

Figure 1



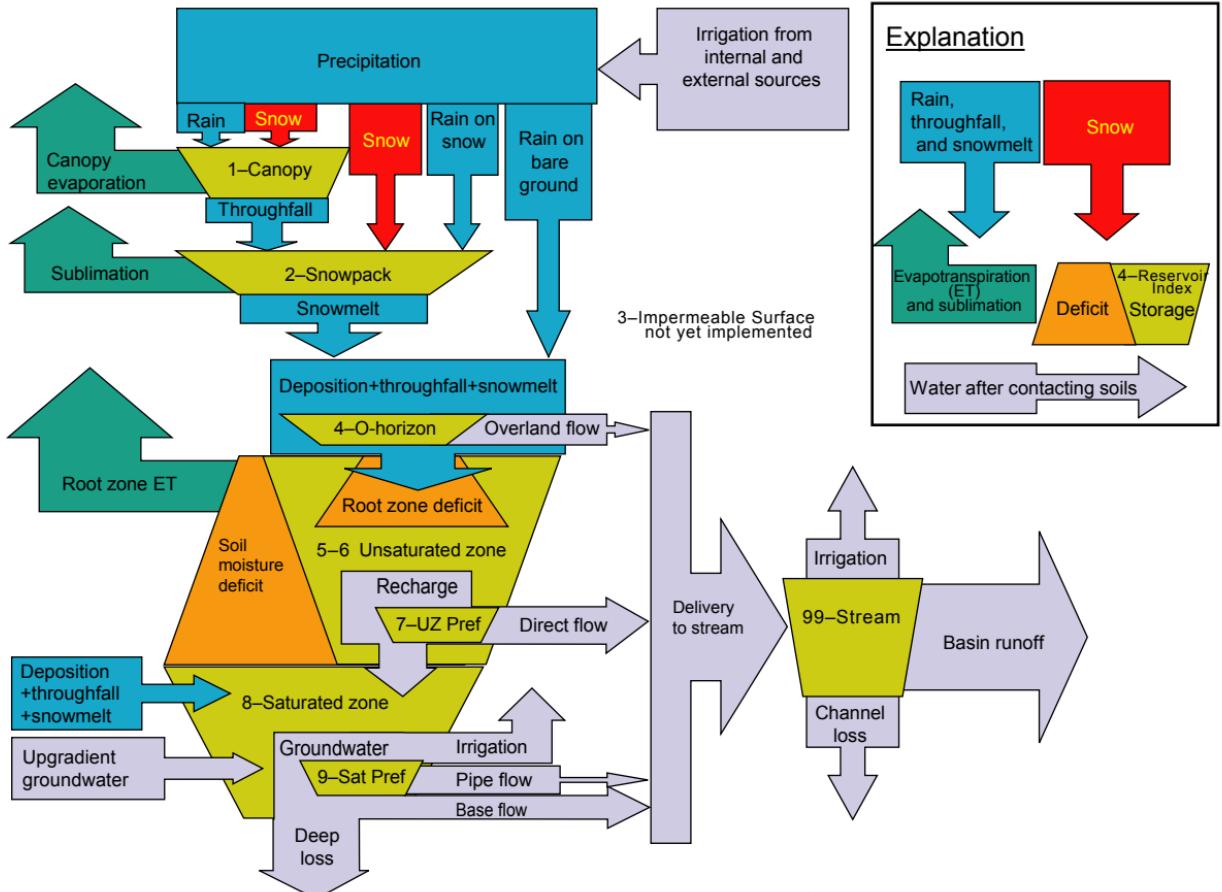


Figure 3

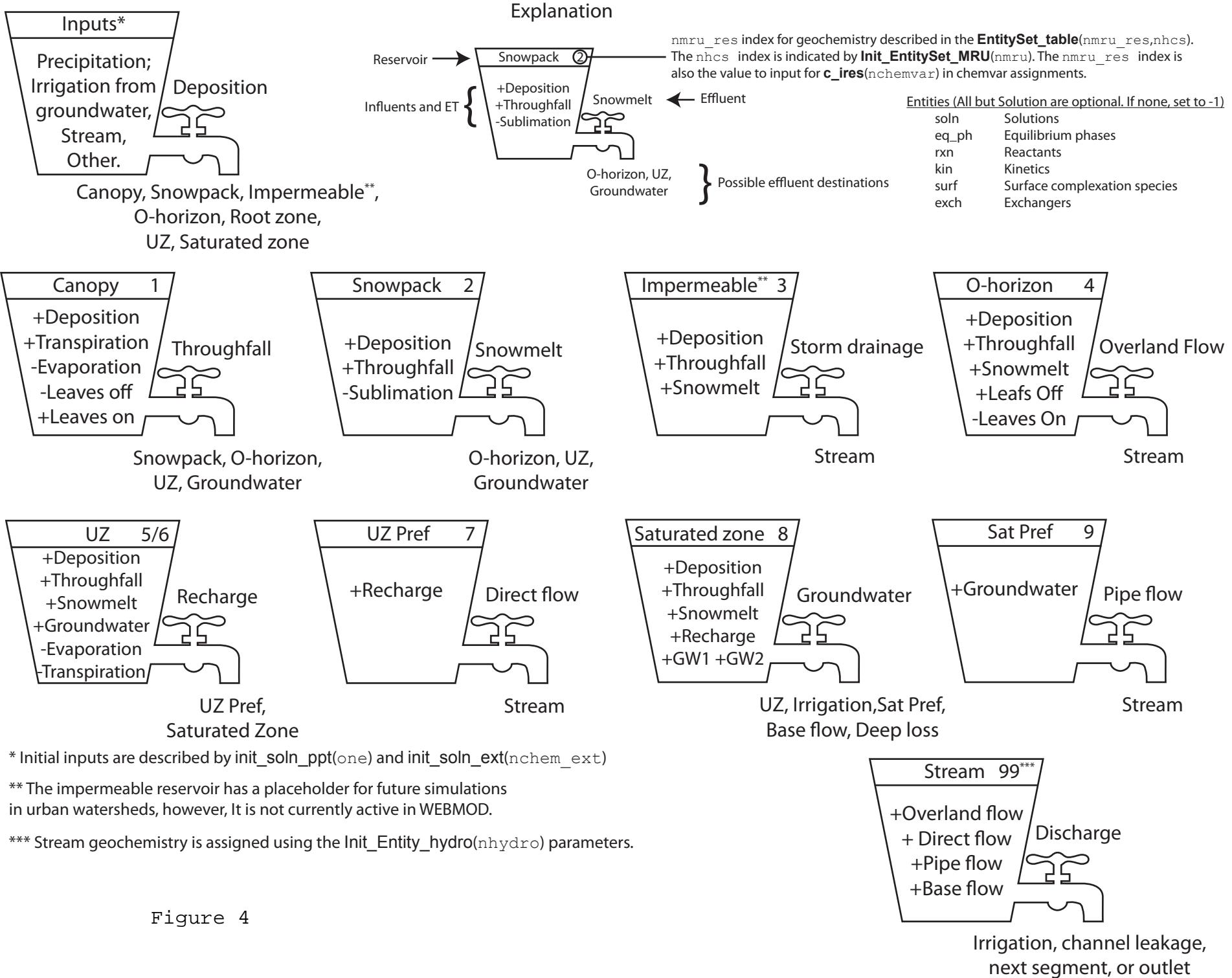


Figure 5

```
WEBMOD_1.0\  
  bin\  
    webmod.exe  
  doc\  
    WEBMOD_Manual.pdf  
  lib\  
    java libraries needed to run the MMS tool and paramtool.  
  projects\  
    Andrews\  
      Andrews.xlsx  
      webmod.bat  
      webmod_paramtool.bat  
      webmod_gui.bat  
      webmod_print.bat  
    Control\  
      webmod.control  
      webmod.control.mod_name  
      webmod.control.var_name  
      webmod.control.par_name  
      webmod.control.param  
    Input\  
      webmod.params  
      webmod.hydro.dat  
      webmod.chem.dat  
      webmod.pqi  
      phreeq_lut  
      phreeqc_web_lite.dat  
    Output\  
      webmod.topout  
      webmod.hydro.out  
      webmod.chem.out  
      webmod.statvar  
DR2\*  
AndrewsTutorial\**
```

* The DR2 project directory has the same structure as the Andrews Creek project directory with the exception that a webmod.chemdat file does not exist because source waters are assigned constant compositions, and the Excel workbook used to organize the model data is named DR2.xlsx.

** The AndrewsTutorial project directory has the same structure as the Andrews Creek project directory

Andrews/Icy/Loch with Bear Lake precip

```

precip 2
tsta_min_c 1
tsta_max_c 1
runoff 3
solrad 1
relhum 1
#####

```

The first line is for comments.

Figure 6

Data begins on line after pound signs. Any text after
the first four pound signs is ignored and can be used
to label the fields.

					ppt_BL	ppt_LV	tsta_min_c	tsta_max_c	Q_and	Q_icy	Q_loch	solrad	relhum	
1983	10	1	0	0	0	0	0.03	3.7	9.2	0.001	0.001	2.52	314.4	0.52
1983	10	2	0	0	0	0.1	0	0.0	7.3	0.001	0.001	2.52	303.3	0.46
1983	10	3	0	0	0	0.2	0.16	-3.0	0.6	0.001	0.001	2.52	269.2	0.66
1983	10	4	0	0	0	0	0.3	-3.6	5.0	0.001	0.001	2.52	301.1	0.58
1983	10	5	0	0	0	0	0	1.8	9.8	0.001	0.001	2.52	300.3	0.48
1983	10	6	0	0	0	0	0	-1.1	11.4	0.001	0.001	2.52	314.4	0.53
1983	10	7	0	0	0	0	0	4.5	11.4	0.001	0.001	2.52	191.8	0.41
1983	10	8	0	0	0	0	0	-1.2	10.3	0.001	0.001	2.52	229.4	0.74
