VELMA 2.0 Quick Example

The VELMA 2.0 Simulator is distributed with an example simulation configuration and its associated input maps and driver data. The example simulation data is located in the following of directory of the VELMA 2.0 distribution:

VELMA Model\VELMA v2.0\BlueRiver_Example

You Must Have Java Installed On Your Computer

Confirm that you have either a Java 7 JRE installed and accessible on your machine by opening a Windows command prompt and typing in the following command:



If instead of the above text (or something like it) you receive a message that java "is not recognized …" (or a similar error message) then you must install a Java JRE (version 7 or above) onto your machine before proceeding. The Java JRE is freely available from Oracle's Java website. Contact your local system administration or tech support for additional information and assistance.

Start the VELMA GUI

You could start VELMA by double clicking the JVelma.jar file located in the VELMA v2.0 folder, but we do not recommend this because VELMA will likely run out of memory during a simulation. <u>To ensure that</u> VELMA has sufficient memory, you will need to follow the steps below.

To start the VELMA 2.0 GUI (named "JVelma"), open a Windows command prompt, and launch the GUI via Java and the JVelma.jar file.

Here is an example of the form the startup command takes:

C:\> java -Xmx1024m -jar C:\Some\full\Path\JVelma.jar

Of course, replace C:\Some\full\Path\ with the actual, fully-qualified path name of the location where your copy of the JVelma.jar file resides.

Here are a couple of screen captures showing actual command lines for starting JVelma:



(In the above screen-capture, the double-quotes around the fully-qualified path+name of the JVelma.jar file are required because the text of the path contains whitespace.)



(When there is no whitespace in the entire path the double-quotes are not required, but still allowed.)

The "-Xmx1024m" command line option specifies the amount of memory available to the JVelma GUI and simulator. The value 1024 is in Megabytes, so this command line allocates a 1 Gigabyte memory space (1024 MB = 1GB) for the JVelma GUI and simulator to run in. You can allocate more memory than 1 GB (e.g. the option "-Xmx4096m" would allocate 4 GB) but if you allocate more memory than your computer can make available, JVelma will fail to start properly.

Please contact <u>mckane.bob@epa.gov</u> if you have any problems with the startup procedure.

Load the Example Simulation Configuration File

After successfully starting the VELMA GUI, click the File \rightarrow "Load Configuration From VELMA XML File" menu item:

<u>File</u> dit		
About VELMA	sole	
Load Configuration From VELMA Startups File		Simulator-Wide Configuration Switches
Load Configuration From VELMA XML File Ctrl-L		Use Nitrification Model
Save Configuration To VELMA XML File Ctrl-S		Use Denitrification Model
Save Configuration As CSV Data File	Cell Size	Use Evenetraneinration based untake
Outlet X Outlet Y		
Simulation Driver Data		Disable the PSM Water Stressor
Available From To		Chemistry Loss Rates to Stream
Run Simulator From To		NH ₄ Fraction

This opens a file browser dialog:

🛓 Select Velma	XML File to Load	—
Look <u>I</u> n:	BlueRiver_Example	
BlueRiver_	WS10_Example_Configuration.xml	
File <u>N</u> ame:		
Files of <u>T</u> ype:	Velma XML data files	▼
		OK Cancel

Click the "Look In" drop-down selector's button (circled in blue above) to navigate to the directory: C:\thePathOnYourComputer\VELMA SSWR 4.3C Product\VELMA v2.0\BlueRiver_Example

The .xml file name () will appear in the "File Name" text box:

BlueRiver_WS10_Example_Configuration.xml

Click "OK" to load that .xml file.

Useful side-note: You can resize the file browser dialog by click-dragging one of its edges or corners. When a directory contains many files, this is very helpful.

