HEC-HMS Lab 8: Modeling Fish Creek in Indiana

Created by Venkatesh Merwade (vmerwade@purdue.edu)

Learning outcomes

The objective of this lab is to explore a relatively sophisticated HEC-HMS model for a small watershed in Indiana. By the end of the exercise, students will know:

1) How to import a basin model into HEC-HMS
2) Explore different methods and parameters used in the model
3) Compare model output with observed discharge/runoff data

Student Time Required: 60 – 90 minutes

The basin model, the map and an Excel file is provided to you under Lab 8 on blackboard. You can also get the data at: ftp://ftp.ecn.purdue.edu/vmerwade/data/fishcreek.zip The Excel file contains observed rainfall and direct runoff for a storm event in 2004.

Open a new HEC-HMS project and save it as fish_creek in your working directory by using **US Customary units.**

Import the Fish Creek basin model by going to File→Import→Basin Model... when prompted, select the "Use data in local project, ignore missing data" and "Localize external data..." in the import options. <**Note:** Depending on the version of HEC-HMS you may not see any messages. Add the basin model if you do not see any messages>

Zoom-in to the basin map and you should be able to see the boundary and all the HEC-HMS components (HEC-HMS schematic network). If you do not see the map, you can import the map by going to view→Background Maps (make sure you select .map extension). If you do not see what you see below, explore the view menu in HEC-HMS.
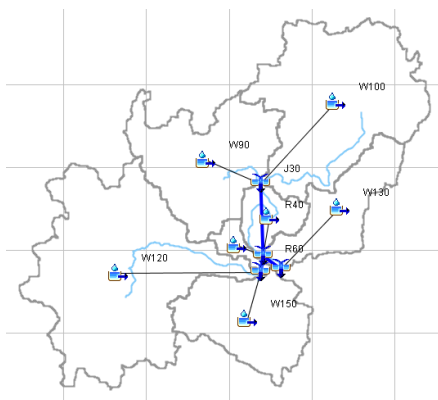
Explore the model, and <u>turn-in</u> the answers to the following questions: (answering the following questions will be easier if you also try to explore some of the menus on the HEC-HMS toolbar, especially, the Parameter menu)

1) <u>How many sub-basins, reaches and junctions do you have in the model? Which element represents the watershed outlet?</u>
2) <u>What is the role of sub-basin, reach and junctions in HEC-HMS?</u>
3) <u>What is the total area of the Fish Creek watershed? How did you find this out?</u>
4) <u>What method is used for computing losses in the model? What parameter(s) are used to in the loss method? List the parameters and what are their average values?</u>
5) <u>What method is used for transformation in the model? List the parameters and their average values.</u>

Run the Fish Creek model by using the rainfall data provided in the Excel File. This will involve creating rainfall gage, meteorologic model, control specification model and a simulation run.

When you create the control specification file, make sure you choose a time step that is smaller than the rainfall/runoff hydrograph interval.

6) <u>Justify your choice of Start and End date/time for the simulation.</u>
7) <u>Plot the hydrograph (at the outlet) in the Excel file that is provided to you, and report the total rainfall, total discharge, peak discharge value, time to peak.</u>

You will see that the Excel file also has observed hydrograph (direct runoff) at the watershed outlet. Lets include this information in the model. Create a new discharge gage by going to Components→Time Series Manager and selecting the discharge gage. Use the information in the Excel file to store the observed data at this gage.

After the discharge gage is created, select "Outlet3" in the component window, then go to the Options tab, and link your discharge gage to Outlet3 as shown below.
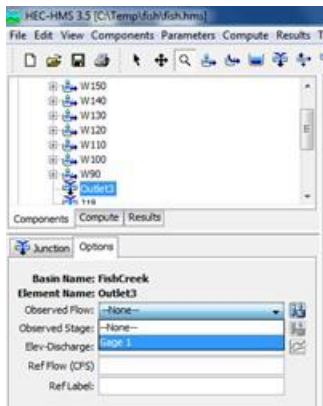
Run the model again, and see the results at Outlet3. You will now see both the model hydrograph and observed hydrograph.

8) Create a presentation quality plot in Excel to show these two hydrographs, and write few lines on the differences between them.
9) Which sub-basins produced the lowest and highest peak hydrograph? Why?
10) Write few lines on how the parameters in the model affect the output hydrograph, and how can you modify the Fish Creek model to match the model output with observed flow? Think about which parameter affects the peak and the time to peak?