1983	10	9	0	0	0	0.2	0.15	1.8	7.5	0.001	0.001	2.52	292.6	0.60
1983	10	10	0	0	0	0.3	0.63	0.0	5.7	0.001	0.001	2.52	225.5	0.65
.														
.														
.														
.														
2012	9	18	0	0	0	0	0	3.1	10.5	1.443	0.001	1.7	364.9	0.35
2012	9	19	0	0	0	0	0	4.1	11.5	1.343	0.001	1.7	390.2	0.32
2012	9	20	0	0	0	0	0	4.8	16.0	1.272	0.001	1.7	363.0	0.31
2012	9	21	0	0	0	0	0	5.8	17.0	1.226	0.001	1.7	361.3	0.36
2012	9	22	0	0	0	0	0	6.8	18.0	1.204	0.001	1.7	364.1	0.51
2012	9	23	0	0	0	0	0	4.0	15.9	1.192	0.001	1.7	308.6	0.35
2012	9	24	0	0	0	0	0	3.8	11.2	1.177	0.001	1.7	145.6	0.64
2012	9	25	0	0	0	1.3	1.69	0.1	7.8	1.197	0.001	1.7	98.2	0.81
2012	9	26	0	0	0	0.3	0.39	0.0	6.4	1.277	0.001	1.7	211.8	0.96
2012	9	27	0	0	0	0	0	-0.8	7.3	1.845	0.001	1.7	229.3	0.87
2012	9	28	0	0	0	0	0	-0.3	11.4	2.004	0.001	1.7	326.1	0.74
2012	9	29	0	0	0	0	0	0.7	12.4	1.702	0.001	1.7	291.0	0.54
2012	9	30	0	0	0	0	0	1.7	13.4	1.489	0.001	1.7	255.0	0.51

Andrews Creek
Version: 1.7
** Dimensions **

nobs
3

nrain
2

ntemp
1

nsolute
11
Ca
@Calcium
Mg
@Magnesium
Na
@Sodium
K
@Potassium
Amm
@Ammonia
Alkalinity
@ Alkalinity
Cl
@Chloride
S
@Sulfate
N(5)
@Nitrate
Si
@Silica
[18O]
@ Oxygen Isotope

•

nevap
0
** Parameters **

mru_elev
1
nmru

First two lines are comments
Dimension definitions follow the line ** Dimensions **. The definitions begin after 4 pound signs '####' and continue until the next set of pound signs or the beginning of the ** Parameters ** section

A dimension definition consists of
Delimiter
dimension (i.e. nobs)
size (i.e. 3 is the number of runoff observations in the data file)
name for each dimension (optional except for nsolute).
@full description (optional in all cases)

The solutes of interest in WEBMOD simulations of aqueous chemistry are named and indexed here. The names must match those in the phreeq_web_lite.dat file and the phreeq_lut file. The full names following the @ symbol are optional.

The ** Parameters ** line marks the end of the section defining the dimensions and the beginning of the section defining the parameters. All dimension sizes in the Parameters section must equal those defined in the Dimensions section.

