

# Terrain Processing and HMS-Model Development using GeoHMS

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## Introduction

This tutorial is designed to expose you to basic functions in HEC-GeoHMS (ArcGIS 10 version) to create input files for hydrologic modeling with HEC-HMS. It is expected that you are familiar with HEC-HMS and ArcGIS. If you want to get into details of HEC-GeoHMS that are not covered in this tutorial please refer to the HEC-GeoHMS users manual.

## Computer Requirements

You must have a computer with windows operating system, and the following programs installed:

1. ArcGIS 10 (with spatial analyst extension)
2. Arc Hydro tools (version that works with 10)
3. GeoHMS toolbar (version that works with 10)

Make sure correct versions of Arc Hydro and GeoHMS tools are installed on the system. Information on latest ArcHydro tools and their installation can be found on the ESRI Hydro Blog: <http://resources.arcgis.com/content/hydro>

Similarly, you can download the HEC-GeoHMS version from the following link:  
<http://www.hec.usace.army.mil/software/hec-geohms/download.html>

You will need to have administrative access to install these tools.

## Data Requirements and Description

The data files used in the exercise consist of DEM grid for Cedar Creek in northeast Indiana and the hydrography data (mainly stream network). Although the data are provided with this exercise, and the steps involved in downloading the NED and NHD data from the USGS website are described in the following document.

[http://web.ics.purdue.edu/~vmerwade/education/ned\\_nhd.pdf](http://web.ics.purdue.edu/~vmerwade/education/ned_nhd.pdf)

It is highly recommended that you go through the exercise of downloading the data to make yourself aware of the procedure involved.

**Download** the data from [ftp://ftp.ecn.purdue.edu/vmerwade/download/data/terrain\\_geohms.zip](ftp://ftp.ecn.purdue.edu/vmerwade/download/data/terrain_geohms.zip)

**Unzip** *terrain\_geohms.zip* in your working directory. The ArcCatalog-view of the data folder is shown below:

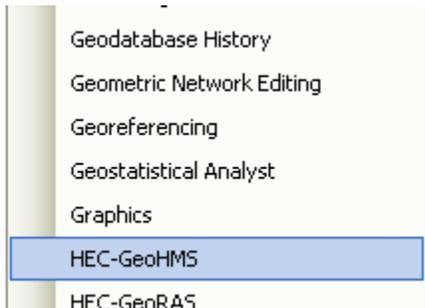


*cedar\_dem* is the raw 30 DEM for Cedar Creek obtained from USGS and clipped for the study watershed. The second dataset, *streams.shp*, is a shapefile containing stream network for the study area. Streams.shp is extracted from that national hydrography dataset (this is done by selecting the stream network for the watershed and exporting it to a shape file). Both raster *cedar\_dem* and *streams.shp* are already assigned a projected coordinate system (NAD\_1983\_UTM\_16).

**Note:** It is very critical to assign and use consistent coordinate system for all the datasets used in delineating watersheds by using any pre-processing tool.

## Getting Started

**Open** ArcMap. Create a new empty map. **Right click** on the menu bar to pop up the context menu showing available tools as shown below.



**Check** the HEC-GeoHMS menu.

You should now see the HEC-GeoHMS toolbar added to ArcMap as shown below. You can leave it floating or you may dock it in ArcMap.



**Note:** It is not necessary to load the Spatial Analyst by clicking Customize → Extensions..., and checking the box next to Spatial Analyst.

## Load the data to ArcMap

**Click** on the Add icon  to add the raster data. In the dialog box, **navigate** to the location of the data; **select** the raster file *cedar\_dem* containing the DEM for Cedar creek and **click** on the

Add button. The added file will then be listed in the Arc Map Table of contents. Similarly **add stream.shp**, and save the map document. Save the map document as *cedar.mxd*.

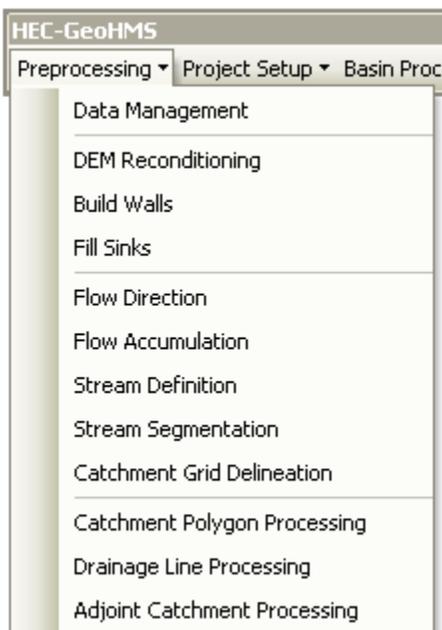
## Dataset Setup

All vector data created with GeoHMS will be stored in a new geodatabase that has the same name as the stored project or ArcMap document (unless pointed to an existing geodatabase) and in the same directory where the project has been saved (your working folder). By default, the new raster data are stored in a subdirectory with the same name as the dataset or Data Frame in the ArcMap document (called Layers by default and under the directory where the project is stored). The location of the vector, raster, and time series data can be explicitly specified using the function *ApUtilities* → *Set Target Locations*.

You can leave the default settings if they are pointing to the same directory where the ArcMap document is saved.

## Terrain Preprocessing

Terrain processing involves using the DEM to create a stream network and catchments. The Processing menu (shown below) in HEC-GeoHMS is used for terrain processing.



All the steps in the Preprocessing menu should be performed in sequential order, from top to bottom. All of the preprocessing must be completed to delineate the watershed for the HEC-HMS model. These steps are already covered in the Arc Hydro Terrain Processing tutorial ([http://web.ics.purdue.edu/~vmerwade/education/terrain\\_processing.pdf](http://web.ics.purdue.edu/~vmerwade/education/terrain_processing.pdf)). Towards the end of the ArcHydro Tutorial, you will have the following datasets:

### Raster Data

1. Raw DEM

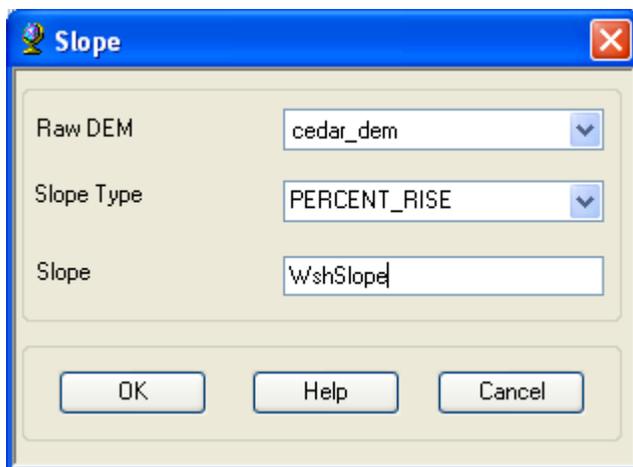
2. HydroDEM (DEM after reconditioning and filling sinks)
3. Flow Direction Grid
4. Flow Accumulation Grid
5. Stream Grid
6. Stream Link Grid
7. Catchment Grid

#### Vector Data

1. Catchment Polygons
2. Drainage Line Polygons
3. Adjoint Catchment Polygons

In addition to these datasets, go ahead and also get the slope grid by using the Arc Hydro Toolbar. To create a slope grid using Arc Hydro tools, **select** *Terrain Preprocessing* → *Slope*.

**Confirm** that the input as cedar\_dem, slope type is percent\_rise, and the output will be a slope grid with the default name WshSlopePct that can be overwritten.



This concludes the terrain processing part. What you have produced is a hydrologic skeleton that can now be used to delineate watersheds or sub-watersheds for any given point on delineated stream network. The next part of this tutorial involves, delineating a watershed to create a HEC-HMS model using HEC-GeoHMS. Save your map document.

## **HEC-HMS Modeling Development using HEC-GeoHMS**

Before you continue, please make sure you have the following datasets in the map document from the previous part.