Once the simulation configuration .xml file has loaded, the VELMA GUI "Run Parameters" tab should look like this:

SUPERIOR - BlueRiver_Example/BlueRiver_V	WS10_Example_	_Configuration.xml			- • •
<u>Eile Edit</u>					
Run Parameters All Parameters	Chart Con	sole			
Simulation Run Name BlueRiver_WS10_	_Example_Co	nfiguration		Simulator-Wide Configuration Switches	
Grid Data				Vse Nitrification Model	
DEM File brbiosize30m_JPDEMstd_0flat	Proc.asc			✓ Use Denitrification Model	
Columns 628	Rows	534	Cell Size 30.0	Ilse Evanotransintation based untake	
Outlet X 196	Outlet Y	459]		
Simulation Driver Data				Disable the PSM Water Stressor	
Available From 1969	То	2488		Chemistry Loss Rates to Stream	
Run Simulator From 1969	То	2008]		
Number of Loops 1				NO ₃ Fraction	
Nash-Sutcliffe Coefficient for Runoff				DON Fraction 0.05	
Compute From 0	То	0		DOC Fraction 0.03	
Notes / Comments					
START					Simulator READY

The "Run Parameters" tab displays a few parameters as a summary of the configuration.

Note the large "Notes / Comments" section: you may type whatever notes you find helpful in this area. The simulator will ignore them.

The "Simulation Run Name" displays the value of the run_index parameter (underlined in blue above). It's very good practice (but not absolutely necessary) for the run_index parameter's value to match the name of its simulation configuration file (without the ".xml" suffix).

Set the Location of the Simulation Configuration's Input Data Files

The VELMA simulator requires several different (and different types) of input files in order to run. It looks for these using the fully-qualified directory path to the directory that you provide it in the simulation configuration's parameters.

Using the All Parameters outline selector, click the drop-down button above the "Group" column and select "Startups"; then select "1.0 Input Data Location":

🔮 VELMA : BlueRiver_Example/BlueRiver_WS10_Example_Configuration.xml						
<u>F</u> ile <u>E</u> dit						
Run Parameters All Parameters Char	Console					
Clear Filters startups -	``	in.*DataLoc	Replace Values			
1.0 Input Data Location						
Group	Item	Parameter	Value			
startups	VelmaStartups.properties	inputDataLocationDirName	BlueRiver_Example			
startups	VelmaStartups.properties	inputDataLocationRootNam	e 🚺			

The inputDataLocationDirName is already set to the correct directory name (i.e. the directory with input data for the Blue River Example simulation). Double-click on the inputDataLo

cationRootName's "Value" field to activate it for editing. Then type in the fully-qualified path name to the directory specified by inputDataLocationDirName (i.e. the fully-qualified path from disk-letter root down to the directory above the inputDataLocationDirName directory).

IMPORTANT: Use forward-slash characters ("/") as path separators; NOT the backward-slash characters ("\") that you use to specify the same path name on a Windows command-line.

Press the Enter ("Return") key after you type in the value for the inputDataLocationRootName; this tells the VELMA GUI to accept the value you've just typed (and the field you typed it into will switch out of edit mode).

Set the Location Where the VELMA Simulator Will Writer Results Files

The VELMA simulator writes several files of results data to an output directory that you specify. The directory must be accessible and writeable (not locked for modification) all during the simulation run.

Under the "All Parameters" GUI tab, click the drop-down button above the "Group" column and select "Calibration"; then use the All Parameters outline selector to choose "2.0 Results Data Location (Results Data Directory Placed Under This Location)": :

States	_Example_Configuration.xml		
<u>F</u> ile <u>E</u> dit			
Run Parameters All Parameters Cha	rt Console		
Clear Filters calibration	Input C	utputData	Replace Values
2.0 Results Data Location (Resul	ts Data Directory Placed Under Th	is Location)	
Group Item Parameter <u>Value</u>			
calibration	VelmaInputs.properties	initializeOutputDataLoc	cationRoot

Double-click the initializeOutputDataLocationRoot parameter's "Value" field to activate it for editing and type the fully-qualified path to a directory on your computer (e.g. "C:/Users/Me/MyVelmaResults" – **without** the enclosing double-quotes).

IMPORTANT: Use forward-slash characters ("/") as path separators; NOT the backward-slash characters ("\") that you use to specify the same path name on a Windows command-line.