Figure 7

```

#####
nevap
0
** Parameters **
#####
mru_elev
1
nmru
Name Width ! the Width is a vestige of X-windows table formats and is ignored.
Number of dimensions ! 1 or 2 dimensional parameters are allowed.
Name of dimension(s) ! two names if 2-dimensional
10 Size of Parameter array ! product if 2-dimensional parameter
2 Type of value ! 1, Integer; 2, Real; 3, Double
3479.0 Value(1)
3318.0 Value(2) ! mru_elev indicates the mean altitude of the MRU in meters.
3545.0
3437.0
3645.0
3667.0
3348.0
3429.0
3683.0
3549.0
#####
st Example for a 2-dimensional parameter st(nac,nmru), that defines the transformed topographic
2 index,  $\sqrt{a}/\tan\beta$ , thresholds for each MRU. Thresholds are ordered from wettest to driest.
nac The first dimension, nac, equals 11
nmru The second dimension, nmru, equals 10
110 The product, nac times nmru, equals 110
2 type = 2(Real); followed by 110 real type values incrementing the first dimension then the second.
7604.02 ac(1,1) = 7604.02
82.49 ac(2,1) = 82.49
45.99 ac(3,1) = 45.99
31.12 ac(4,1) = 31.12
27.43 ac(5,1) = 27.43
23.74 ac(6,1) = 23.74
20.02 ac(7,1) = 22.02
16.29 ac(8,1) = 16.29
12.59 ac(9,1) = 12.59
8.89 ac(10,1) = 8.89
1.47 ac(11,1) = 1.47
7600.64 ac(1,2) = 7600.64
90.81 ac(2,2) = 90.81

```

Figure 8

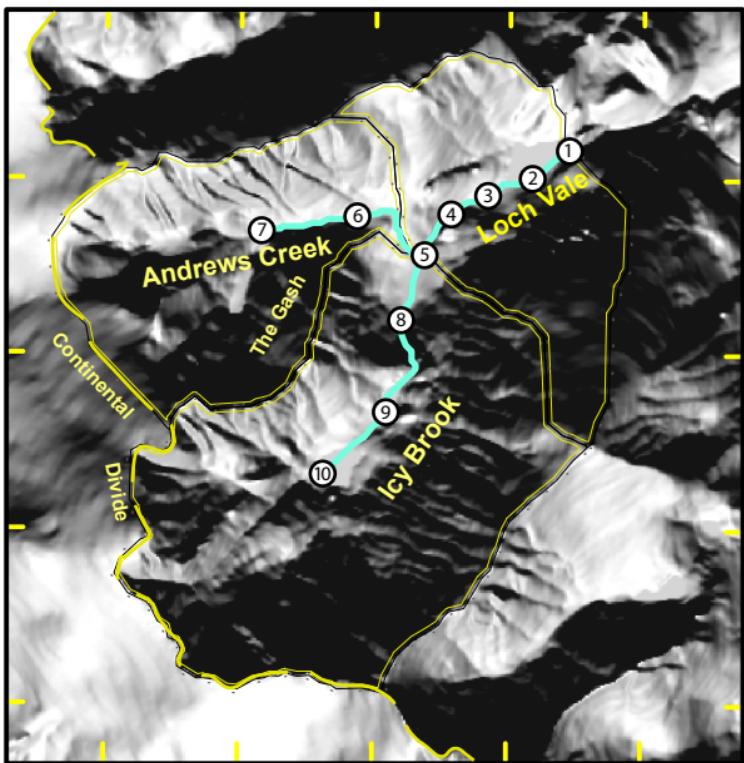
105°41'00"W 105°40'30"W 105°40'00"W 105°39'30"W 105°39'00"W

40°17'30"N

40°17'00"N

40°16'30"N

40°16'00"N



Base from U.S. Geological Survey, 2011
Universal Transverse Mercator Zone 13N
North American Datum 1983

EXPLANATION

Channel routing point

Perennial stream - flow accumulation greater than 1 km²



Figure 9

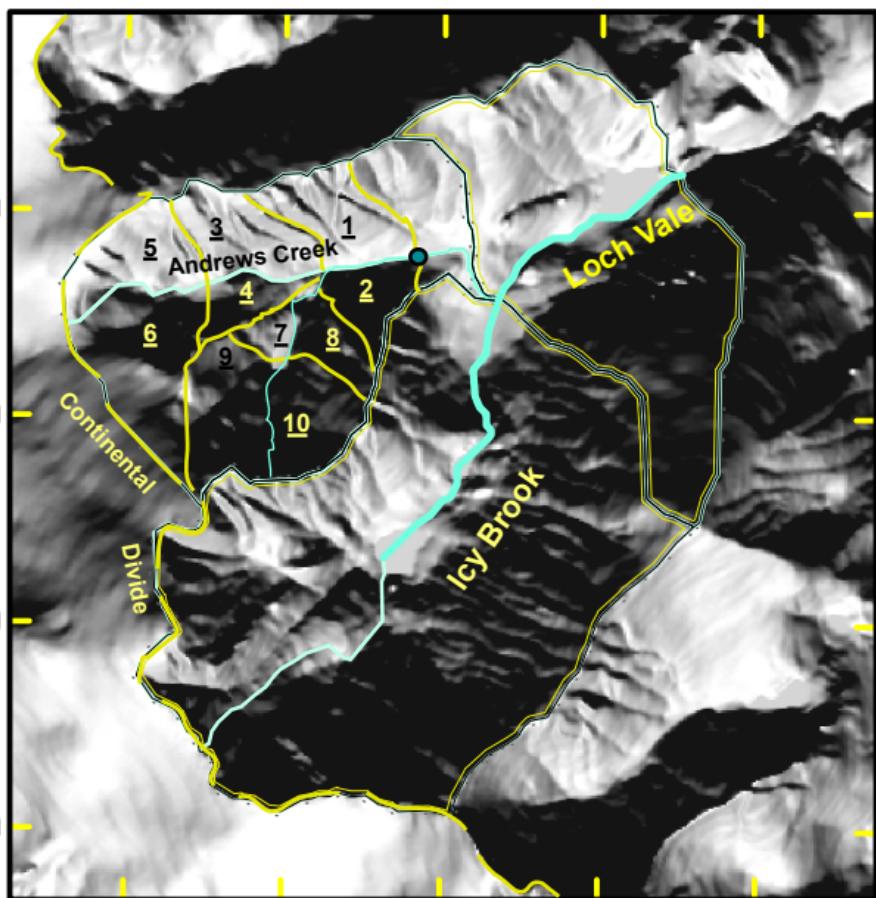
105°41'00"W 105°40'30"W 105°40'00"W 105°39'30"W 105°39'00"W

40°17'30"N

40°17'00"N

40°16'30"N

40°16'00"N



Base from U.S. Geological Survey, 2011
Universal Transverse Mercator Zone 13N
North American Datum 1983