#### Rasters

1. Cedar\_dem (raw DEM)
2. Fil (filled DEM)

3. Fdr (flow direction grid)
4. Fac (flow accumulation grid)
5. Str (stream network grid)
6. StrLnk (stream link grid) (Note: earlier version of ArcHydro names this grid as Lnk)
7. Cat (catchment grid)
8. WshSlopePct (slope grid)

#### Vectors

1. Catchment
2. DrainageLine
3. AdjointCatchment

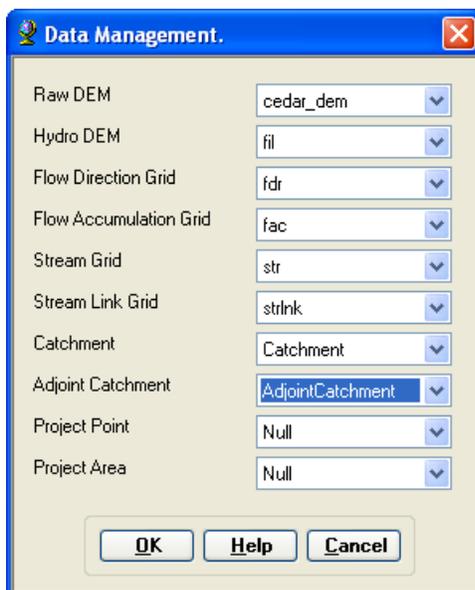
**Save** the map document.

## **HEC-GeoHMS Project Setup**

*The HEC-GeoHMS project setup menu has tools for defining the outlet for the watershed, and delineating the watershed for the HEC-HMS project. As multiples HMS basin models can be developed by using the same spatial data, these models are managed by defining two feature classes: *ProjectPoint* and *ProjectArea*. Management of models through *ProjectPoint* and *ProjectArea* let users to see areas for which HMS basin models are already created, and also allow users to re-create models with different stream network threshold. It is also convenient to delete projects and associated HMS files through *ProjectPoint* and *ProjectArea* option.*

### **Dataset Setup**

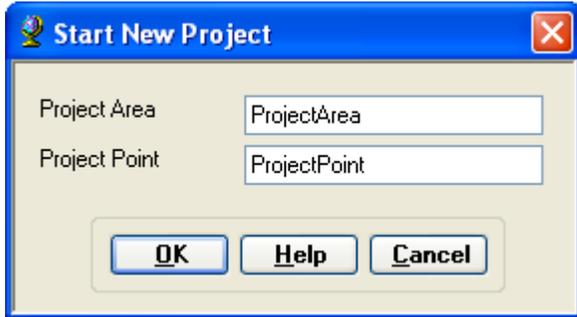
**Select** *HMS Project Setup* → *Data Management* on the HEC-GeoHMS Main View toolbar. **Confirm/define** the corresponding map layers in the Data Management window as shown below:



Click *OK*.

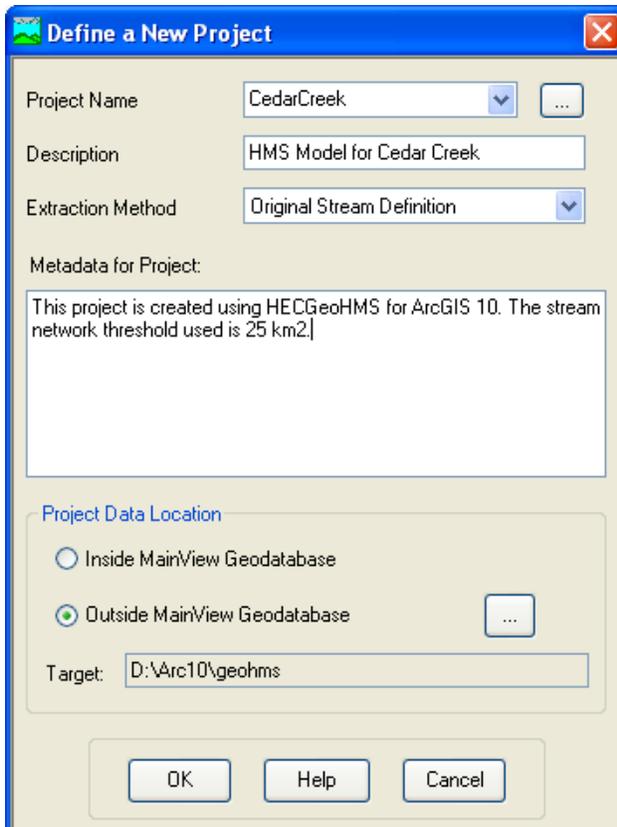
### Creating New HMS Project

Click on *Project Setup* → *Start New Project*. **Confirm** *ProjectArea* for ProjectArea and *ProjectPoint* for ProjectPoint, and click *OK*.



(**Note:** For some reason, if you get an error message about accuracy/resolution of the data, this has to do with tolerances for x,y,m,z coordinates in your spatial coordinates which you need to fix in ArcCatalog)

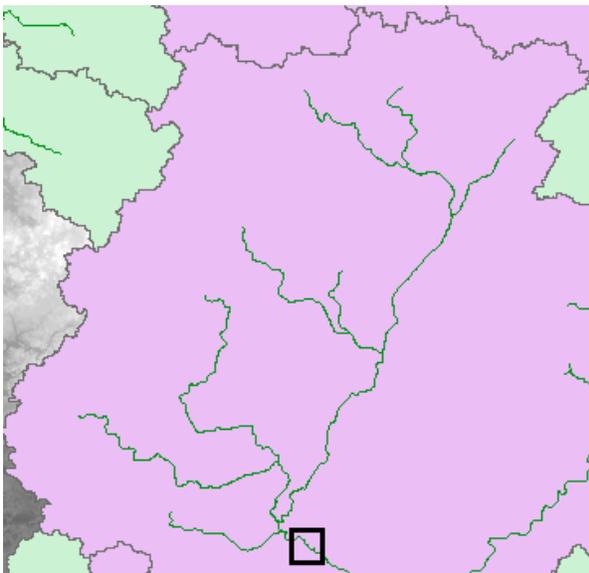
This will create ProjectPoint and ProjectArea feature classes. In the next window, provide the following inputs:



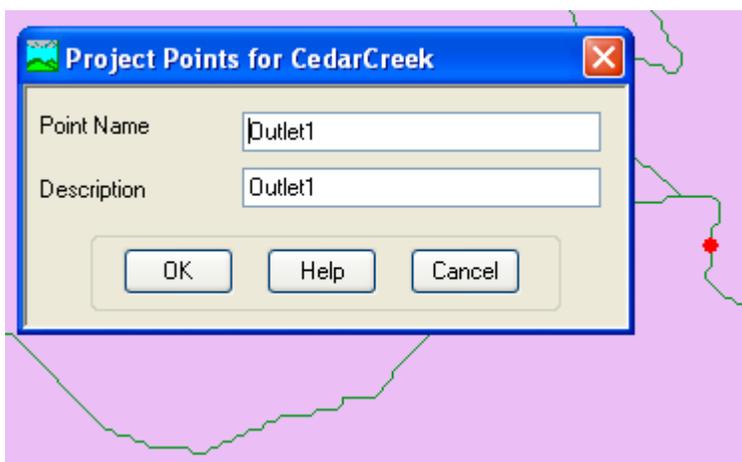
If you click on Extraction Method drop-down menu, you will see another option “A new threshold” which will delineate streams based on this new threshold for the new project. For now **accept** the default original stream definition option. You can write some metadata if you wish, and finally **choose** the outside MainView Geodatabase for Project Data Location, and **browse** to your working directory where *cedar.mxd* is stored. **Click OK**.

**Click OK** on the message regarding successful creation of the project. You will see that new feature classes *ProjectArea* and *ProjectPoint* are added to ArcMap’s table of contents. These feature classes are added to the same geodatabase cedar.gdb.

