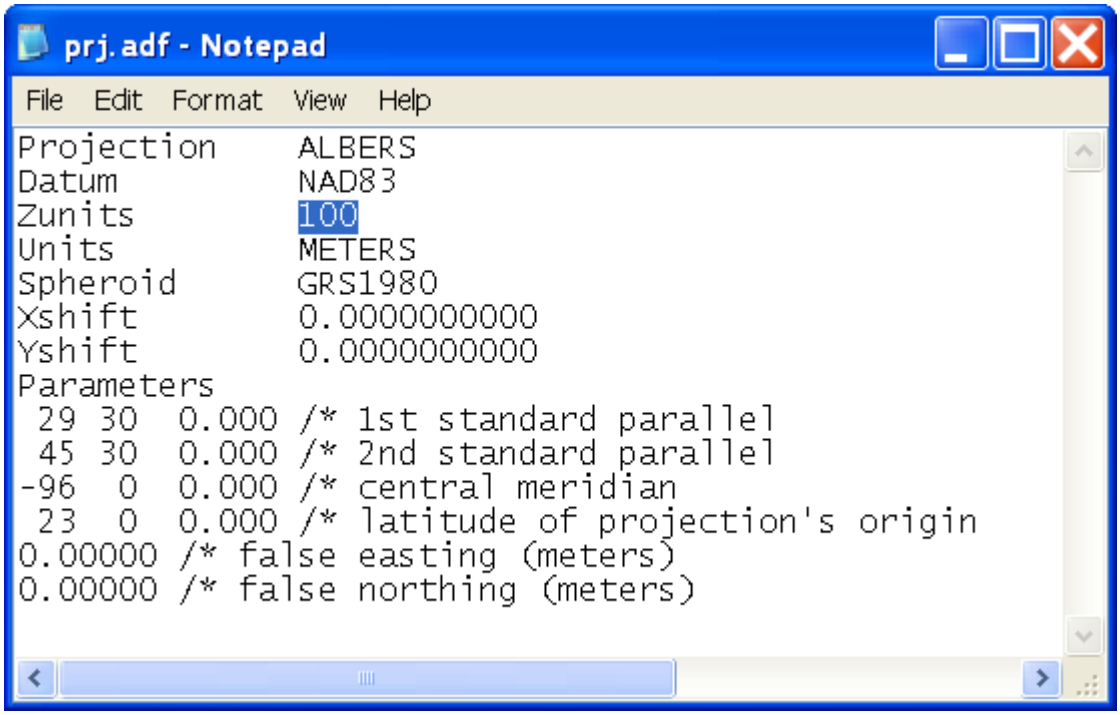
Exercise # 7: Watershed Delineation Using NHDPlus and the ArcHydro Tools – Last Updated 4/30/2008

This exercise requires the ArcHydro tools. If the ArcHydro tools have not yet been installed, see NHDPlus Exercise 0: Preparation.

Preprocessing NHDPlus Production-unit data

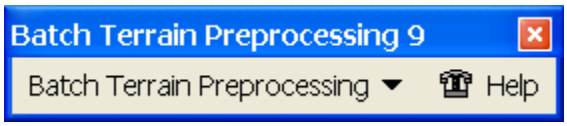
To use the NHDPlus data for watershed delineation and characterization in the ArcHydro Tools, the data must first be preprocessed. The preprocessing is done by NHDPlus Production Unit.

1. In the processing unit elevation folder, (e.g. ***elev_unit_a***), open ***elev_cm\prj.adf*** using Notepad. Make sure it has "Zunits 100". If it has "Zunits NO", change it as shown below.

