \text{rmn1} * .1$

From SWAT2005 code, it seems that you are right. Let's wait for others with deeper understanding on this point to clarify it.

## 260-What are FLOWOUT and FLOWIN parameters?

**Question :** In order to calculate flow values in downstream stations, we must add and route upstream sources all together. But in SWAT, we have 2 parameters in output.rch named FLOWIN and FLOWOUT. These parameters are unknown for me. Again, in the file fig. fig, we can add different sources ( reservoir , reaches, point sources,, ) toward the watershed outlet. In SWAT, we have to specify a column for calibration which is the column of FLOWOUT in output.rch. So, My question is this: Do I have to subtract upstream water flows ( generated from upstream sources ) from flow values of my monitoring stations ( measured flow values ) to calibrate flow in SWAT or I should use only measured values without any change or subtraction? I don't think FLOWOUT is equal to measured flow values.

**Answer:** FLOWOUT is the simulated flow at the outlet of each sub basin. And it should be equal to the measured flow values.

## 261-My ARCGIS 9.2 doesn't have .NET support while installation

**Question :** Why my arc GIS 9.2 doesn't have .NET support when I want to install it? Is it the reason I get the error " The Upgrade patch cannot be installed ." while installing Service Pack 2 or 4?

**Answer:** I don't know if it is the reason I get the error " The Upgrade patch cannot be installed ." while installing Service Pack 2 or 4, but if your Arc GIS installation folder doesn't have a Dot Net subfolder, you should probably uninstall Arc GIS first, then install the .Net Framework 2.0 from Microsoft website, and then re-install Arc GIS, before you can successfully install Arc Swat. (That's what I did)

## 262-Debugging

**Question :** I am in the process of learning swat and i am using it to model a watershed in Kenya.

When I was running the simulation, it crashed and gave me a ' simulation NOT completed 'error message. I have tried to use the debugging method explained in the tutorial and run the swat2003.exe in DOS command window. I got the following message but I cannot understand.

```
Microsoft Windows XP [Version 5.1.2600] (C) Copyright 1985-2001 Microsoft Corp.
```

```
C:\Documents and Settings\Workstation>C:\AVSWATX\hosea2\scenarios  
\default\txt into  
ut\swat2003
```

```
SWAT2003  
Soil & Water Assessment Tool  
UNIX Version  
Program reading from file. CIO . . . executing  
forrtl: severe (24): end-of-file during read, unit 1, file C:  
\Documents and Set  
ings\Work station\file. CIO  
Image      PC      Routine      Line      Source  
swat2003.exe 00636839 Unknown      Unknown Unknown  
swat2003.exe 00636697 Unknown      Unknown Unknown  
swat2003.exe 00635874 Unknown      Unknown Unknown  
swat2003.exe 00635CA9 Unknown      Unknown Unknown  
swat2003.exe 0062E069 Unknown      Unknown Unknown  
swat2003.exe 00460148 GETALLO    124 getallo.f  
swat2003.exe 004A935B MAIN       73 main.f  
swat2003.exe 00673CB9 Unknown      Unknown Unknown  
swat2003.exe 00656B69 Unknown      Unknown Unknown  
kernel32.dll 7C816D4F Unknown      Unknown Unknown
```

```
C:\Documents and Settings\Workstation>
```

### Answer:

In getallo.f on line 124 SWAT is trying to read the first line in file. CIO. If it encounters end-of-file, this means that file. CIO was empty or not even existing in your working directory in the first place (on line 123 it says open "(1,file="file. CIO")" - if this file had not been existing in your working directory, an empty file with that name will be created by the program). Most probably you didn't click "Set up SWAT run" on the "Run SWAT" dialog - this is the command that causes Arc SWAT to write the contents of

file. CIO. So you have to click that command, or copy file. CIO from another SWAT TxtInOut directory and edit it with a text editor if necessary.