Next **Zoom-in** to downstream section of the Cedar creek to define the watershed outlet as shown below:

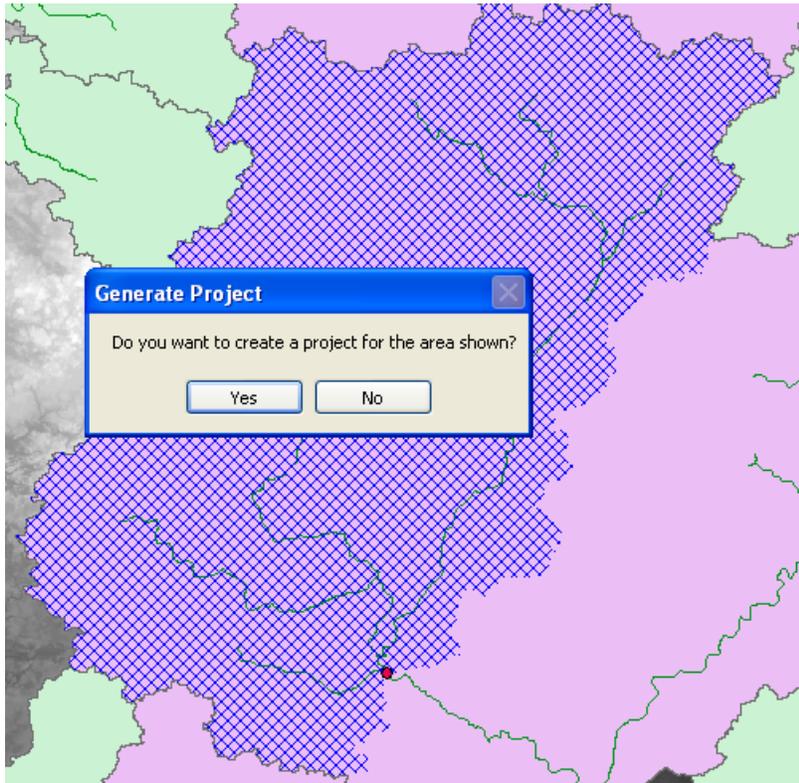


Select the *Add Project Points* tool  on the HEC-GeoHMS toolbar, and **click** on the downstream outlet area of the cedar creek to define the outlet point as shown below as red dot:



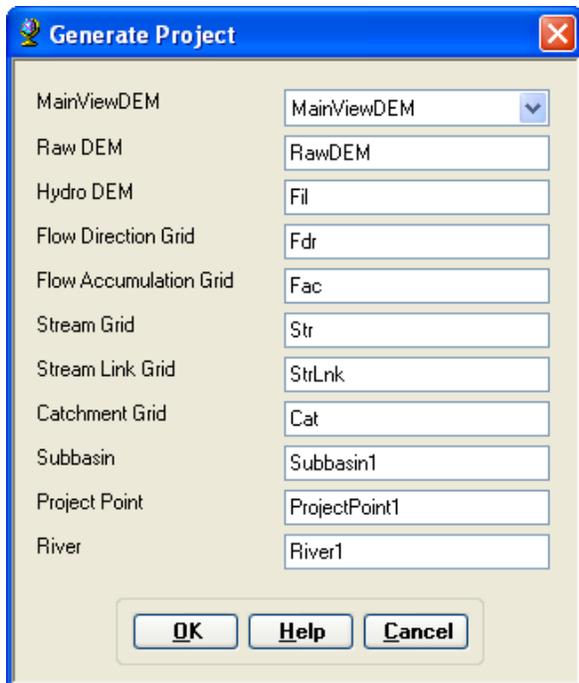
**Accept** the default Point Name and Description (*Outlet*), and **click OK**. This will add a point for the watershed outlet in the *ProjectPoint* feature class. **Save** the map document.

Next, **select** *HMS Project Setup* → *Generate Project*. This will create a mesh (by delineating watershed for the outlet in Project Point), and display a message box asking if you want to create a project for this hatched area as shown below:



(**Note:** This part could be challenging sometimes. If you face problem in creating Project Area, just delineate a watershed using the point delineation tool  in Arc Hydro for the Project Point feature, and load this watershed polygon into ProjectArea feature class. Make sure the HydroID of ProjectArea is same as ProjectID of ProjectPoint. Also you need to make sure the name and description match with each other)

**Click Yes** on the message box. Next, **confirm** the layer names for the new project (leave default names for Subbasin, Project Point, River and BasinHeader), and **click OK**.



This will create a new folder inside your working folder with the name of the project *CedarCreek*, and store all the relevant raster, vector and tabular data inside this folder. The raster data are stored in a sub folder with the project name (*CedarCreek*) inside *CedarCreek* folder. All vector and tabular data are stored in *CedarCreek.mdb*. You will also notice that a new data frame (*CedarCreek*) is added in ArcMap containing data for cedar creek.

You can also play with the contributing area tool  to find out contributing area at different points in the cedar creek stream network. With *lnk* grid active, **select** the contributing area tool, and **click** at any point along the stream to know the contributing area.

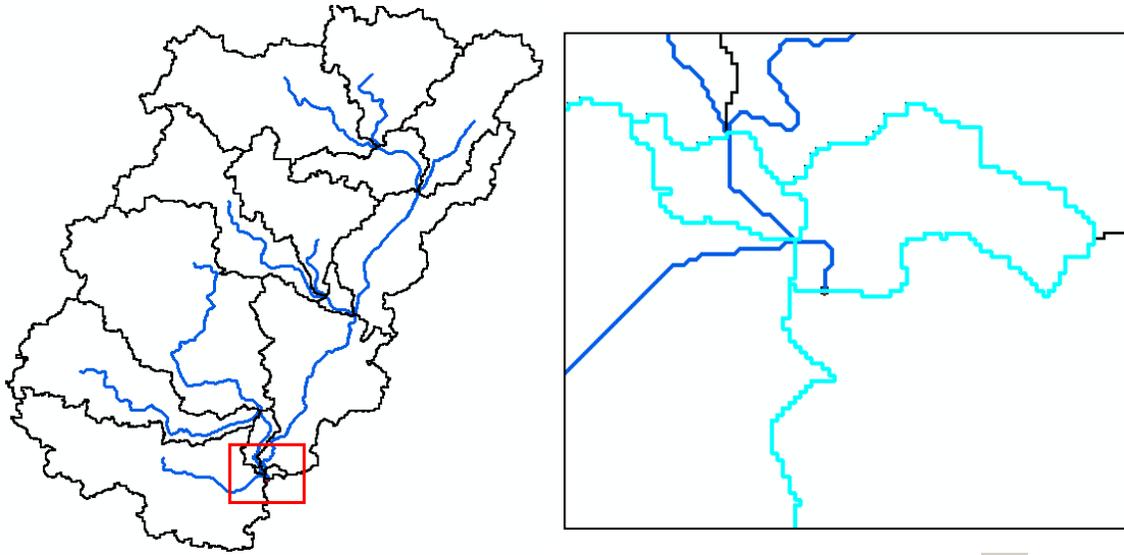
**Save** the map document.

## Basin Processing

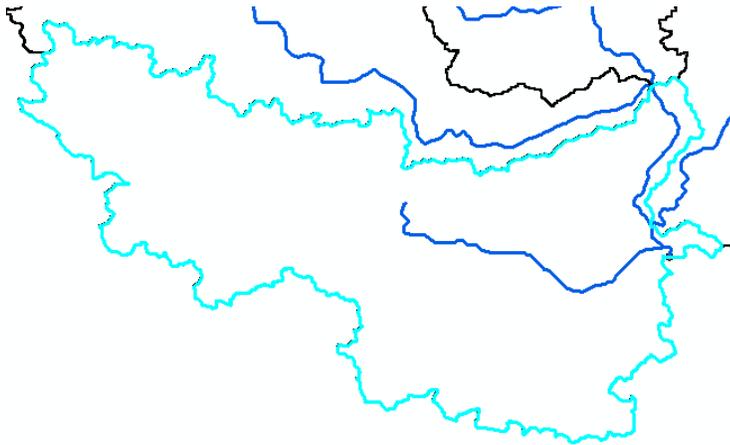
The basin processing menu has features such as revising sub-basin delineations, dividing basins, and merging streams.