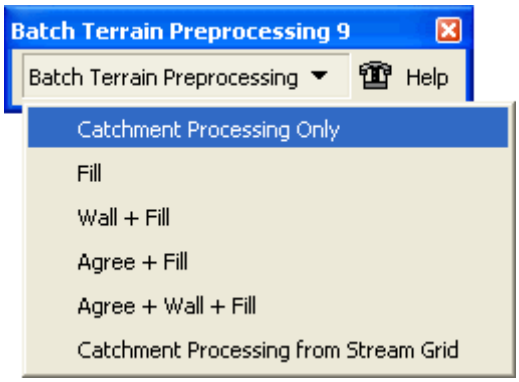


2. Start ArcMap.
   a. Use the **File**, **Add Data** menu. In the **Add Data** dialog, navigate to the ***elev_unit_a*** folder, select the ***elev_cm*** grid. Click **Add**.
   b. Use the **File**, **Add Data** menu. In the **Add Data** dialog, navigate to the ***fac_fdr_unit_a*** folder, select the ***fac*** and ***fdr*** grids. Click **Add**.
3. Create a folder named ***archydro_unit_a*** under ***NHDPlus06***. Use the **File**, **Save** menu. Save to ***06a.MXD*** (named for processing unit) in the folder ***NHDPlus06\archydro_unit_a*** folder.

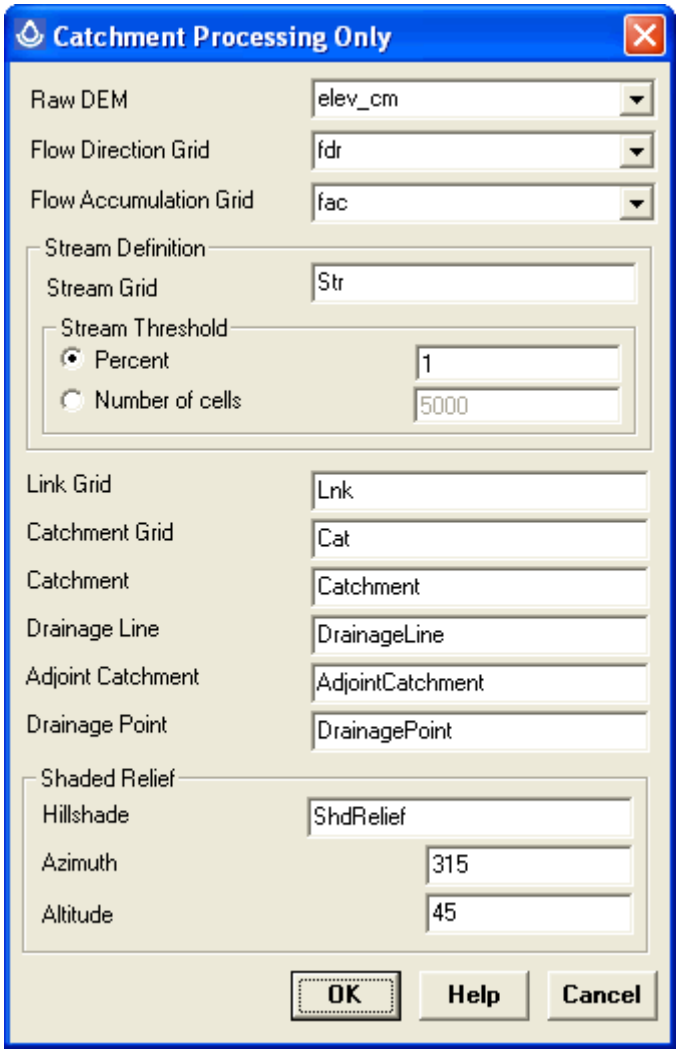
4. Use **View**, **Toolbars**, and turn on the Batch Terrain Preprocessing 9 toolbar. It will look like this:



5. Select Catchment Processing Only from the pulldown menu:



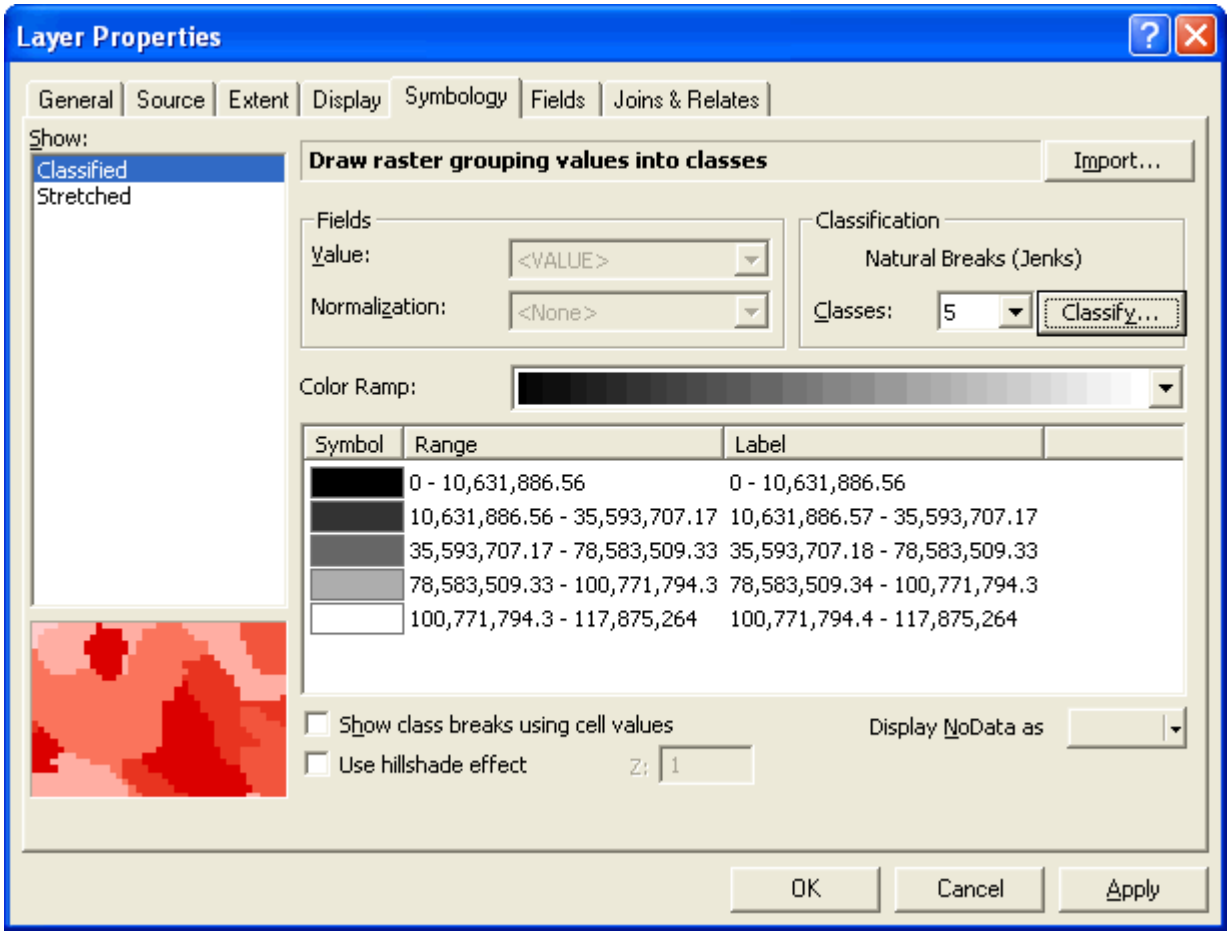
6. Fill in the form so it looks like this, then click OK:



7. This process takes about 1-2 hours on Region 6, Processing Unit A, depending on system capabilities. Note this process will create grids ***cat***, ***lnk***, ***ShdRelief***, and ***str*** in a folder named ***Layers***, which will be created in the ***NHDPlus06\archydro_unit_a*** folder.
8. Repeat Steps 1-7 for every processing unit you wish to use for watershed delineation.