By the way, if you are modeling a watershed in Kenya you have to pay careful attention to the way SWAT models plant growth and water use of plants. In SWAT2005, plants go dormant if a threshold day length is not exceeded. The threshold day length for tropical areas is equal to the minimum day length at the latitude of your weather stations. So, if any sub basin latitude in your .sub files is greater than the latitude of the weather station it is associated with (in the .wgn files), the threshold day length will be reached shortly before Dec. 21st (if your watershed is north of the equator) or June 21st (if it is south of the equator). Then plants will go dormant (which of course they shouldn't since you are in tropical climate), and stop using water, which will give you an unrealistic water balance! You can solve that problem by either slightly modifying the source code in read wgn.f (line 190) or by manually changing the latitude of your weather stations in the .wgn files.

Thank you for your assistance, I checked and found that i had clicked on 'Set up SWAT run'. The file. CIO was created and i opened it (in excel) and it had all the parameters. I tried changing the forecast period (in excel) and then run the model again but it still collapsed. I also tried to copy another file. CIO from another project and still didn't work. I must say that I am a new user learning the model and I am not so good at source code or interpretation of the error messages.

Is there another way out that I can try. Thank you for the advice on the modeling of plant growth and water use on SWAT in Kenya. I am using SWAT2003 with Arc View interface and have not interacted much with the Arc GIS interface of SWAT 2005 but I am planning to do that once I am through with SWAT2003.

## 263-SWAT reservoir modeling-nitrate routing

**Question :** I'm using SWAT to model a watershed with a reservoir at its outlet. The reservoir is uncontrolled with water withdrawal for consumptive use. One of the output variables I'm looking at is the NO<sub>3</sub> concentration in the reservoir.

I'm finding that the NO<sub>3</sub> concentration tends to shoot up to an unreasonable level whenever the volume in the reservoir goes down. I've compared the SWAT NO<sub>3</sub> concentration against my own estimates (that I found from discrediting the NO<sub>3</sub> mass balance using a backward difference scheme) and

found the SWAT results to be generally higher than my results. Further, my results don't show the above-mentioned shooting up tendency.

Following that, I checked the SWAT source code, and am now hypothesizing that there is a bug there. More specifically, if I'm reading the source code right: SWAT is failing to account for the NO<sub>3</sub> leaving the reservoir in the consumptive water withdrawal stream, thus causing an accumulation of NO<sub>3</sub> in the system (where there shouldn't be) that becomes especially obvious when the reservoir volume is on a downtrend.

I'm wondering if anyone has had a similar experience? Or if anyone can confirm my hypothesis of the bug in the SWAT NO<sub>3</sub> reservoir mass balance?

### **Answer:**

I have used SWAT with impoundments as well (I attached my related paper under "Files" on this site as "Bosch.2008"), so I have similarly looked into SWAT nutrient processing in reservoirs and ponds with some detail. I have not had to deal with consumptive water use, so I have not specifically looked into the code concerning this. But I think your assessment of no N loss through this water withdrawal seems likely given the discussion of N balance in the manuals. If you have the need for very detailed modeling of nutrient dynamics in a reservoir, you may want to consider interfacing the WASP model with SWAT for your application as I know some have had success doing this. There are a few things you might try to get around this limitation of SWAT, however. You mentioned that the reservoir is uncontrolled which I assume means that inflow is typically equal to outflow. If this is the case there should not be a large fluctuation in volume contrary to what you described in your simulation. If you can dampen this fluctuation, then your unrealistic high [NO<sub>3</sub>] should be fixed as well. I think using the Targeted Volume outflow estimation approach is best for this. Along with this be sure to make the NDTARG (number of days to get back to target outflow) is only a day or two and adjust the emergency spillway volume and surface area to only 5% higher the principle measurements. This will force the volume to stay relatively constant. If the extreme volume fluctuation you describe is realistic, then you might want to try altering the N settling rates at different times of the year. You can set the 2 settling periods according to the volume change. For example, if the reservoir volume is typically very low during the summer months and thus the model simulates very high [NO<sub>3</sub>], then make those months one of the settling periods and increase the settling rate for that time period.