0

0.5

1.0

KILOMETER
0.5 MILE

Figure 10

105°41'00"W 105°40'30"W 105°40'00"W 105°39'30"W 105°39'00"W

40°17'30"N

40°17'00"N

40°16'30"N

40°16'00"N

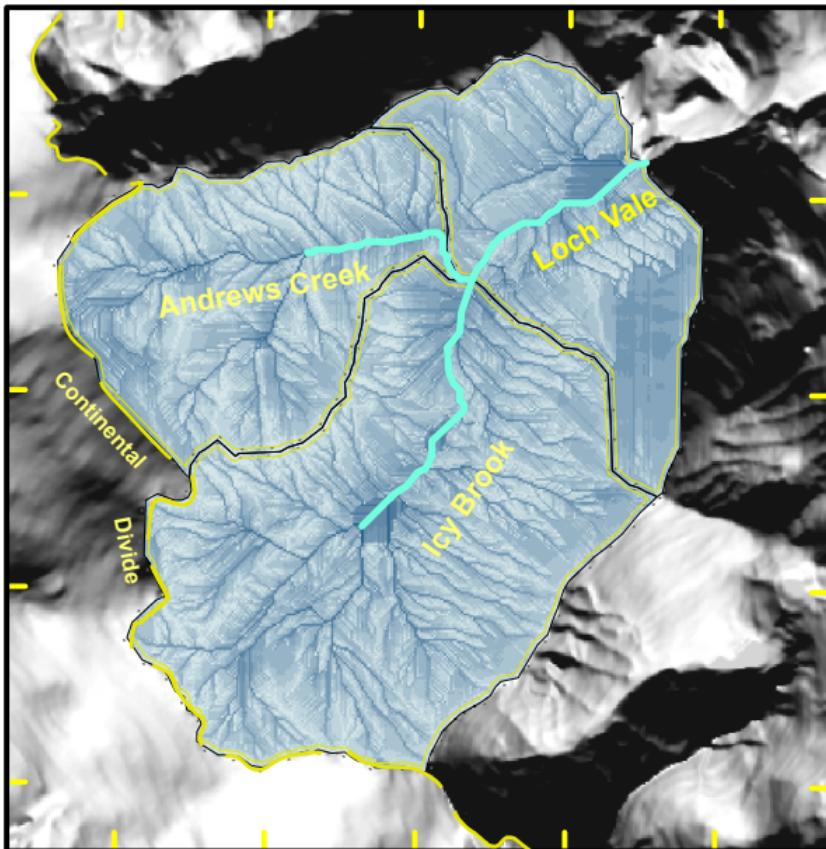


Figure 11

Base from U.S. Geological Survey, 2011
Universal Transverse Mercator Zone 13N
North American Datum 1983

0 0.5 1.0 KILOMETER
0 0.5 MILE

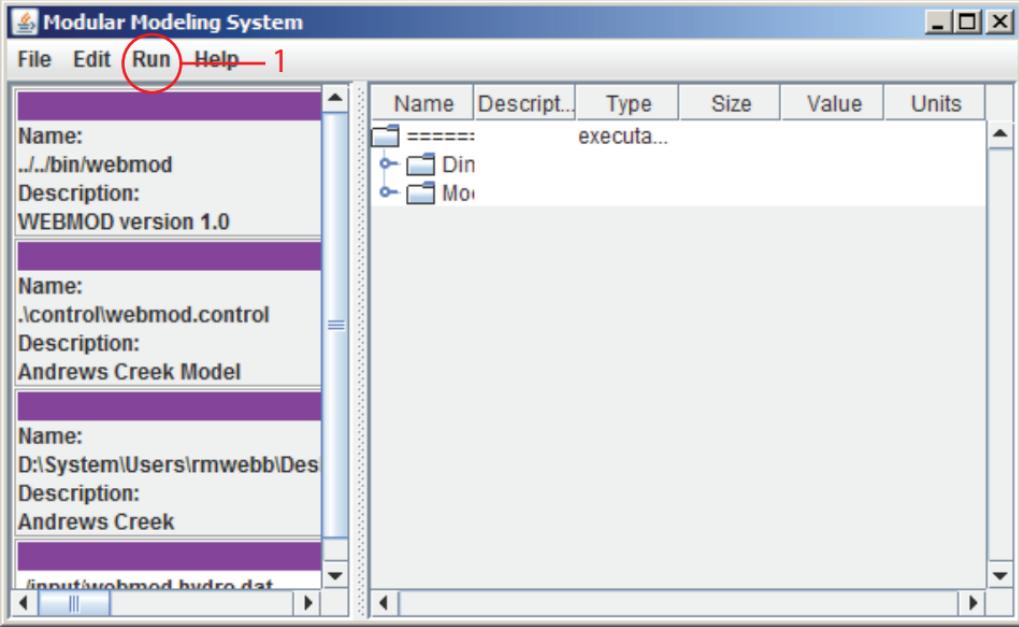
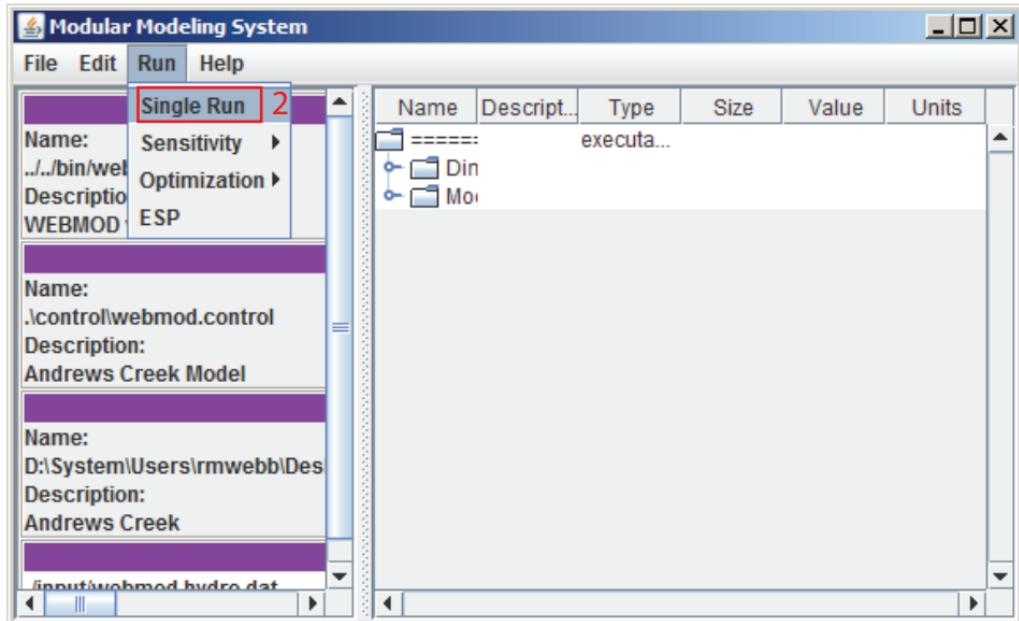


Figure 12a



MMS Run Control - Single Run

Time Info				
	Model Start	Model End	Data Start	Data End
Second	0	0	0	0
Minute	0	0	0	0
Hour	0	0	0	0
Day	1	30	1	30
Month	10	9	10	9
Year	1983	2012	1983	2012

Init Timestep: 100000000000e+01

Graphing Program

How Many Runtime Graphs?

