A systematic methodology to answer the question that is being raised is presented. This method ensures that the underlying hydrology is conserved at the best to answer the question.

Step-1:

Identify the basin of your interest. This should be based on a proper research methodology (Refer to PART IX)

Step-2:

Extract the associated catchments and the stream network using ESRI products or other vendors. These catchments and the stream network cover the basin of your interest. See the attached PDF file.

Basin Shape/Spatial File

One of the catchments within the basin

Basin of your interest
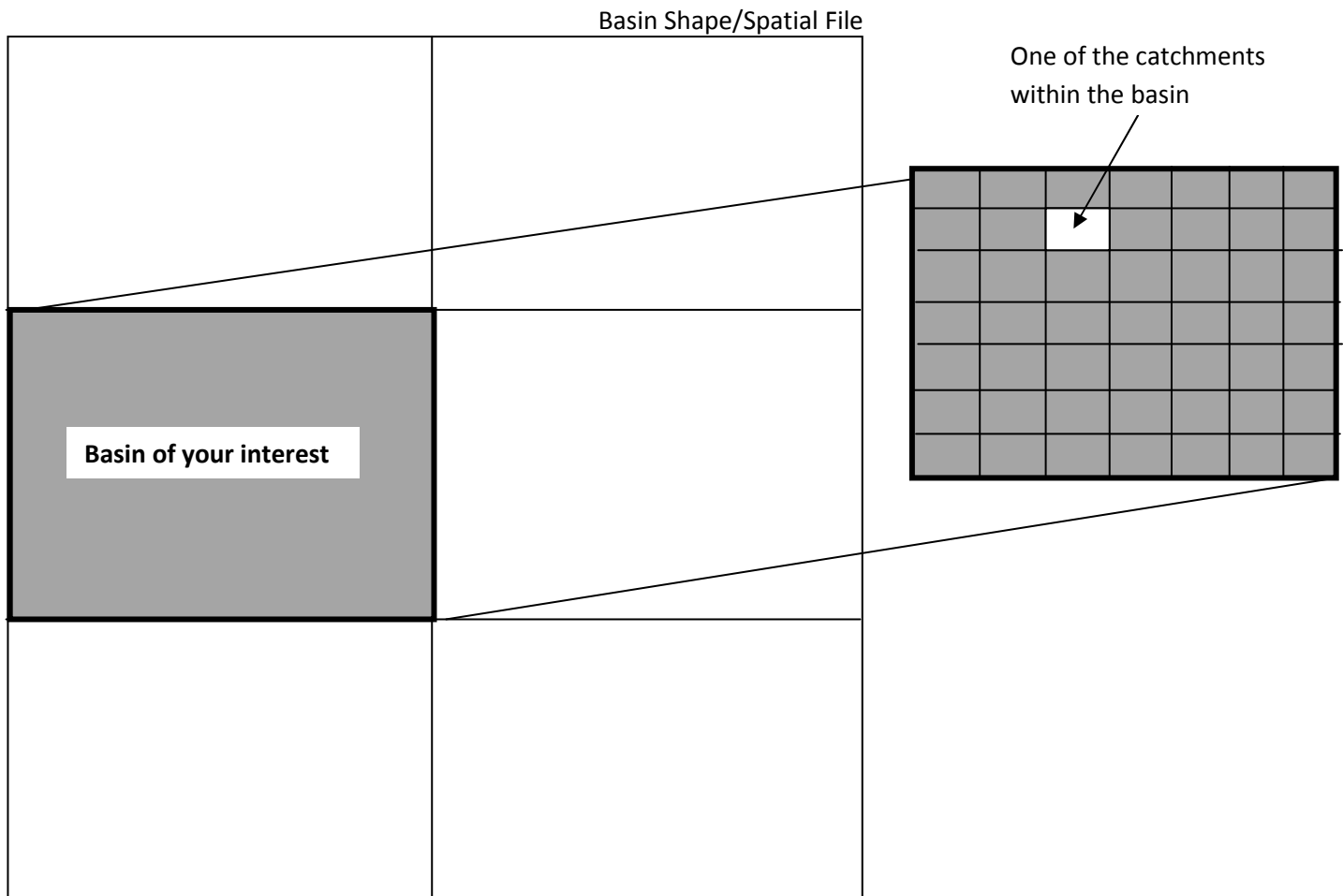
Step-3:

Use one of the existing techniques to order or name the stream network developed in step 2. For example, if you are using Strahler's method to order your stream network, you will end up with a network like the one shown below. There are many methods to order or name a stream network.

Therefore, you will have to do some research to determine the best method that is suited for the problem that you are solving.
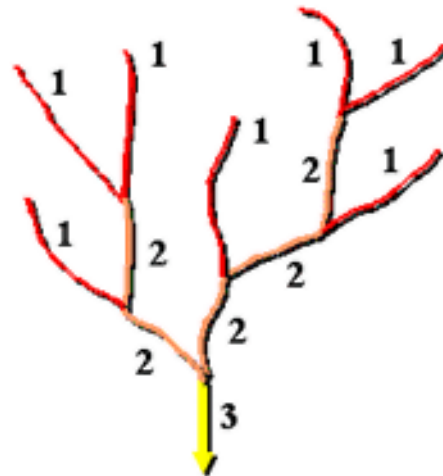
From ESRI's documentarian

Step-4:

Run your ML model, considering all the **catchments** that you have in your **basin**. Report the coefficient that is of your interest (e.g., NSE).

 Step-5:

Run your ML model, considering the catchments after removing the smallest stream number. If you are referring to the above figure, the smallest number will be 1. You can randomly remove the streams from the network.

Step-5-1:

    Assume that you have 500 catchments with "1". Assume that you have 10,000 catchments within your basin. You can run your ML model after removing those 500 catchments. In other words, you will have 10,000–500=9,500 catchments in your simulation. Report the coefficient that is of your interest (e.g., NSE).

Step-5-2:

    Assume that you have 500 catchments with "1". Assume that you have 10,000 catchments within your basin. You can run your ML model after removing one of those 500 catchments. You can randomly remove the catchment from the network. In other words, you will have 10,000-1=9,999 catchments in your simulation. You repeat this procedure by removing them one by one. In other words, your final simulation will have 10,000–500=9,500 catchments in your simulation. Report the coefficient that is of your interest (e.g., NSE). You will have an array of NSEs.

Step-6:

Run your ML model, considering the catchments after removing the next smallest stream number. If you are referring to the above figure, the next smallest number will be 2. You can randomly remove the streams from the network.

Step-6-1: Refer to Step-5-1

Step-6-2: Refer to Step-5-2

Step-7:

Continue your simulation work until you reach the largest stream number in your network. If you are referring to the above figure, the largest stream number will be 3.

Step-8:

Plot your NSEs and answer the question that has been raised.

In summary, a reverse algorithm needs to be developed to address the problem. Moreover, being conversant with spatial operations using products from ESRI or other vendors is required.