## **264-Field Scale Modeling by a Large-Scale Model?**

**Question :** SWAT is a large-scale, hydrological watershed-scale model. In most countries, these are no as accurate land-use maps to assess a watershed in field-scale. So, How can we expect SWAT to assess field scale issues such as the effect of crop rotation or management practices on , for example, water quality? If we can not define exact watershed situation specially in terms of land cover and crop rotation and field areas, How can we expect such a thing from SWAT?

**Answer:** Forgive me if my answer seems over-simplistic. Like any model, your results are only as good as the data you provide.

I suppose for a field-scale model, you will need input data that are at the field scale... as opposed to if your system were at the watershed scale, then you will be looking at input data that are at the watershed scale.

Supposing that you do have field-scale data, then my feeling is that SWAT should apply just as well since its equations/theory seem general enough that they apply whether at the field or watershed scale (can someone confirm or disprove this??).

## **265-2 years of crop rotation**

**Question :** If I have a crop grown between 6th month ( in 1st year ) until 3rd month ( in 2nd year ), Is it necessary to define 2 years in MGT file? Is it correct if I define the first crop since 6th month until 3rd month without defining 2 years in MGT file? Can SWAT realize that these crops have to be grown after each other?

**Answer:** I would try both ideas and see the .std file. Ideally speaking if a plant has not started growing then it cannot be harvested (for the first year of simulation) unless if you had initial plant growth.  
Please let the group know of your results.

## **266-Questions on water balance and routing in SWAT**

### **Question :**

As shown in the documentations, SWAT calculates flows using total sub basin area and precipitation. On other hand, When calculating the water volumes in impoundment (wetlands, ponds and lakes), SWAT again uses impoundment areas to add the volume of precipitation falling on the water body into its water balance. Because impoundment areas have already been

included in HUR/sub basin areas, I am wonder if SWAT double accounts the precipitations falling on the water bodies thus over-estimates the flows? In addition, I know SWAT routes flows from HURs to channels first and then lakes before flowing to next sub basins, but how it routes flow if there are wetlands, ponds and lakes in a sub basin?

### **Answer:**

Good question -- you could get an idea by vastly increasing the areas of your reservoirs and seeing how this affects your water yields. But it would be good to get a definitive answer. If you get it figured out, please post your findings.

> In addition, I know SWAT routes flows from HURs to channels first and  
> then lakes before flowing to next sub basins, but how it routes flow if  
> there are wetlands, ponds and lakes in a sub basin?

Flow (surface runoff, lateral flow, and groundwater) from a sub basin gets directed first to the Pond and Wetland in that sub basin, BEFORE going to the channel. If the fractional area of a sub basin drainage ascribed to its Pond is 0.17, then 17% of all flow (and transported sediment and nutrients) goes directly to the Pond. Then, sediment and phosphorus settle out according to parameters you set (NSED and PSETLRP -- if they're still called that); some water may evaporate or infiltrate. The remainder, if pond volume is greater than the principal volume, spills into the channel according to the Pond outflow parameters you've set.

In-channel lakes -- all considered as "reservoirs" in SWAT -- are the opposite: water goes into the channel reach first, and then into the reservoir, considered to be at the "bottom end" of the reach.

## **267-Tree growth**

### **Question :**

I have a number of linking queries regarding tree growth in SWAT. I have attempted this a number of times but are finding trees are not growing and biomass and LAI are declining annually in a step pattern.

Feb this year Willem Vervoort asked Nancy and or the SWAT team to put the sequence of code needed for plant growth, ie which sub routines are called and in what order - is this somewhere on the users site? Please let me know where this is and how I can get this. Also I have just re-read the SWAT manual for the umpteenth time and it says once the IDC of 7 is chosen

(crop.dat) that the model partitions new growth between leaf (20%) and woody (80%) growth. Can you please point me to the equation/sub-routine this is done? Also when stating initial biomass in the management files, is this total biomass or leaf biomass? If the initial biomass represents total biomass how can the model differentiate between leaf and woody biomass in this initial total estimate?