Edit Options for Graph:

File Info

Model Output: /it/webmod.hydro.out
 Variable Init: /input/webmod.var_in
 Variable Save: /it/webmod.var_save
 Statistics: /it/webmod.statistics
 Stat Var: /put/webmod.statvar
 GIS Output: /put/webmod.anisout

Message

Model Finished

Start

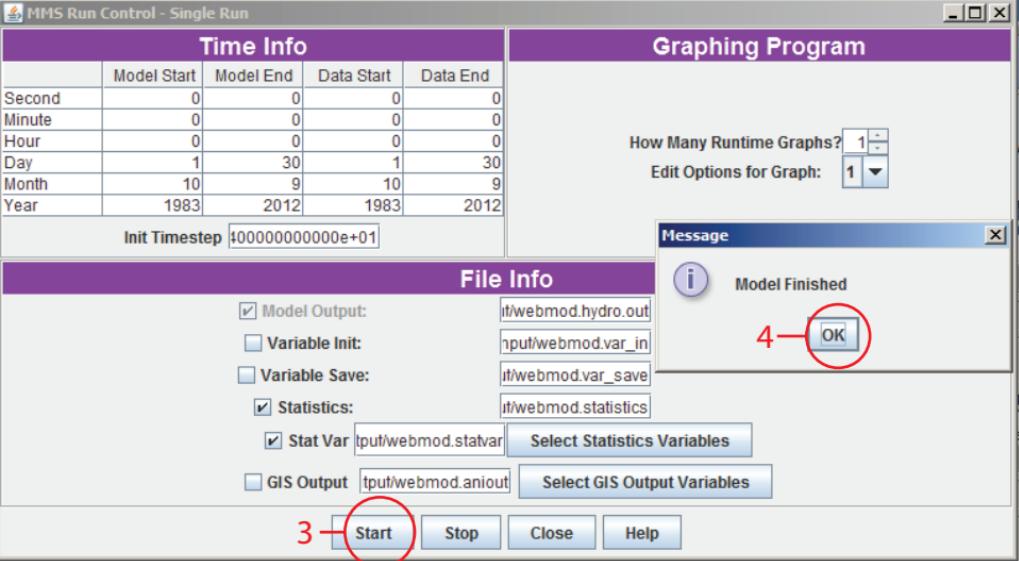
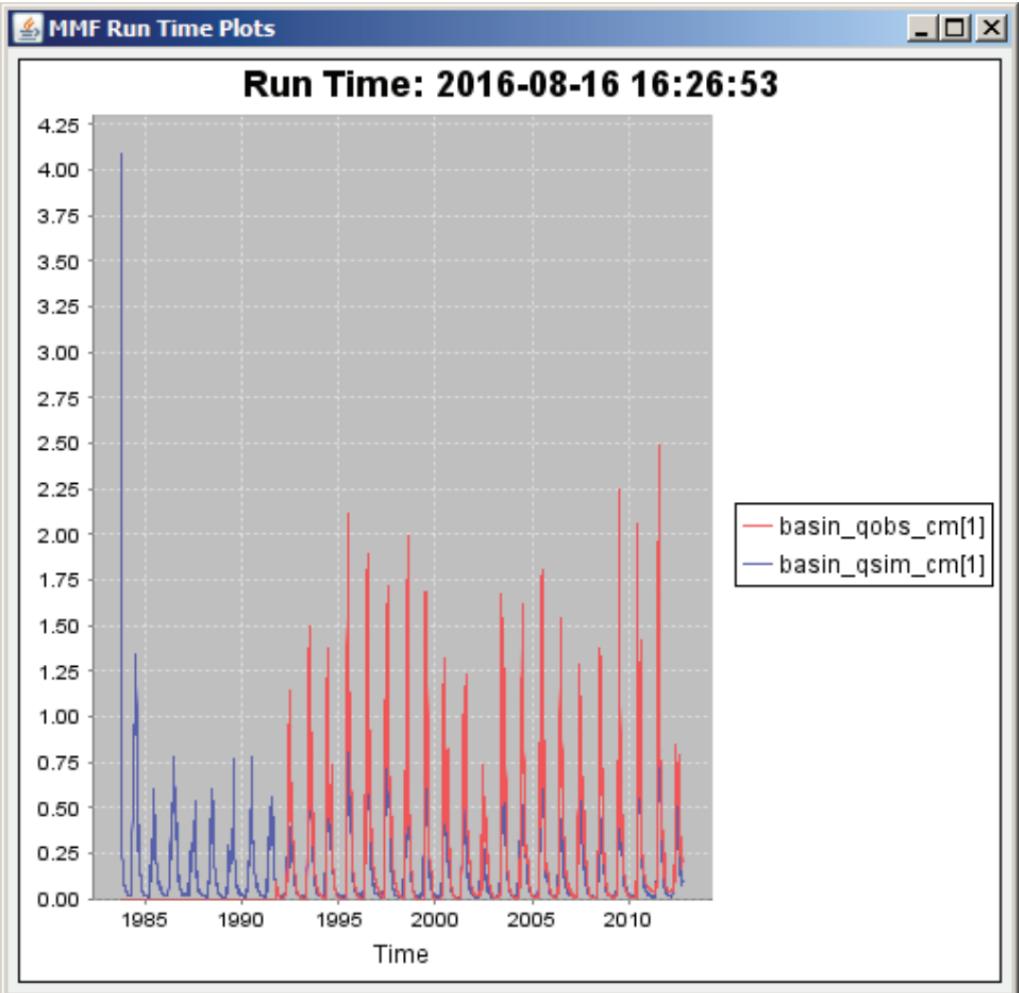
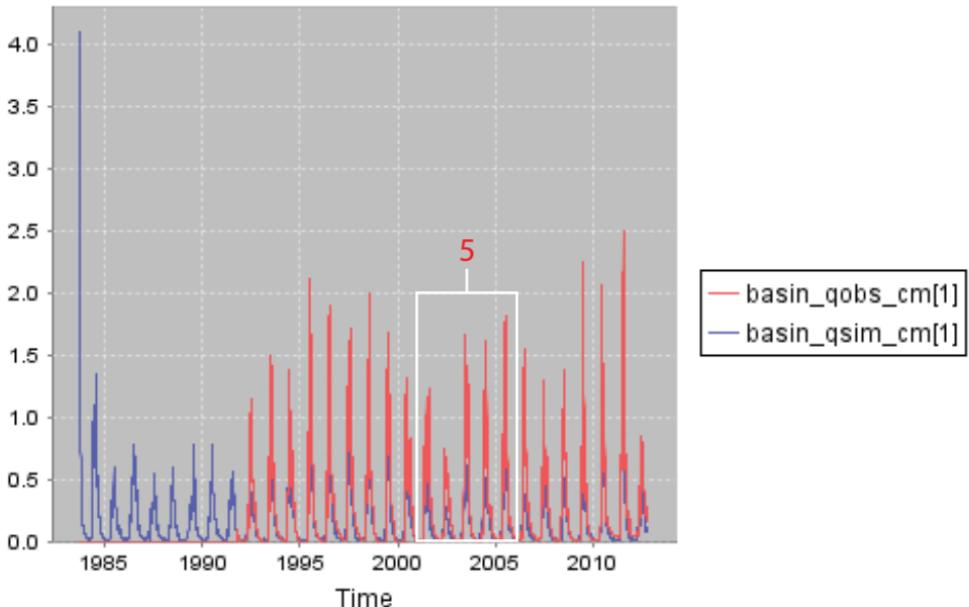
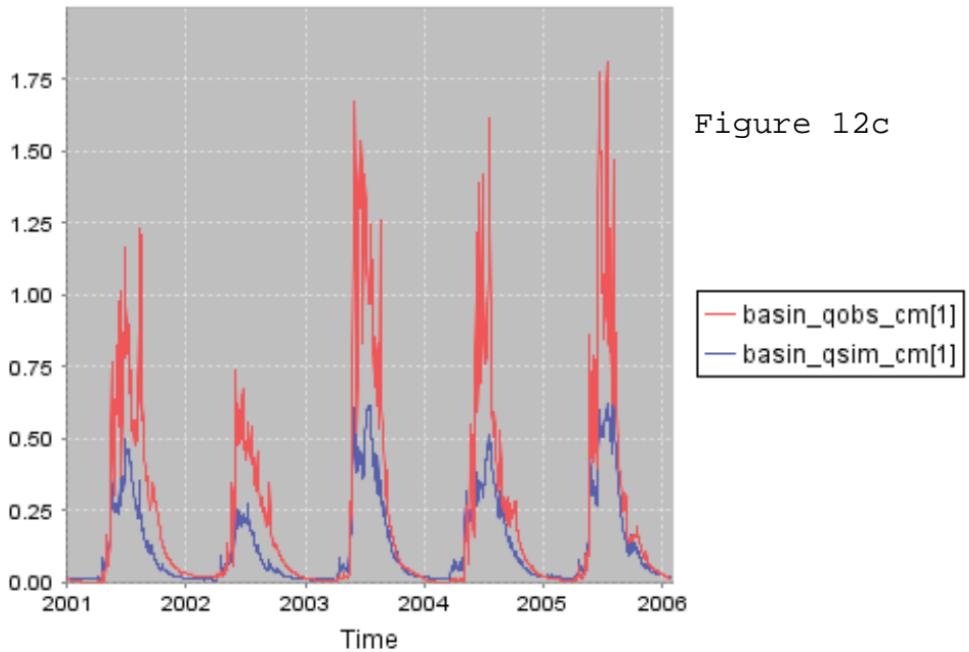