### Merge Basins

This process merges two or more adjacent basins into one. **Zoom-in** to the area marked in the rectangle below:



**Select** the three adjacent basins (shown above) using the standard select tool . **Click** on *Basin Processing* → *Basin Merge*. You will get a message asking to confirm the merging of selected basins (with basins hatched in background), **click Yes**. Similarly merge two more sub-basins as shown below:



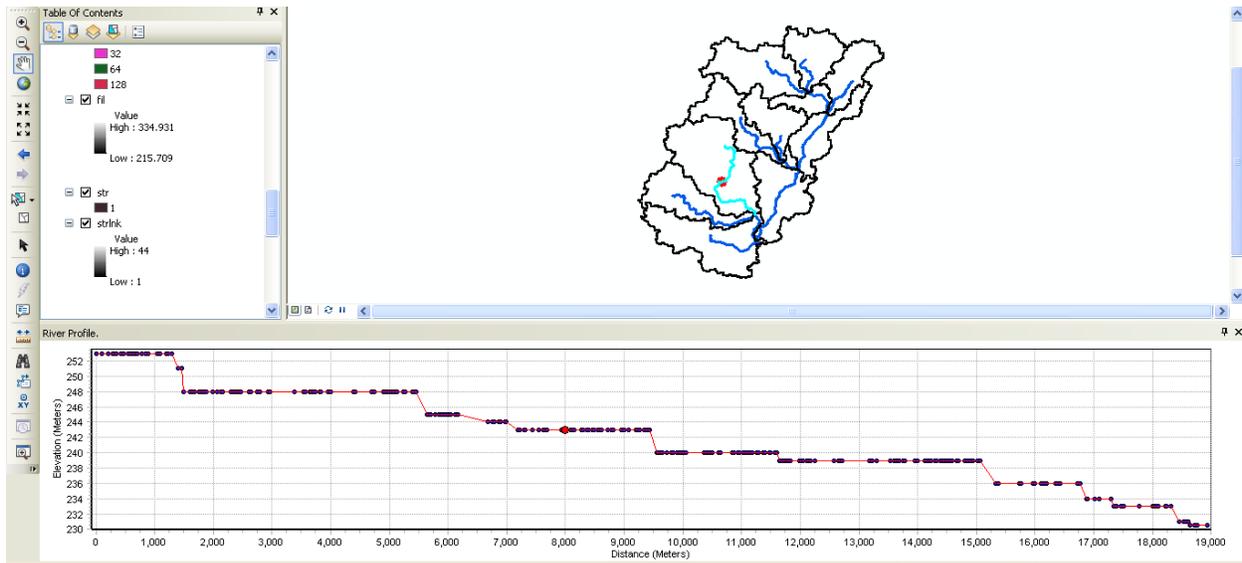
As a result of this merging, we now have 12 sub-basins and 15 river segments in the project. **Save** the map document.

### River Profile

(**Note:** we will only look at the functionality of river profile tool, and not split river/basin using this tool.)

The River Profile tool  allows displaying the profile of selected river reach(es). If the river slope changes significantly over the reach length, it may be useful to split the river/watershed at

such a slope change. **Select** the *River Profile* tool , and **click** on any river segment that you are interested in inspecting. **Confirm** the layers in the next window, and **click OK**. This will invoke a dockable window in ArcGIS at the bottom that will display the profile of the selected reach. If you **click** at a point along the profile, a corresponding point showing its location on the river reach will be added to the map display (shown below as red dot).



If you want to split the river segment at the selected point, you can just right click on the point inside the dockable window and split the river. If you want to split the sub-basin at the point displayed in the map, you can use the subbasin divide  tool, and click at the point displayed on the map. We will not split any river segments in this exercise.

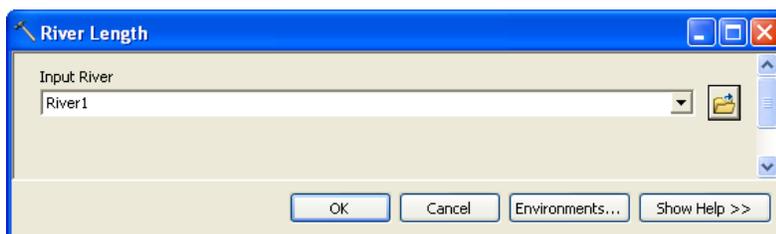
**Close** the dockable window, and **save** the map document.

## Extracting Basin Characteristics

The basin characteristics menu in the HEC-GeoHMS Project View provide tools for extracting physical characteristics of streams and sub-basins into attribute tables.

### River Length

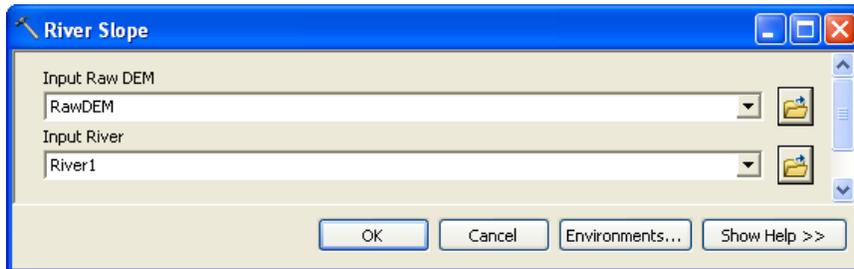
This tool computes the length of river segments and stores them in *RiverLen* field. **Select Characteristics**→*River Length*. **Confirm** the input River name, and **click OK**.



You can check the RiverLen field in the input River1 (or whatever name you have for your input river) feature class is populated. **Save** the map document.

## River Slope

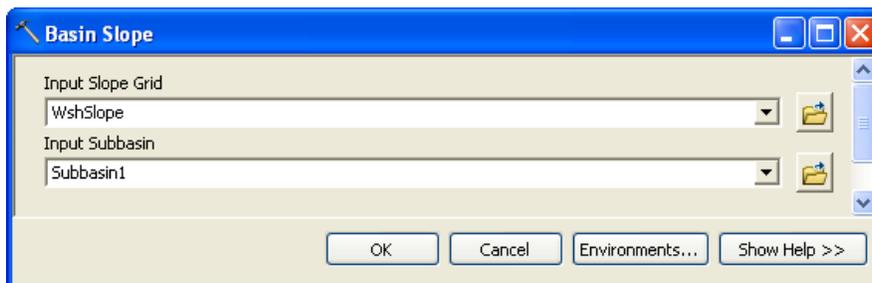
This tool computes the slope of the river segments and stores them in *Slp* field. **Select** *Basin Characteristics*→*River Slope*. **Confirm** inputs for RawDEM and River, and **click** *OK*.



You can check the *Slp* field in the input *River1* (or whatever name you have for your input river) feature class is populated. Fields *ElevUP* and *ElevDS* are also populated during this process.  $Slp = (ElevUP - ElevDS)/RiverLen$ .

## Basin Slope

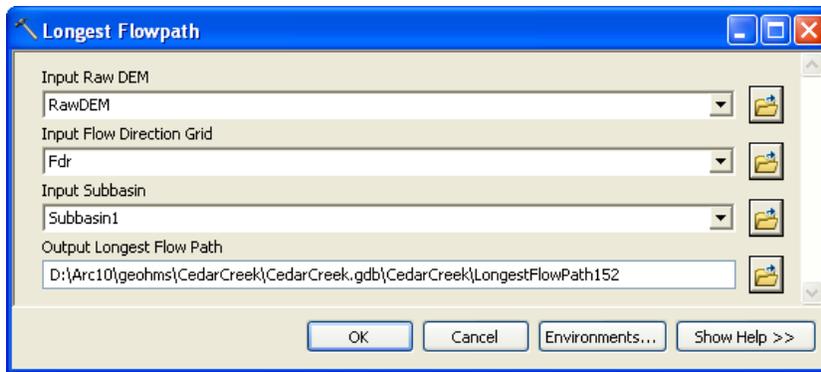
This tool computes average slope for sub-basins using the slope grid and sub-basin polygons. **Add** *wshslopepct* (percent slope for watershed) grid to the map document. **Select** *Characteristics*→*Basin Slope*. **Confirm** the inputs for Subbasin and Slope Grid, and **click** *OK*.



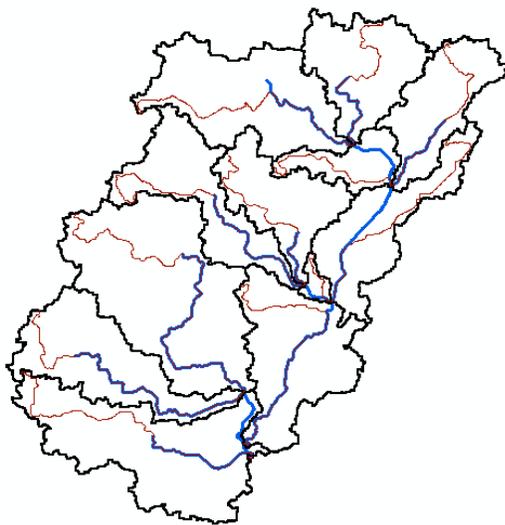
After the computations are complete, the *BasinSlope* field in the input Subbasin feature class is populated.