Remember to press the Enter key after you finish typing the value of the initializeOutputDataLocationRoot parameter.

When the VELMA simulator runs this simulation configuration, it will create a new directory, using the value of the run_index parameter (it's already set for you in this example) as the new directory's name, and place results files in that new directory.

Save Your Parameter Changes

When you change parameter values, they are only changed within the current VELMA GUI session. To actually save them back to the simulation configuration, you must explicitly save them to the file. Click the File \rightarrow "Save Configuration To VELMA XML File" menu item:

ſ	💁 VELMA : BlueRiver_Example/BlueRiver_WS10_Example_Configuration.xml							
C	Eile Edit							
	About VELMA		sole					
	Load Configuration From VELMA Startups File	e					Replace Values	1
	Load Configuration From VELMA XML File	Ctrl-L						1
4	Save Configuration To VELMA XML File	Ctrl-S						4
	Save Configuration As CSV Data File	\sim	Item	Parameter		Value	•	l
	cellDataWriter	Outlet	_CellWriter.properties	initializeActiveJdays		1-366	^	-
	cellDataWriter	Outlet	_CellWriter.properties	cellY		459		
	cellDataWriter	Outlet	_CellWriter.properties	cellX		196		
	weather	Defaul	tWeatherModel	snowMeltRate		5.0		1
	weather	Defaul	tWeatherModel	rainOnSnowEffect		0.5		
	weather	Defaul	tWeatherModel	rainDriverDataFileName		WS10 Precip 1969-200	18 CSV	

IMPORTANT: Saving changes overwrites the simulation configuration file on disk!

The VELMA GUI warns you when you try to save changes to an existing .xml file:

🛃 Save Configuration to XML 🛛 🔀
Save In: BlueRiver_Example
BlueRiver_WS10_Example_Configuration.xml
Existing File
File Name: BlueRiver_WS10_Example_Configuration.xml
Files of Type: VELMA XML files
Save File Cancel

Clicking "No" or "Cancel" stops the save process.

Clicking "Yes" allows the VELMA GUI to overwrite the existing file.

For this example, let's save our changes to a different file name. This will preserve the original file, and create a new file with all the original file's parameters values along with our changes.

You *could* simply rename the file in the "File Name:" field of the file browser before clicking the "Save File" button. If you choose a name that doesn't exist, the browser will correctly create a new .xml file without demur. However, recall that earlier in this example, we mentioned that it's a very good practice to keep the run_index parameter value. Let's modify the run_index parameter's value first.

Click "No" or "Cancel" to stop the save process.

In the VELMA GUI's "All Parameters" tab, click the drop-down button of the outline selector and select "2.1 Results Data Directory Name (Results Data Placed in Directory With This Name)".

Change the "Value" field for the run_index parameter.

Press the Enter key to make the VELMA GUI accept the new value.

-- OR --

In the VELMA GUI's "Run Parameters" tab, click into the "Simulation Run Name" text field. Change the value in the text field. Press the Tab key to make the VELMA GUI accept the new value. (Note that this differs from the "accept change" key you use in the "All Parameters" table!)

Here are examples of modified run_index parameters:

Via the "All Parameters" tab:

SVELMA : BlueRiver_Example	9 VELMA : BlueRiver_Example/BlueRiver_WS10_Example_Configuration.xml					
<u>F</u> ile <u>E</u> dit						
Run Parameters All Para	meters Chart Console					
Clear Filters calibrat	tion 🔽 Input	run_in		Replace Values		
2.1 Results Dat	2.1 Results Data Directory Name (Results Data Placed in Directory With This Name)					
A. 			·····			
Group	Item	Parameter		Value		
calibration VelmaInputs.properties run_index		run_index	BlueRiver_WS10_Exa	ample_Configuration_REVISED		

-- OR –

Via the "Run Parameters" tab:

STELMA : BlueRiver_Example/BlueRiver_WS10_Example_Configuration.xml		
<u>File</u> Edit		
Run Parameters All Parameters Chart Console		
Simulation Run Name BlueRiver_WS10_Example_Configuration_REVISED	Simulator-Wide Configuration Switches	
Grid Data	Vse Nitrification Model	
DEM File brbiosize30m_JPDEMstd_0flatProc.asc	✓ Use Denitrification Model	
Columns 628 Rows 534 Cell Size 30.0 Outlet V 400 Outlet V 450 Image: Cell Size 30.0	Use Evapotransipration-based uptake	

Now click the File \rightarrow "Save Configuration To VELMA XML File" menu item again:

🔊 Save Configuration to XML
Save In: BlueRiver_Example
BlueRiver_WS10_Example_Configuration.xml
File Name: BlueRiver_WS10_Example_Configuration_REVISED.xml
Files of Type: VELMA XML files
Save File Cancel

The "File Name:" text value automatically defaults to the run_index name; click "Save File" to save.

Click the Start Button to Start a Simulation Run

Clicking the "START" button (circled in blue in the screenshot below) in the lower-left corner of the VELMA GUI window starts the current simulation configuration running, and shifts the view to the GUI's "Chart" tab. The Chart selection is automatically set to "Time Series" at simulation start¹, but there are other charts available. Click the drop-down button of the chart selector (also circled in blue) to the right of the START button to select different charts.

The lower right-hand corner of the VELMA GUI window displays status "RUNNING" and the simulation's current date and loop state (underlined in blue below)

¹ There may be a pause between when you click START and the simulation shifts to the Chart tab and begins running. The length of the pause depends upon the size of the simulation area, and how much work is required to initialize the simulator from the simulation configuration.



Clicking the "Snapshot" button (circled in red above) creates an image-capture of the currently-selected chart's current state and writes it to a PNG file in the specified results directory. You may click Snapshot multiple times during simulation run – the PNG files are given unique names, prefixed with "run_". At the end of each simulation year, the currently-selected chart is snapshot automatically. End-of-year snapshot filenames are prefixed "out_" to distinguish them from "manual" snapshot images.

Here is an example "run_..." (manually-captured) snapshot file illustrating a different chart display:



Notice that this chart displays two types of information: spatial (all cells current state) and temporal (averaged daily or annual state – daily in this case – over some period).

Look In the Specified initialOutputDataLocationRoot Results Directory for Results

After a simulation completes, automatic and manual chart display snapshots as well as .csv files of daily and annual results are available for review in directory specified by initialOutputDataLocationRoot.

You can also click the "Console" tab, and check the final few lines of console output to see the run time of the simulation, and the Nash-Sutcliffe coefficient calculated for the simulated versus observed runoff daily values².