The reason I ask is because of my earlier question regarding P and N up-take and needs for plant growth. At the moment I am finding that all trees in my model are P stressed even though I have put maximum amounts of continuous fertilizer. I suspect that because N and P needs are calculated on the proportion of biomass these nutrient needs are too high. This is because the model is assuming that all the biomass requires the same amount of N and P but in reality only the leaves and new growth have these high levels. Does anyone have any suggestions? Just to explain that I consider daily increases in biomass and LAI which is located in the hru output for each hru.

These daily biomass amounts are in kg/ha and not t/ha as the header file suggests. My final question for those struggling with tree growth in SWAT is regarding PHU to maturity. Should I calculate the PHU required for a tree to grow from seed to maturity even if this takes 100 years for example? Or are my PHU in the General Management file the sum of heat units for the year of tree growth and the fraction of current tree age to mature tree age take this into account?

Any insight into biomass accumulation and growth of almost mature trees would help me.

### **Answer:**

I am not sure if this helps. But apparently I did receive a flowchart of SWAT at some point. I will also load this onto the SWAT user site.

## **268-Use to Sub watersheds and streams extracted by some other software**

**Question :**I have just started to use SWAT and have some difficulties. I want to use to Sub watersheds and streams extracted by some other software. Initially I used the same DEM for DEM set up and in place of allowing the SWAT to delineate the sub watershed and streams, I want to use user-defined option for the streams and sub watersheds. I have shape files of the streams and sub watersheds developed by some other software. If I add them in Arc GIS, they match well over the DEM which was used in SWAT. But when I used user defined option in SWAT and browsed to the same shape

files, there is error in SWAT saying the GRIDCODE should be integer type. If I add these shape files in Arc GIS and open their attribute table, then all the values in the column GRIDCODE are integers. What can be the problem and its probable solution.

**Answer:** The data format for user defined watershed and streams are very strict. Please read the documentation and posting on the Arc SWAT user group by others. Also there is an example user defined watersheds and streams under exinputs directory of the arc swat\databases installation location.

## 269-SWAT2005.exe vs. SWAT2003.exe

**Question :** What are the differences between the swat2005.exe and the swat2003.exe executables? Why is swat2003.exe distributed under SWAT2005 Model downloads?

swat2003.exe -6/15/2006 time stamp -3089 kb file size in Windows Explorer  
-available at [http://www.brc.tamus.edu/swat/soft\\_model\\_2005soft.html](http://www.brc.tamus.edu/swat/soft_model_2005soft.html)  
through either the HTTP or FTP executable

swat2005.exe -6/4/2008 time stamp -3221 kb file size in Windows Explorer  
-available at <http://www.brc.tamus.edu/swat/arcswat.html> through the Arc SWAT 2.1.1 Beta release (Arc GIS 9.2 Install (65 MB), released 8/18/2008)

**Answer:** The arc swat 2.1 release notes say "the following parameter range tables in the SWAT2005.mdb database have been updated to include new SWAT 2005 model parameters:

- Bsnrng
- Hrurng
- Mgtoprng
- Rterng"

I guess those don't exist in SWAT2003?

But Srini says they are the same:  
[http://groups.google.com.au/group/swatuser/browse\\_thread/thread/acc2f...](http://groups.google.com.au/group/swatuser/browse_thread/thread/acc2f...)

So the differences are mainly between 2000 and 2005  
<http://www.brc.tamus.edu/swat/downloads/doc/swat2005/differences2000t...>

## **270-Error handling in SWAT!**

### **Question :**

Please refer the section " Stream definition" and then Pre-defined Streams and Watersheds.