## Longest Flow Path

This will create a feature class with polyline features that will store the longest flow path for each sub-basin. **Select** *Characteristics*→*Longest Flow Path*. **Confirm** the inputs, and leave the default output name *LongestFlowPath* unchanged. **Click** *OK*.



A new feature class storing longest flow path for each sub-basin is created as shown below.

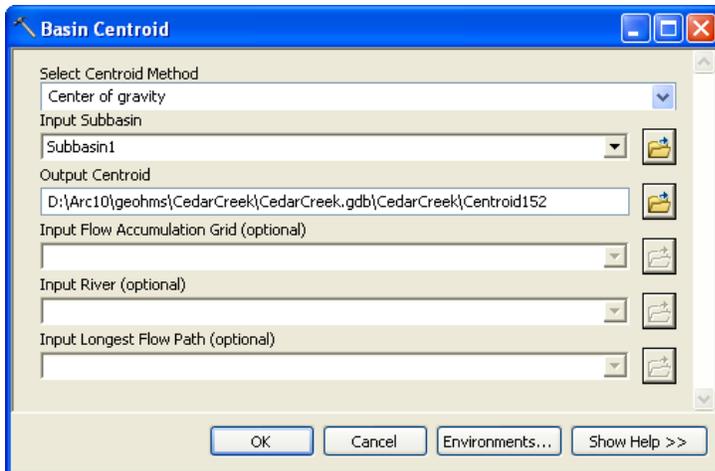


**Open** the attribute table of Longest Flow Path, and examine its attributes. **Close** the attribute table, and **save** the map document.

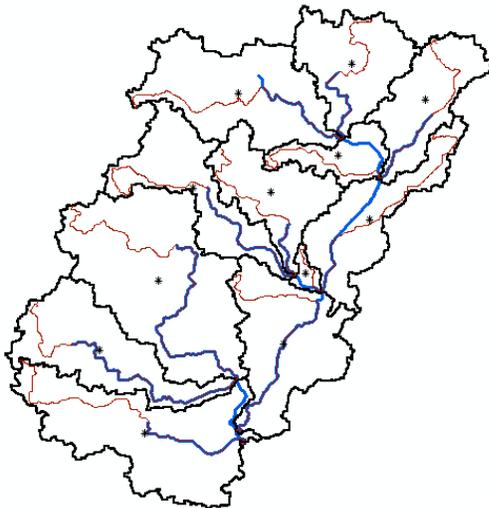
### **Basin Centroid**

This will create a *Centroid* point feature class to store the centroid of each sub-basin. Select *Characteristics*→*Basin Centroid*. **Choose** the default *Center of Gravity Method*, input Subbasin, leave the default name for Centroid. Click OK.

(Note: Center of Gravity Method computes the centroid as the center of gravity of the sub basin if it is located within the sub basin. If the Center of Gravity is outside, it is snapped to the closest boundary. Longest Flow Path Method computes the centroid as the center of the longest flow path within the sub basin. The quality of the results by the two methods is a function of the shape of the sub basin and should be evaluated after they are generated.)



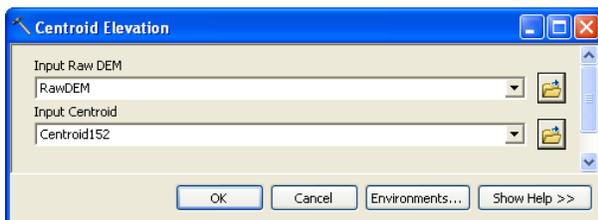
A point feature class showing centroid for each sub-basin is added to the map document.



As centroid locations look reasonable, we will accept the center of gravity method results, and proceed. **Save** the map document.

### Basin Centroid Elevation

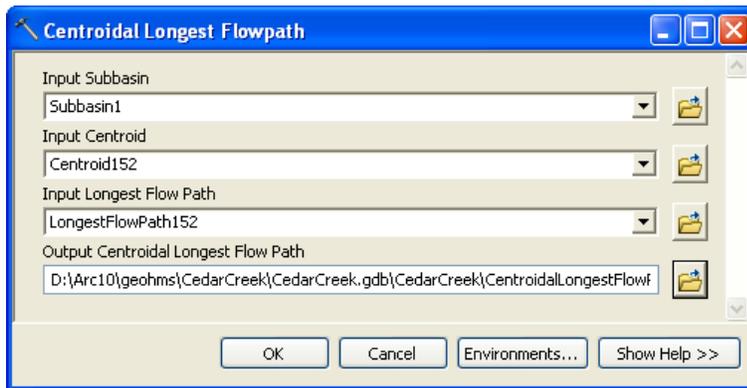
This will compute the elevation for each centroid point using the underlying DEM. **Select Characteristics** → **Centroid Elevation Update**. **Confirm** the input DEM and centroid feature class, and **click OK**.



After the computations are complete, **open** the attribute table of Centroid to examine the Elevation field. The centroid elevation update may be needed when none of the basin centroid methods (center of gravity or longest flow path) provide satisfactory results, and it becomes necessary to edit the Centroid feature class and move the centroids to a more reasonable location manually.

### Centroidal Longest Flow Path

**Select** *Characteristics* → *Centroidal Longest Flow Path*. **Confirm** the inputs, and leave the default name for output Centroidal Longest Flow Path, and **Click OK**.



This creates a new polyline feature class showing the flowpath for each centroid point along longest flow path. **Save** the map document.

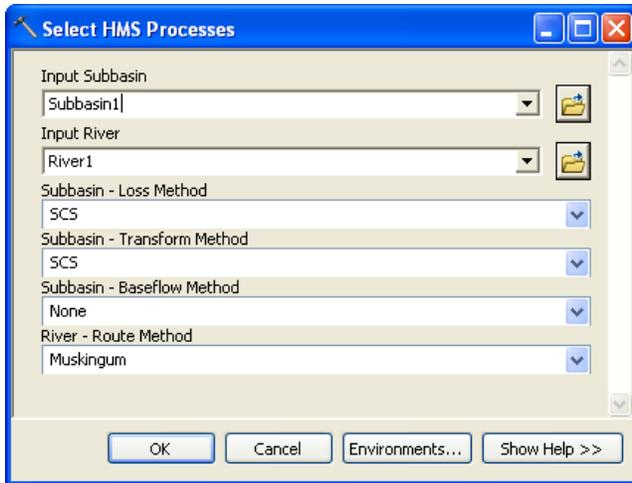
### HMS Inputs/Parameters

The hydrologic parameters menu in HEC-GeoHMS provides tools to estimate and assign a number of watershed and stream parameters for use in HMS. These parameters include SCS curve number, time of concentration, channel routing coefficients, etc.

### Select HMS Processes

You can specify the methods that HMS should use for transform (rainfall to runoff) and routing (channel routing) using this function. Of course, this can be modified and/or assigned inside HMS.

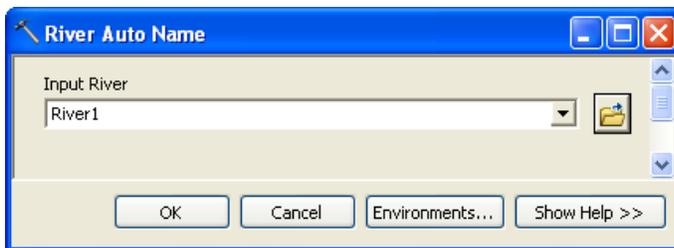
**Select** *Hydrologic Parameters* → *Select HMS Processes*. **Confirm** input feature classes for Subbasin and River, and **click OK**. Choose *SCS* for Loss Method (getting excess rainfall from total rainfall), *SCS* for Transform Method (for converting excess rainfall to direct runoff), *None* for Baseflow Type, and *Muskingum* for Route Method (channel routing). **Click OK**.