🛃 VELMA : BlueRiver_Example/BlueRiver_WS10_Example_Configuration_REVISED.xml	
<u>File</u> <u>E</u> dit	
Run Parameters All Parameters Chart Console	
INFO 14:15:02 VelmaSimulatorEngine: Starting 2006 11:23 [Day=22] loop=11 loopStep=14570 step=14571 nstep=1899270 step=14610	
INFO 14:15:02 VelmaSimulatorEngine: Starting 2008-11-24 [Day=329 loop=1/1 loopStep=14572 step=14572 nstep=189927 ostep=14610	
INFO 14:15:02 VelmaSimulatorEngine: Starting 2008-11-25 iDay=330 loop=1/1 loopStep=14573 step=14573 nstep=189927 ostep=14610	
INFO 14:15:02 VelmaSimulatorEngine: Starting 2008-11-26 jDay=331 loop=1/1 loopStep=14574 step=14574 nstep=189927 ostep=14610	
INFO 14:15:02 VelmaSimulatorEngine: Starting 2008-11-27 jDay=332 loop=1/1 loopStep=14575 step=14575 nstep=189927 ostep=14610	
INFO 14:15:02 VelmaSimulatorEngine: Starting 2008-11-28 jDay=333 loop=1/1 loopStep=14576 step=14576 nstep=189927 ostep=14610	
INFO 14:15:02 VelmaSimulatorEngine: Starting 2008-11-29 jDay=334 loop=1/1 loopStep=14577 step=14577 nstep=189927 ostep=14610	
INFO 14:15:02 VelmaSimulatorEngine: Starting 2008-11-30 jDay=335 loop=1/1 loopStep=14578 step=14578 nstep=189927 ostep=14610	
INFO 14:15:02 VelmaSimulatorEngine: Starting 2008-12-1 jDay=336 loop=1/1 loopStep=14579 step=14579 nstep=189927 ostep=14610	
INFO 14:15:02 VelmaSimulatorEngine: Starting 2008-12-2 jDay=337 loop=1/1 loopStep=14580 step=14580 nstep=189927 ostep=14610	
INFO 14:15:02 VelmaSimulatorEngine: Starting 2008-12-3 jDay=338 loop=1/1 loopStep=14581 step=14581 nstep=189927 ostep=14610	
INFO 14:15:02 VelmaSimulatorEngine: Starting 2008-12-4 jDay=339 loop=1/1 loopStep=14582 step=14582 nstep=189927 ostep=14610	
INFO 14:15:02 VelmaSimulatorEngine: Starting 2008-12-5 jDay=340 loop=1/1 loopStep=14583 step=14583 nstep=189927 ostep=14610	
INFO 14:15:02 VelmaSimulatorEngine: Starting 2008-12-6 jDay=341 loop=1/1 loopStep=14584 step=14584 nstep=189927 ostep=14610	
INFO 14:15:02 VelmaSimulatorEngine: Starting 2008-12-7 jDay=342 loop=1/1 loopStep=14585 step=14585 step=189927 ostep=14610	
IINFO 14:15:02 VeImaSimulatorEngine: Starting 2008-12-8 jDay=343 loop=1/1 loopStep=14586 step=14586 step=189927 ostep=14610	
IIN-FO 14:15:02 VeImaSimulatorEngine: Starting 2008-12-9 JDay=344 (loop=1/1 loopStep=1458 / step=1458 / step=18992 / ostep=14610	
INFO 14:15:02 VeimasimulatorEngine: Starting 2008-12-10 JDay=345 100p=11/1 100pStep=14588 step=14588 nstep=18992/ 0step=14510	
INFO 14/15/02 veimasimulatoEngine: Starting 2008-12-11 JUAy=346 100p=14/11 100pStep=14/589 step=14/589	
INNEO 14.15.02 Veimasimulatotengine: Statung 2006-12-12 JDay=347 100p5101 100p5tep=14590 step=14590 nstep=14590 step=14540	
INNEO 14:15:02 VelmasimulatorEngine: Statung 2008-12-13 Jbag=348 100p=111 100pStep=14591 step=14591 nstep=14592/ 0step=14510	
INFO 14.15.02 Verifiation function for the first of the formation of the f	
INFO 14.15.02 VelimaSimulatorEngine. Statung 2008-12-15 jDay=350 100P=1/1 100pStep=14593 Step=14593 IStep=14592 IStep=14510 UStep=14010 UStep=14010 UStep=14510 IStep=14504 Is	
nnr o 14, 15,02 velinitasimulator Engline, statung 2000 12-10 (bag)-30 holps in holpstep-i 14094 step-i 14094 histep-i 14094 histep-i 14010 NEC 14, 15,02 velinitasimulator Engline, Statung 2009, 10,4 (bag)-30 holpstituti holpstep-i 14094 step-i 14094 histep-i 14094 histep-i 14010	