I have watershed/sub watershed delineated by some other software and I wanted to use them in the SWAT simulation in place of watershed delineated by SWAT itself. When I imported the shape files its says the following error " Invalid dataset. User watershed data field "GRIDCODE" must be of 'interger' type" Would anyone please explain why this error is there and what can be the probable solution..

### **Answer:**

Refer to page 14-15 on Arc SWAT User Guide. It explains the required attributes for user defined watersheds and streams. You have to prepare the watershed attribute tables exactly the same way.

## **271-Error Number -2147467261**

### **Question :**

At the end of watershed delineation,

the below messages be appear. Would you please give me to sole this error

" Error Number: -2147467251 "

" Error message: Attempted to read or write protected memory. That other memory is corrupt."

### **Answer:**

Check whether the access databases created by Arc SWAT did not exceed 2GB - if it did, compress'em using Arc Catalog.

## **272-Short term simulation**

### **Question :**

Has anyone used SWAT for short term simulation, such as close to event based simulation (just a few days).

**Answer:**

I haven't tried exactly that, but have looked at things like that. For a very short simulation you can probably adjust Swat's many parameters to get an almost perfect fit. But then if you leave the parameters at those same values, for some other event, the result will probably not be nearly as good.

## 273-Warming up SWAT

**Question :**

I am not sure, I probably should have a look at SWAT again, been busy with other research for the last year or so. Check what NSKIP exactly does, do you just skip the output? Then it would be sufficient as a warm-up. It might mean the model does not need much of a warm-up.

**Answer a:**

Right -- NSKIP refers to the warm-up period at the beginning of the run. The model is running for the full time you specify in the model-set-up dialog box, but the output is summarized only for the years after NSKIP. A few years (maybe 1; 2 is safer; I tend to use 5) is probably sufficient to get the system hydrology to warm-up. I don't know how the scale of your watershed and climate affect this -- perhaps larger and drier watersheds need longer warm-up periods. (My experience is with a 700 km<sup>2</sup> watershed, with annual rainfall about 800mm.) For water quality, be aware that some model parameters (I'm thinking of soil phosphorus, for example) could take considerably longer to equilibrate -- perhaps decades. In this case, a few years of model "warm-up" are technically not sufficient, not at least for your model to reach a quasi-steady state condition (a "stationary" condition without directional change). However, you may never notice the effect if the parameter changes so slowly that the changes in output are small over the time period of the model run. I'd think this would be a publishable idea and not too time-consuming to explore, if any of you out there want to tackle it. (OK, a small publication for a limited audience -- but I'd like to see it done.)

**Answer b:**

Well -- this is a good question, and makes me realize that I've just made some assumptions that I haven't fully checked out. (1) For hydrology, I think it depends on where SWAT initializes the various hydrologic pools. Do soil moisture and shallow aquifer storage start out at zero, or some estimated value? I've never really

looked. As a user, I haven't explicitly set such values -- though perhaps there's an option I've missed. But unless you can set all these values to known amounts -- or SWAT does a very good job of estimating initial values based on soil properties (for example) -- then I'd think a warm-up period would be useful, if not necessary. In any case, hydrologic warm-up doesn't take much time -- a year or two may be plenty. Again, this may vary with watershed size, land cover, and annual precipitation. And, if you've only got a few years of monitoring data, couldn't you still run the data for a few years in advance of the monitoring period? Even if you don't have climate data for that warm-up period, you could just duplicate a few years of climate data (as representative values) and apply it to the warm-up period --- you're not going to use the output from that period anyway. It'd be useful to pick a single year of climate data and duplicate it for 10-20 years; then run the model and see when (how many years it takes) annual runoff reached a pseudo-steady state. (2) Soil chemistry is perhaps a slightly different animal. If you know your soil chemistry and nutrient application rates, then I think you're quite right -- you don't really need a warm up period. I tend to think in terms of long-term average results under pseudo-steady state conditions -- but in many (if not most) cases the soil chemistry may not really be in equilibrium with nutrient applications and removal. Soils may still be accumulating phosphorus, for example. A warm-up period could, in theory, alter your conclusions -- i.e., where your soil ends up with regard to nutrient content might depend on the length of warm-up period you choose. This is a problem in theory -- it would be interesting to see how big an effect this could have.