You can **open** the attribute table of subbasin feature class to see that the subbasin methods are added to *LossMet*, *TransMet*, and *BaseMet* fields, respectively. The Muskingum method is added to *RouteMet* field in the River feature class. You can treat these methods as tentative which can be changed in HMS model. **Save** the map document.

### River Auto Name

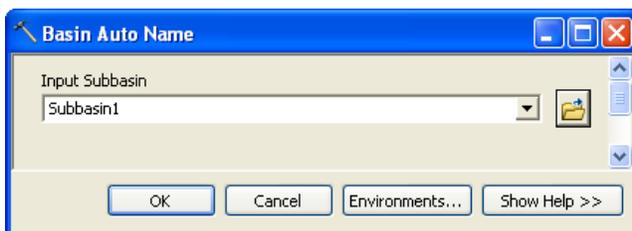
This function assigns names to river segments. **Select Parameters**→*River Auto Name*. **Confirm** the input feature class for River, and **click OK**.



The *Name* field in the input River feature class is populated with names that have “R###” format, where “R” stands for river/reach “###” is an integer.

### Basin Auto Name

This function assigns names to sub-basins. **Select Parameters**→*Basin Auto Name*. **Confirm** the input feature class for sub-basin, and **click OK**.

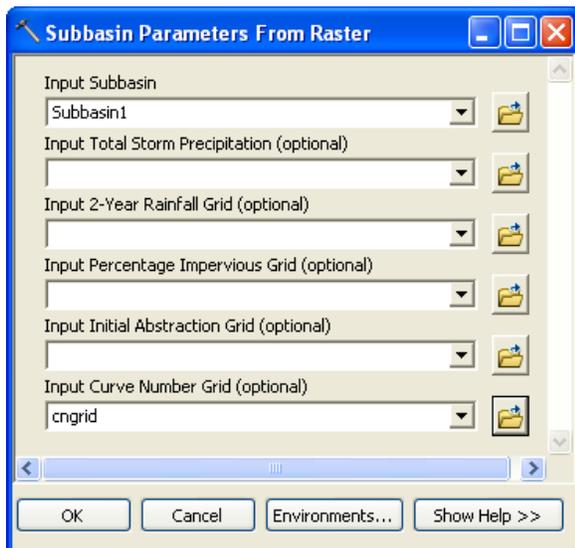


Like river names, the *Name* field in the input Subbasin feature class is populated with names that have “W####” format, where “W” stands for watershed, and “####” is an integer. **Save** the map document.

## Sub-basin Parameters

Depending on the method (HMS process) you intend to use for your HMS model, each sub-basin must have parameters such as SCS curve number for SCS method and initial loss constant, etc. These parameters are assigned using Subbasin Parameters option. This function overlays subbasins over grids and compute average value for each basin. We will explore only those parameters that do not require additional datasets or information.

**Add** *cngrid* (curve number grid) from Layers folder to the map document. **Select** *Hydrologic Parameters* → *Subbasin Parameters*. You will get a menu of parameters that you can assign. **Uncheck** all parameters and **check** *BasinCN* as shown below, and Click OK.



**Confirm** the inputs for Subbasin and Curve Number Grid, and **click** OK.

After the computations are complete, you can **open** the attribute table for subbasin, and see that a field named *BasinCN* is populated with average curve number for each sub-basin. **Close** the attribute table, and **save** the map document.

(**Note:** We will skip parameters associated with computing rainfall as these numbers should come from detailed analysis of the watershed. However, if you are interested, you can explore these functions because you have all the necessary data for their execution.)

SCS Curve Number is extracted using a grid, but parameters can also be extracted by using a feature class and its intersection with subbasins by using the Subbasin Parameters from Features option, but this option is not described in this exercise.

## CN Lag Method

The function computes basin lag in hours (weighted time of concentration or time from the center of mass of excess rainfall hyetograph to the peak of runoff hydrograph) using the NRCS National Engineering Handbook (1972) curve number method. **Select** *Hydrologic Parameters* → *CN Lag Method*. This function populates the *BasinLag* field in the subbasin feature class with numbers that represent basin lag time in hours. **Save** the map document.

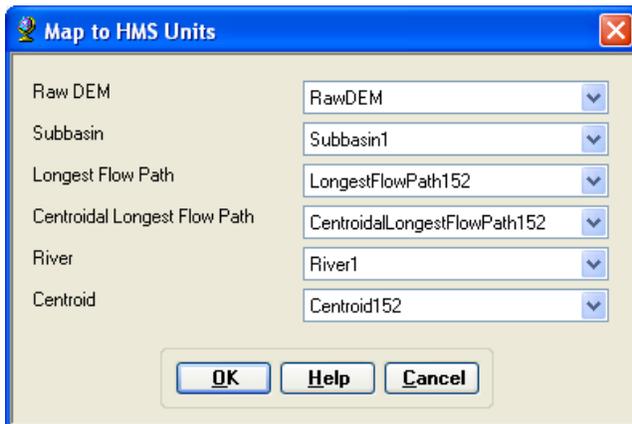
Take a look at attribute tables of River and Subbasin feature class to see what fields are populated, and what they mean in hydrologic modeling.

## HMS

The HMS menu has tools for creating input files for HEC-HMS.

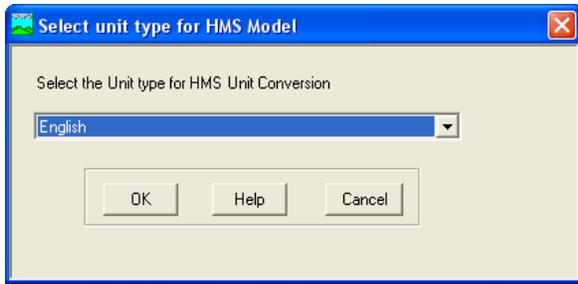
### Map to HMS Units

This tool is used to convert units. **Click** on *HMS* → *Map to HMS Units*. **Confirm** the input files, and **click** *OK*.



(**Note:** Due to some unknown reasons, if you get an error message at this point saying field cannot be added to a layer, save the map document, exit ArcMap and open the document, and try again)

In the next window, **choose** *English* units (default) from the drop-down menu, and **click** *OK*.

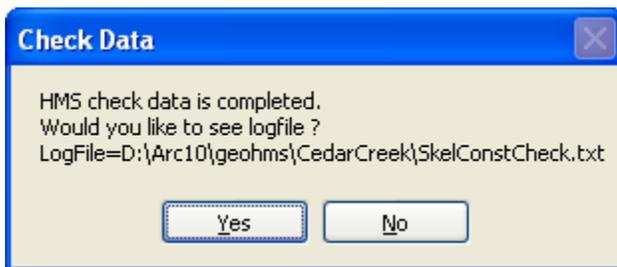


After this process is complete, you will see new fields in both River and Subbasin feature classes that will have fields ending with “\_HMS” to indicate these fields store attributes in the specified HMS units (English in this case). All fields that store lengths and areas will have corresponding “\_HMS” fields as a result of this conversion.

### Check Data

This tool will verify all the input datasets. **Select HMS** → **Check Data**. **Confirm** the input datasets to be checked, and **click OK**.

You should get a message after the data check saying the check data is completed successfully as shown below.



You can also look at the log file and make sure there are no errors in the data by scrolling to the bottom of the log file as shown below.