Figure 12b



Run Time: 2016-08-16 16:26:53

6

Run Time: 2016-08-16 16:26:53

MMS Run Control - Single Run

Time Info					Graphing Program	
	Model Start	Model End	Data Start	Data End		
Second	0	0	0	0		
Minute	0	0	0	0		
Hour	0	0	0	0		
Day	1	30	1	30		
Month	10	9	10	9		
Year	1991	2012	1983	2012		
Init Timestep	400000000000e+01					

File Info

<input checked="" type="checkbox"/> Model Output:	it/webmod.hydro.out
<input type="checkbox"/> Variable Init:	input/webmod.var_in
<input type="checkbox"/> Variable Save:	it/webmod.var_save
<input checked="" type="checkbox"/> Statistics:	it/webmod.statistics
<input checked="" type="checkbox"/> Stat Var	tput/webmod.statvar
	Select Statistics Variables
<input type="checkbox"/> GIS Output	tput/webmod.anisout
	Select GIS Output Variables

15—Start Stop Close Help

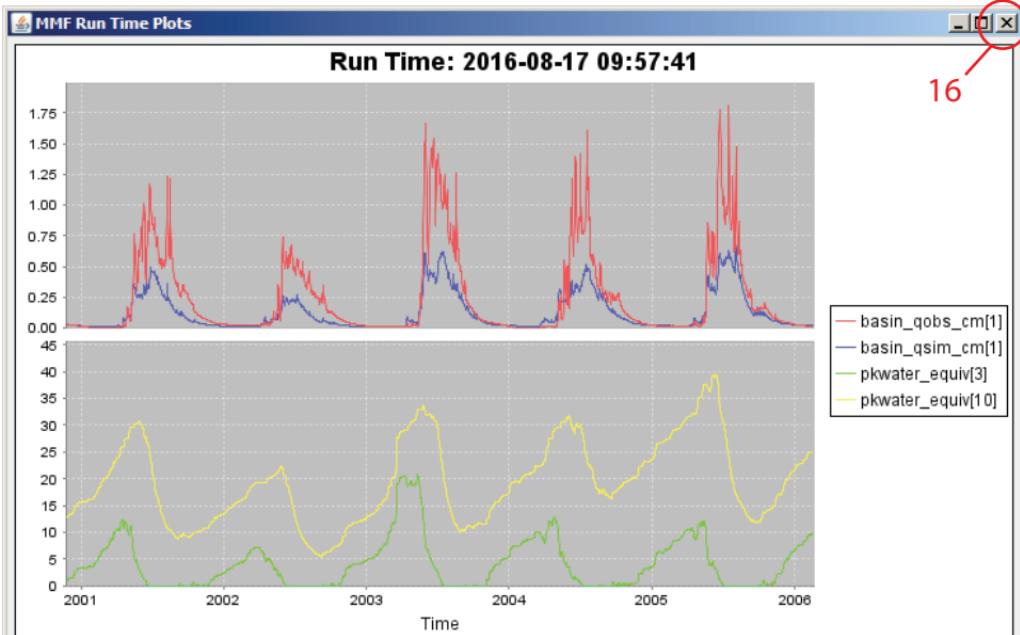
MMS - Select Variables for Run Time Plot 2