## 274-Using R to write SWAT input

### Question :

It actually is much simpler than I thought. Attached is a little script that rewrites the HRU files, let me know if this causes any problems.

The pseudo code is:

```
set directory read in file names from directory that end in ".hru"
```

```
cycle through loop, open each file and read the text rewrite the lines you  
want write the file back out close file
```

I think this can be done more elegantly using "apply" than with a for loop and that will make it faster. I will rewrite and post that too.

### **Answer:**

here is another version and a file to rewrite the hru files using supply. I did not notice any change in speed directly, but have not tested that thoroughly. Note that I read in from the "txtinout" dir and read out to the "Pest" dir. That way I don't overwrite my original files. I had to create the Pest dir first manually (Only the dir not the files). I have about 488 hru's so this works quite rapidly.

I use tinn-R for scripting, but you can use others.  
(<http://www.sciviews.org/Tinn-R/>  
<http://sourceforge.net/projects/tinn-r>)

Attached is also a file to plot observed vs predicted from the output of the autocalibration (which you can also run from DOS), you can write a similar file to process the Pest output.

## **275-Running SWAT without its interface!**

### **Question :**

Have anyone of you ever tried to run SWAT without its interface. As the SWAT fortran code is available on this website, is it possible to run the SWAT without its interface? I included all the SWAT files in one new project and compiled. It compiled with no errors but at the time of execution , there were some 80 errors. If anyone has ever run SWAT without its interface, please inform me what could be a probable problem.

### **Answer:**

running SWAT without the interface works fine. I have used R ([www.r-project.org](http://www.r-project.org)) for pre and post processing of data files for running different scenarios, but you could use any other math command line structure. I have only used the AVSWAT interface to set up the watershed as I haven't yet bothered working out how to write the fig file, but I am sure that can be done as well. You can run SWAT2005.exe

just from the dos command prompt, or via another command structure. That way you can also link SWAT to PEST if that is what you want to do. The main trick is to pay very good attention to the manual in terms of whether the input files are FORTRAN formatted or just FREE.

## **276-HRUs Map**

### **Question :**

I am trying to get a map of the HRUs. Does any of the SWAT version have this tool?

### **Answer:**

Yes. In arc swat you can get hru maps

## **277-Data structure of SWAT**

### **Question :**

Would anyone please let me know if the data structure used in SWAT is a part of interface or the code which is available on the website? I am particularly interested in the data structure pertaining to the connection of sub-basins and the river streams.

I mean which number sub-basin is connected to which number stream node. How to display those files which show the connection between the sub-basins and the stream nodes.

### **Answer a:**

The heart of any SWAT model is the swat2005 engine, which is the Fortran program that reads text files as input and writes text files as output. These files are all in the TXTINOUT folder, if you've got a working example to look at. Technically you don't need the interface to create the input text files -- but getting these text files in just the correct format can be difficult without the GIS interface. I strongly recommend the use of the interface; it has had years of usage and revision to iron out most of the wrinkles. Furthermore, it has moved beyond just a way to get the input data files written (which is a critical function), and it is now a very important analysis tool. So if at all possible, I would use the Arc GIS interface if you can afford it. Otherwise, there is an open-source GIS software version available, and I also like to see open-source software used and supported.

Or perhaps you're just interested in manipulating some of the input files for other purposes. The structure of these files should be given in the SWAT Input-Output manual. Or, if you know someone with SWAT already installed and running, just get them to send you their TXTINOUT folder so you can look at the input files directly. Running one of the tutorial examples should give you everything you'd need.

### **Answer b:**

Here is the link to MWSWAT:

<http://www.waterbase.org/>

# **THE END**