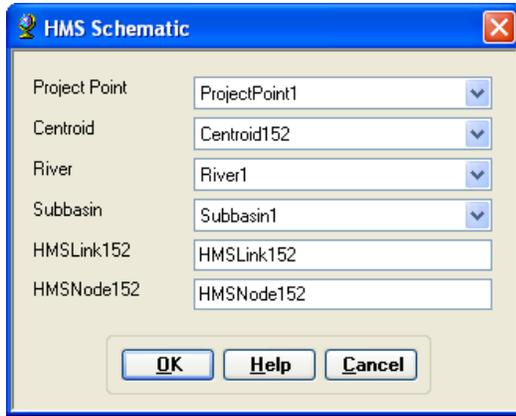
```
CHECKING SUMMARY
*****

Unique names           - no problems.
River containment      - no problems.
Center containment     - no problems.
RIVER connectivity    - no problems.
VIP relevance          - no problems.
```

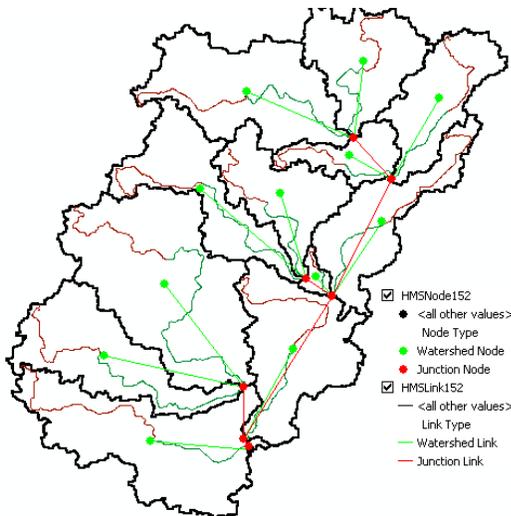
If you get problems in any of the above four categories (names, containment, connectivity and relevance), you can look at the log file to identify the problem, and fix them by yourself. This version of HecGeoHMS apparently gives error with river connectivity even if the rivers are well connected. Therefore, check the data carefully, and if you think everything is OK, ignore the errors (if you get any for connectivity) and proceed.

### HMS Schematic

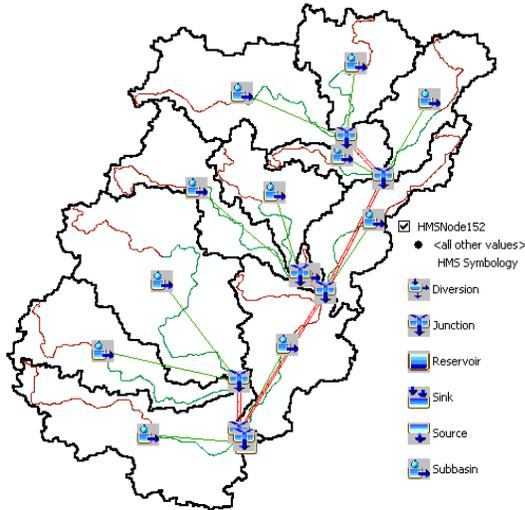
This tool creates a GIS representation of the hydrologic system using a schematic network with basin elements (nodes/links or junctions/edges) and their connectivity. **Select HMS→HMS Schematic.** **Confirm** the inputs, and **click OK.**



Two new feature classes *HMS Link* and *HMSNode* will be added to the map document.



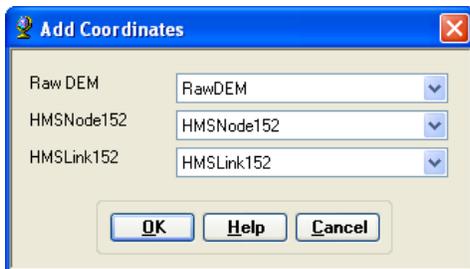
After the schematic is created, you can get a feel of how this model will look like in HEC-HMS by toggling/switching between regular and HMS legend. **Select HMS→Toggle HMS Legend→HMS Legend**



You can keep whatever legend you like. **Save** the map document.

### Add Coordinates

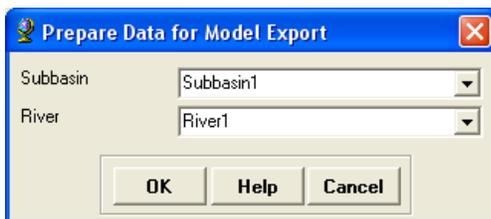
This tool attaches geographic coordinates to features in *HMSLink* and *HMSNode* feature classes. This is useful for exporting the schematic to other models or programs without losing the geospatial information. **Select** *HMS*→*Add Coordinates*. **Confirm** the input files, and **click** *OK*.



The geographic coordinates including the “z” coordinate for nodes are stored as attributes (CanvasX, CanvasY, and Elevation) in *HMSLink* and *HMSNode* feature classes.

### Prepare Data for Model Export

**Select** *HMS*→*Prepare Data for Model Export*. **Confirm** the input Subbasin and River files, and **click** *OK*.



This function allows preparing subbasin and river features for export.

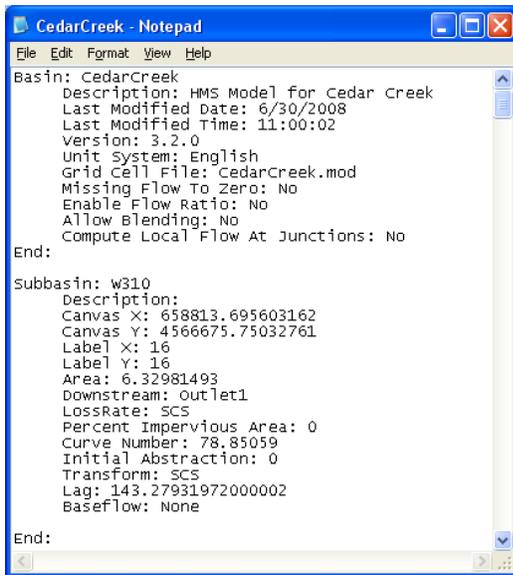
## Background Shape File

**Select HMS**→*Background Shape File*. This function captures the geographic information (x,y) of the subbasin boundaries and stream alignments in a text file that can be read and displayed within HMS. Two shapefiles: one for river and one for sub-basin are created in the project folder. **Click OK** on the process completion message box.

## Basin Model

**Select HMS**→*Basin Model File*. This function will export the information on hydrologic elements (nodes and links), their connectivity and related geographic information to a text file with .basin extension. The output file *CedarCreek.basin* (project name with .basin extension) is created in the project folder. **Click OK** on the process completion message box.

You can also open the .basin file using Notepad and examine its contents.



```
CedarCreek - Notepad
File Edit Format View Help
Basin: CedarCreek
Description: HMS Model For Cedar Creek
Last Modified Date: 6/30/2008
Last Modified Time: 11:00:02
Version: 3.2.0
Unit System: English
Grid Cell File: CedarCreek.mod
Missing Flow To Zero: No
Enable Flow Ratio: No
Allow Blending: No
Compute Local Flow At Junctions: No
End:
Subbasin: w310
Description:
Canvas X: 658813.695603162
Canvas Y: 4566675.75032761
Label X: 16
Label Y: 16
Area: 6.32981493
Downstream: Outlet1
LossRate: SCS
Percent Impervious Area: 0
Curve Number: 78.85059
Initial Abstraction: 0
Transform: SCS
Lag: 143.27931972000002
Baseflow: None
End:
```

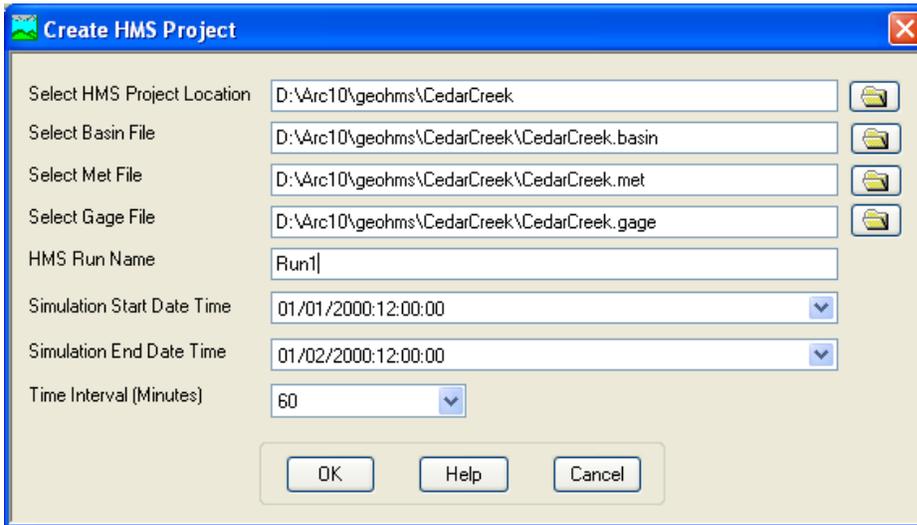
## Meteorologic Model

We do not have any meteorologic data (temperature, rainfall etc) at this point. We will only create an empty file that we can populate inside HMS. **Select HMS**→*Met Model File*→*Specified Hyetograph*. The output file *CedarCreek.met* (project name with .met extension) is created in the project folder. **Click OK** on the process completion message box.