Available Variables	Selected Variables
newsnow	pkwater_equiv[3]
obj_func	pkwater_equiv[10]
obj_func_sum	
orad	
p	
pkwater_equiv 10	
potet	
pptmix	
pptmix_nopack	

Describe Select To Delete

Index [10] 9 11, 12

13—OK Cancel Help



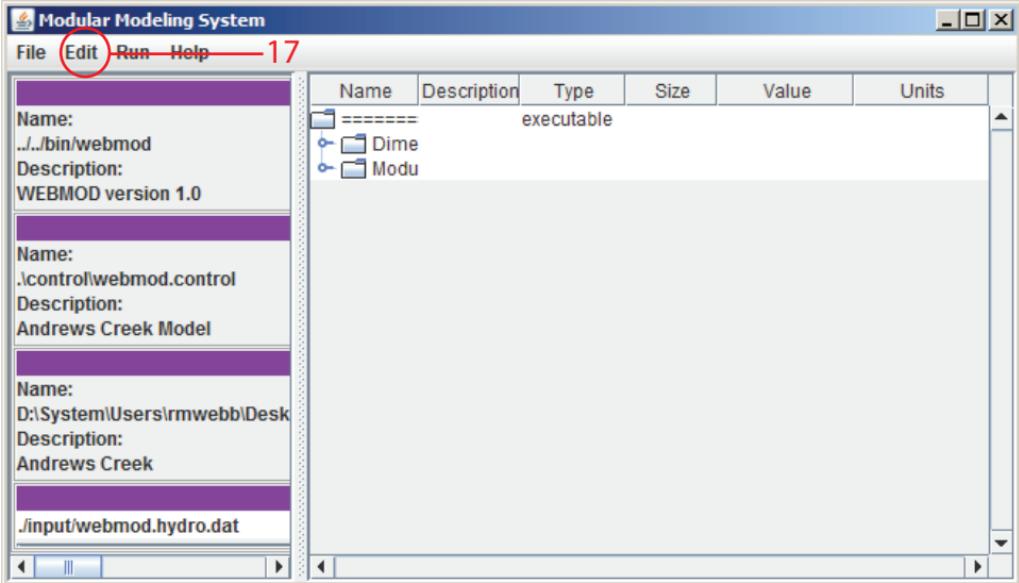


Figure 12e

19

Copy X All Columns Rows Fix It The Expander Report Difference Compare to Defaults Describe

D:\System\Users\irmwebb\Desktop\webmod.params

Dimension Sizes

	Dimension Size
ntrain	2
nslute	11
nconvert	3
nxkbin	9
nac_nmru_nresinp	2310
nchemvar	10
nevap	0
nac	11
ndeplval	22
nphq_lut	75
nchem_ext	0
nmru_res	9
nhcs	10
ndepl	2
five	5
nresinp	21
ngw_ext	0
nchan	1
ntemp	1
nhydro	1
nmru	10
ndays	366
nirrig_int	0
nexlag	2
nobs	3
nnum	1
nmonths	12
nsol	1
nchemobs	1
one	1
nsnow	0
ntopchan	2
nirrig_ext	0

Figure 12f

20

21

22

23

Copy X All Columns Rows Fix It The Expander Report Difference Compare to Defaults Describe

D:\System\Users\irmwebb\Desktop\webmod.params

Dimension Sizes

Parameter Values by Dimension

	1	2	3	4	5	6	7	8	9	10	11	12
1	1	1	1	1	1	1	1	1	1	1	1	1
2	1	1	1	1	1	1	1	1	1	1	1	1
3	1	1	1	1	1	1	1	1	1	1	1	1
4	1	22	1	1	1	1	1	1	1	1	1	1
5	1	1	1	1	1	1	1	1	1	1	1	1
6	1	1	1	1	1	1	1	1	1	1	1	1
7	1	1	1	1	1	1	1	1	1	1	1	1
8	1	1	1	1	1	1	1	1	1	1	1	1
9	1	1	1	1	1	1	1	1	1	1	1	1
10	1	1	1	1	1	1	1	1	1	1	1	1

Input

Please input a value
1.41

OK Cancel

25

26

27

28

29

30

Copy X All Columns Rows Fix It The Expander Report Difference Compare to Defaults Describe

D:\System\Users\irmwebb\Desktop\webmod.params

Save As

Dimension Sizes

Parameter Values by Dimension

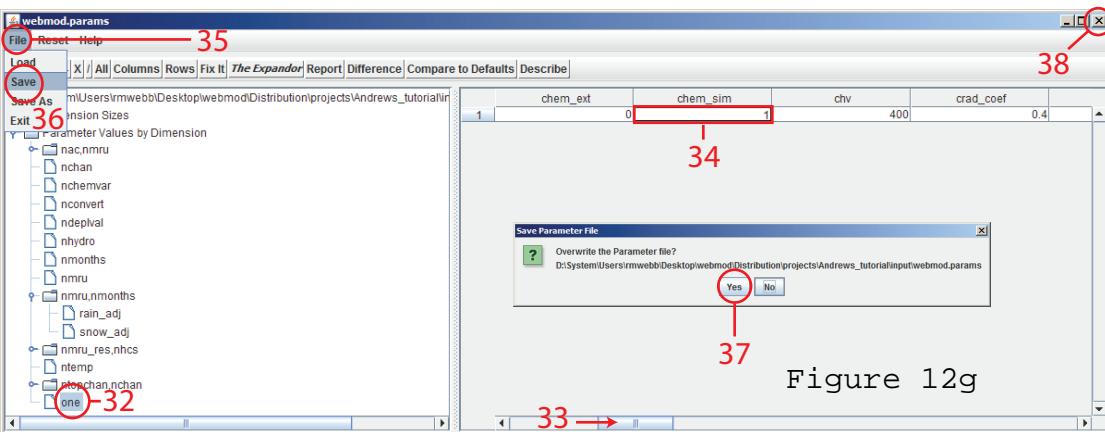
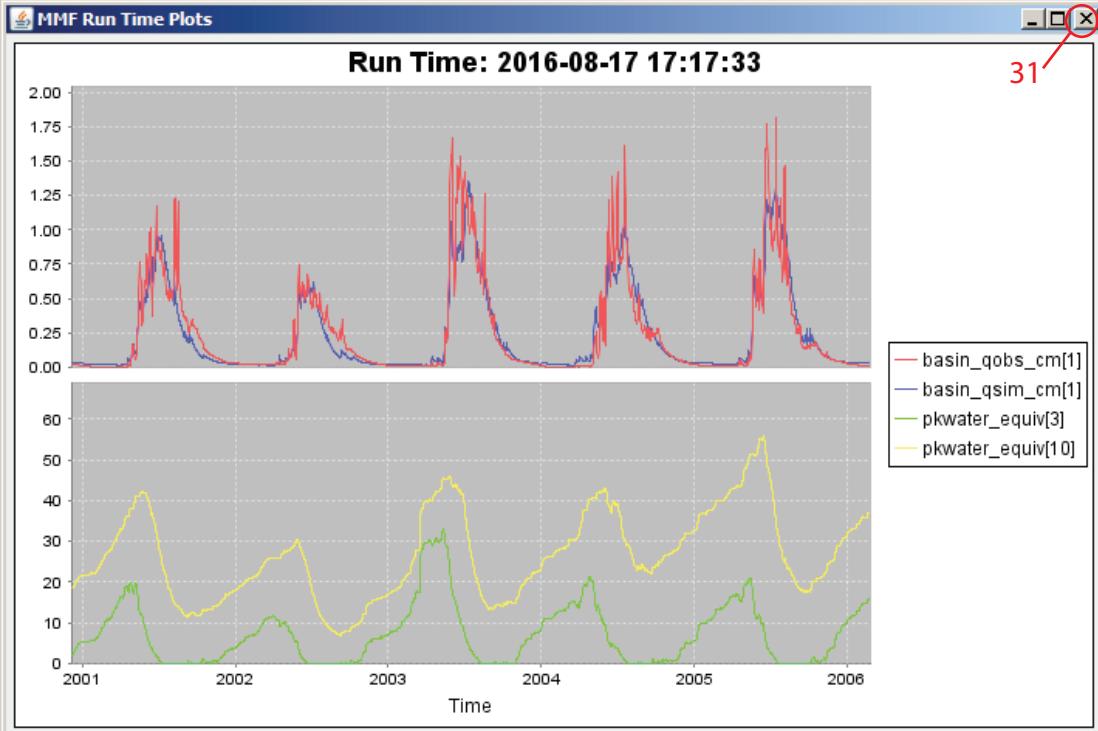
	1	2	3	4	5	6	7	8	9	10	11	12
1	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41
2	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41
3	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41
4	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41
5	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.21
6	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.21	2.21
7	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41
8	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41
9	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41
10	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41	1.41