INICO 14/15/02 Verindarindustrulinet, statuling 2006/12/17 (2007)-325 (Joon-11/L) Joogber 14/35 Step = 1655/15/12/Jone = 166/10/2007) astan = 166/10	
INFO 14:15:02 VolmaSimulatorEngine: Stating 2000-12:16 Jbag-556 Joop=1/1 JoopStan=14567 stan=14507 stan=14507 stan=14510	
INFO 14:15:02 VelmaSimulatorEngine: Stating 2006 12: 15 (54)-554 1600-111 (bootSten=14598 sten=14598 rsten=14598 rsten=14610	
INFO 14 1502 VelmaSimulatorEngine: Starting 2008 12 20 July 356 Jono 11/1 Jono Sten 14599 Sten 14599 Sten 14599 Total 14610	
INFO 14 15:02 VelmaSimulatorEngine: Stating 2008-12-22 iDay=357 loop=1/1 loopSten=14600 sten=14600 sten=189927 osten=14610	
INFO 14:15:02 VelmaSimulatorEngine: Starting 2008-12-23 IDay=358 loop=1/1 loopStep=14601 step=14601 nstep=189927 ostep=14610	
INFO 14:15:02 VelmaSimulatorEngine: Starting 2008-12-24 IDay=359 loop=1/1 loopStep=14602 step=14602 nstep=189927 ostep=14610	
INFO 14:15:02 VelmaSimulatorEngine: Starting 2008-12-25 iDay=360 loop=1/1 loopStep=14603 step=14603 nstep=189927 ostep=14610	
INFO 14:15:02 VelmaSimulatorEngine: Starting 2008-12-26 jDay=361 loop=1/1 loopStep=14604 step=14604 nstep=189927 ostep=14610	
INFO 14:15:02 VelmaSimulatorEngine: Starting 2008-12-27 jDay=362 loop=1/1 loopStep=14605 step=14605 nstep=189927 ostep=14610	
INFO 14:15:02 VelmaSimulatorEngine: Starting 2008-12-28 jDay=363 loop=1/1 loopStep=14606 step=14606 nstep=189927 ostep=14610	
INFO 14:15:02 VelmaSimulatorEngine: Starting 2008-12-29 jDay=364 loop=1/1 loopStep=14607 step=14607 nstep=189927 ostep=14610	
INFO 14:15:02 VelmaSimulatorEngine: Starting 2008-12-30 jDay=365 loop=1/1 loopStep=14608 step=14608 nstep=189927 ostep=14610	
INFO 14:15:02 VelmaSimulatorEngine: Starting 2008-12-31 jDay=366 loop=1/1 loopStep=14609 step=14609 nstep=189927 ostep=14610	
INFO 14:15:02 CellDataWriter: Writing: Cell Data File STARTED at 2014-09-04 14:15 "C:\Users\kdjang\Velma_Results\BlueRiver\SOF-004\BlueRiver_WS10_Example_Configuration	_RE\
INFO 14:15:02 CellDataWriter: Writing: Cell Data File _ DONE at 2014-09-04 14:15 "C:\Users\kdjang\Velma_Results\BlueRiver\SOF-004\BlueRiver_WS10_Example_Configuration_RE	VISE
IINFO 14:15:02 CellDataWriter: Writing: Cell Data File STARTED at 2014-09-04 14:15 °C:\Users\kdjang\Velma_Results\BlueRiver\SOF-004\BlueRiver_WS10_Example_Configuration_F	REVIS
INFC 14:15:02 CellDataWriter: Writing: Cell Data File DONE at 2014-09-04 14:15 "C:\Users\kdjang\Velma_Results\BlueRiver\SOF-004\BlueRiver_WS10_Example_Configuration_RE	VISE
INFO 14:15:02 VeimasimulatorEngine: Completed 2008 at 2014-09-04 14:15	
INFO 14:15:02Globalstate: Nash-Sutcline Coemcient=0.8045351825866978 Loop=1 Years=[1969 to 2008]	
IIIIFU 14.15.92 veimaoimuaitutentijiike olimaisuu Luin Companya.	Cor
mmr or 14, 15, 35 remna omma autoring me, Generating ammual results ine or IAAT LED al 2014-03-04 14, 15 C/USERSKröjang/weima_Results/billeeRverSOF-004BilleeRver_WS10_EXample,	_Confi
The or the tasks with the second s	igurat
inter of the low remnanting and the sense of	uratio
	ar du U =
START	r DONE

Contact mckane.bob@epa.gov if you have questions.

² Obviously, the Nash-Sutcliffe is only meaningful when observed data is available as part of the input set (as it is in the case of this example).