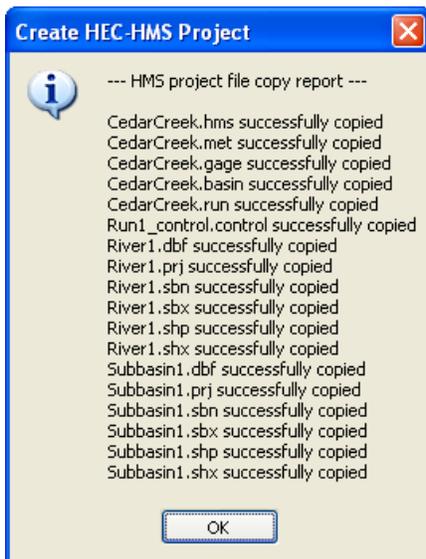
You can also open the .met file using Notepad and examine its contents.

## HMS Project

This function copies all the project specific files that you have created (.met, .map, and .met) to a specified directory, and creates a .hms file that will contain information on other files for input to HMS. **Select HMS→Create HMS Project.** Provide locations for all files. Even if we did not create a gage file, there will be a gage file created when the met model file is created. Give some name for the Run, and leave the default information for time and time interval unchanged. This can be changed in HEC-HMS based on the event you will simulate. **Click OK.**



If a .hms file already exist in that folder, you may get a message asking you to overwrite or not. After you respond to that message a project file report will be displayed as shown below:

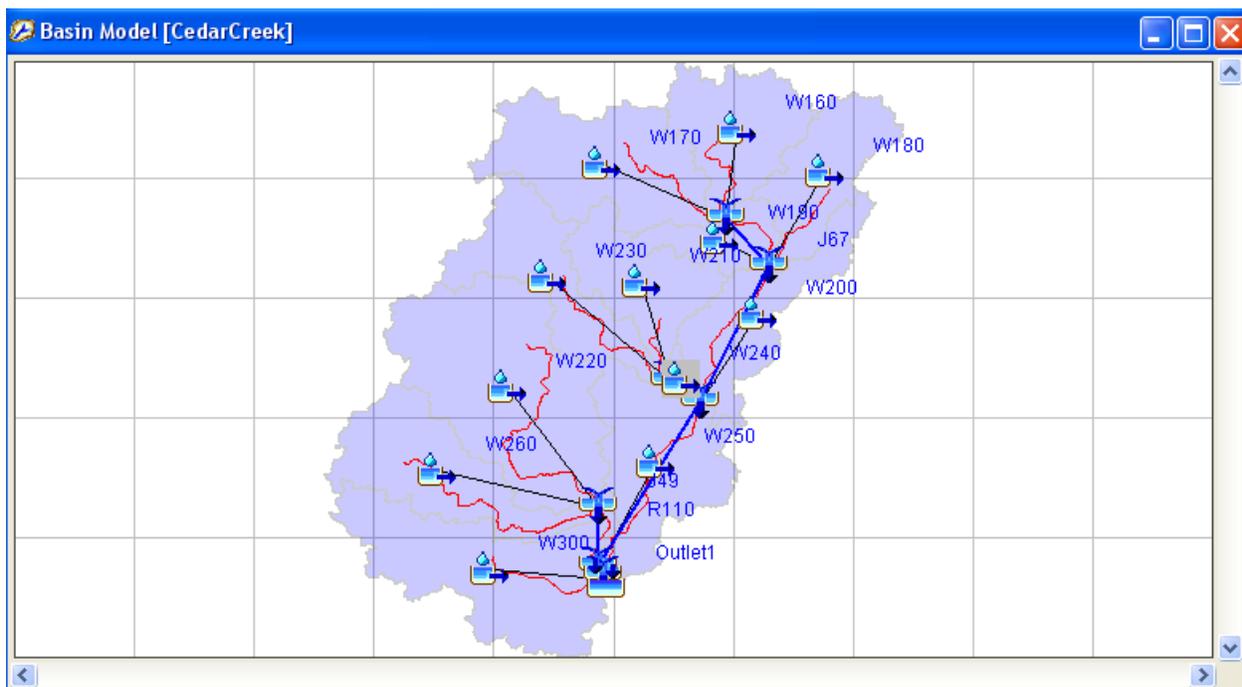


This set of files displayed in project report defines the HMS project that you can open and manipulate in HMS directly without interacting with GIS. Typically, you will have to modify meteorologic and basin files to reflect field conditions before actually running the HMS model. **Close** the report. **Save** the map document.

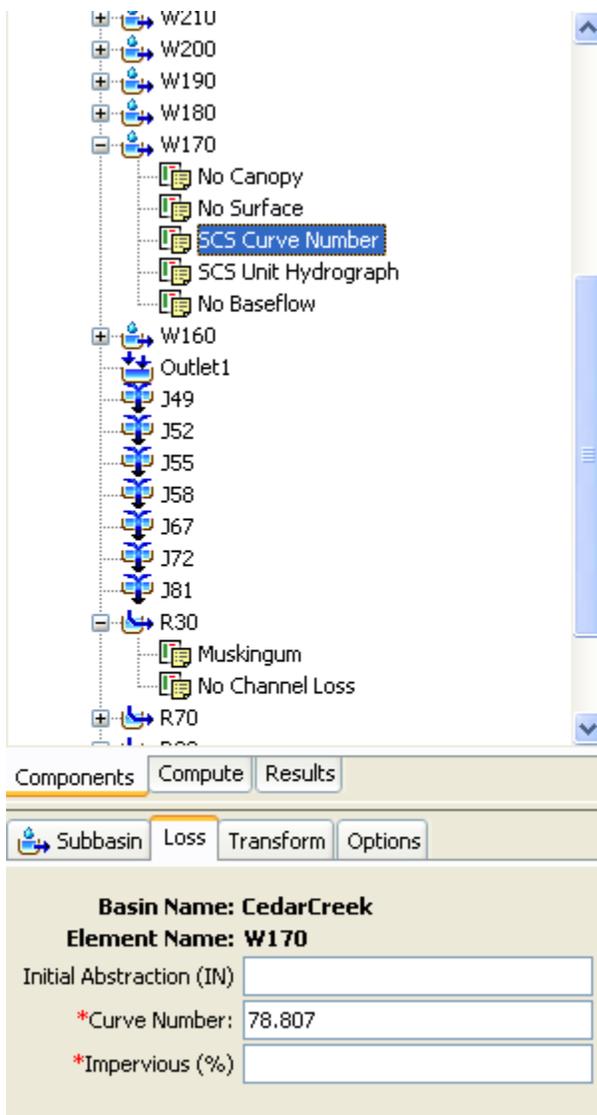
## Opening the HMS Model

This section briefly explains how to interface or open the project files created by GeoHMS using HMS.

**Open** *HEC-HMS*, and **select** *File*→*Open*. **Browse** to *CedarCreek.hms* file, and **click** *Open*. You will see that two folders: *Basin Models* and *Meteorologic Models* will be added to the *Watershed Explorer* (window on top-left) in *HEC-HMS*. **Expand** the *Basin Models* folder and **click** on *CedarCreek*. This will display the Cedar creek schematic. Click on *View*→*Background Map*, and then add the river and basin shapefiles to see the watershed as shown below. basin along with its sub-basins, streams, links and junctions as shown below.



If you expand the CedarCreek basin in watershed explorer, you will see the list of junctions, reaches and subbasins. You can click on any reach and see its associated methods. For example, when you **click** on a Reach (R##), you will see that *Muskingum* routing method is associated with it. Similarly, if you **click** on a Watershed (W##), you will see *SCS Curve Number* (for abstractions) and *SCS Unit Hydrograph* (for runoff calculations) are associated with it. Again, if you **click** on *SCS Curve Number*, you will see corresponding parameters in the *Component Window* as shown below. All this information, which is now independent of GIS, is extracted from attributes that we created in HEC-GeoHMS.



Manipulating data in HMS, populating the Meteorologic file, and running the model is beyond the scope of this tutorial, and will be covered in other tutorial. **Save** your HMS project.

OK, you are done for now!!