Save Parameter File

Overwrite the Parameter file?
D:\System\Users\irmwebb\Desktop\webmod\Distribution\projects\AndrewsTutorial\input\webmod.params

Yes No

29



MMS Run Control - Single Run

Time Info				
	Model Start	Model End	Data Start	Data End
Second	0	0	0	0
Minute	0	0	0	0
Hour	0	0	0	0
Day	1	30	40	1
Month	10	9	10	9
Year	1991	1995	1983	2012

Init Timestep

Graphing Program

How Many Runtime Graphs?

4
1
2
3
4

Edit Options for Graph:

39

File Info

Model Output:

Variable Init:

Variable Save:

Statistics:

Stat Var

GIS Output

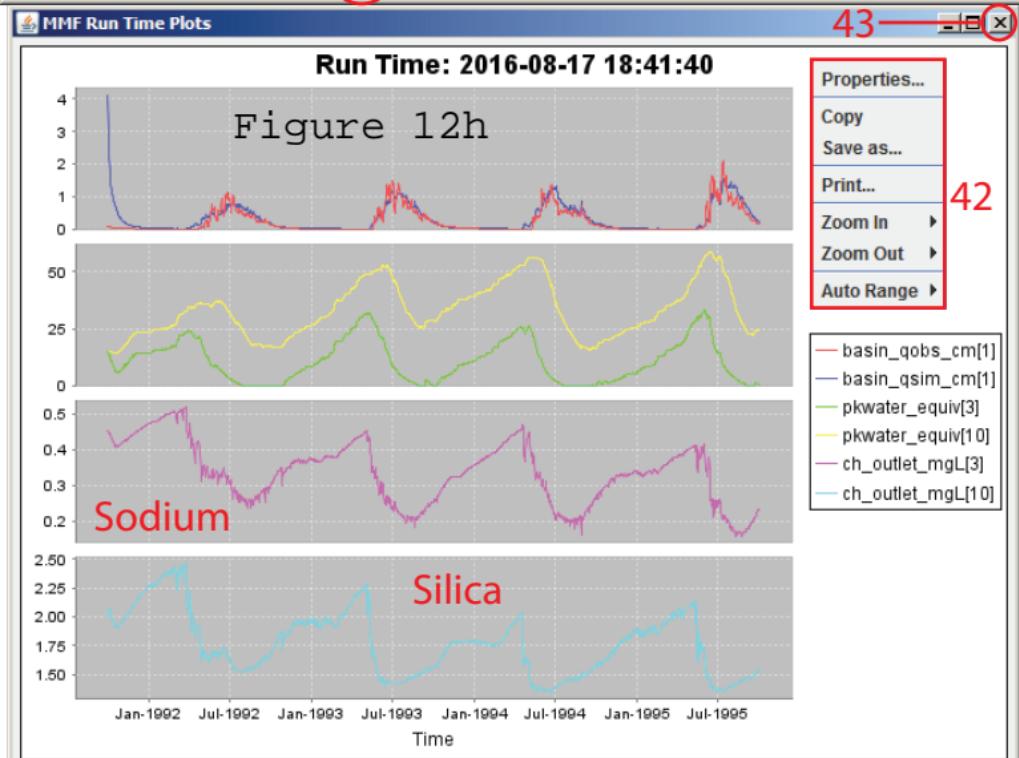
41

Start

Stop

Close

Help



TextPad - D:\System\Users\rmwebb\Desktop\webmod\Distribution\projects\Andrews_tutorial\input\webmod.pqi

File Edit Search View Tools Macros Configure Window Help

Find incrementally Match case

webmod.pqi

```
KINETICS 1 O-Horizon, UZ, and saturated zone (both matrix and preferential flow)

Oligoclase
    -parm 0.303          # fit the first parameter as log10 Surface Area
    -m    1000
    -44

Biotite
    -parm -0.1583        # fit the first parameter as log10 Surface Area
    -m    1000

Chlorite
    -parm 0.622          # fit the first parameter as log10 Surface Area
    -m    1000

Calcite
    -parm -6.44          # fit the first parameter as log10 Surface Area
    -m    1000

Pyrite_O2
    -formula Pyrite 1
    -m    1000
    -m0   1000
    -parms -2.33 0 0.5 -0.11 # fit the first parameter as log10 Surface Area
    -tol   1e-008

Nitrification
    -formula Amm -1 NH3 +1
    -m    1000
    -parms -3.25

-step 86400
END
```

Figure 12i

Search Results

387 | 10 | Read | Ovr | Block | Sync | Rec | Caps