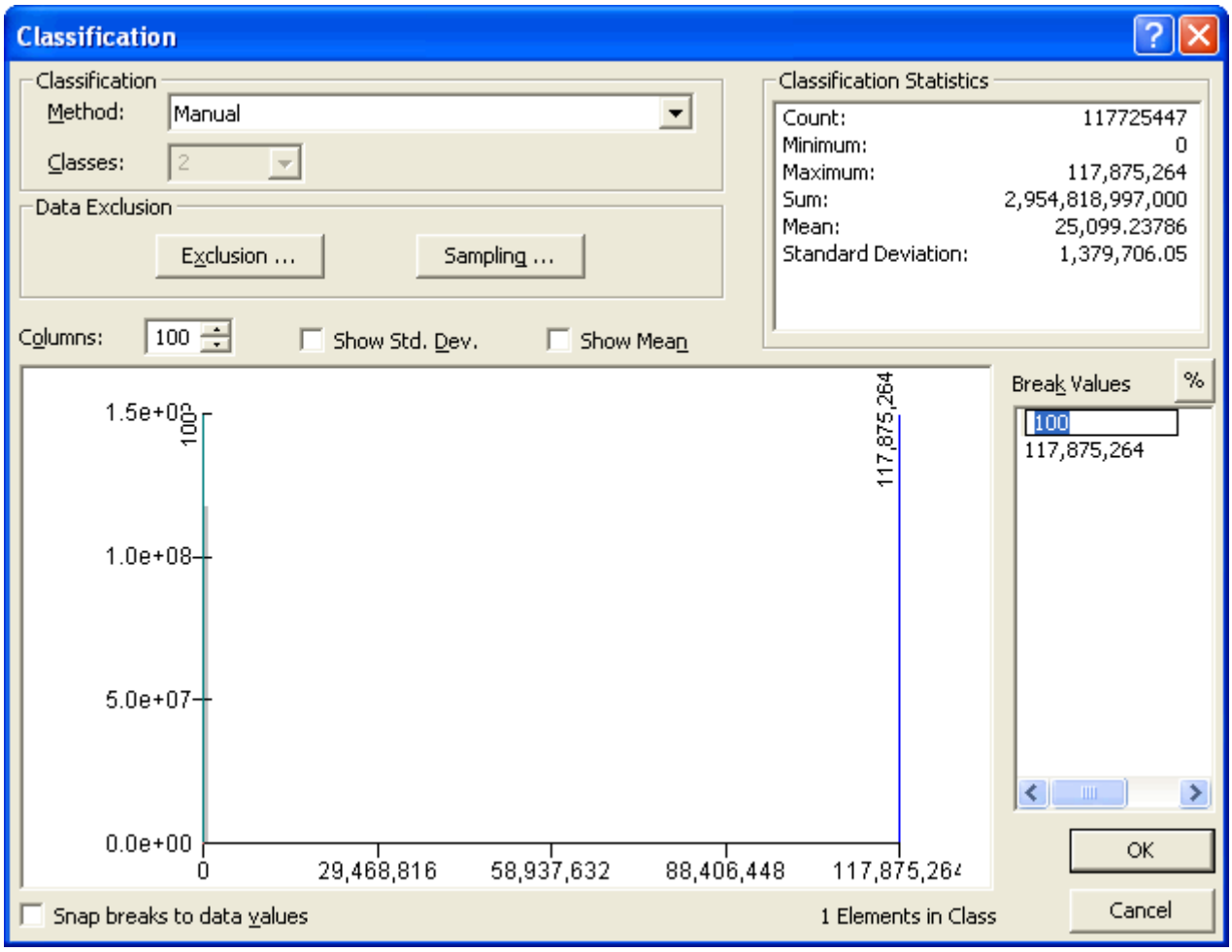
Using the Preprocessed Data for Watershed Delineation

1. Open ArcMap and create a fresh MXD. Name it something like ***test1.MXD*** and save it wherever you'd like.
2. Use the **File**, **Add Data** menu. In the **Add Data** dialog, navigate to the ***NHDPlus06\ fac_fdr_unit_a*** folder, select the ***fdr*** and ***fac*** grids. Click **Add**. Navigate to the ***NHDPlus06\archydro_unit_a\Layers*** folder and add the ***str*** grid. From the ***06a.mdb*** geodatabase, under the ***Layers*** feature dataset, add ***Catchment*** and ***AdjointCatchment***.
   Note: These Catchment polygons are different from the ones we've seen in the NHDPlus. These are created by the ArcHydro Tools, and don't relate directly to NHD. These catchments are MUCH bigger than the NHD-based catchments. Don't confuse these with the NHDPlus catchments.
3. Right-click on the ***fac*** grid, and choose **Properties**. Select the **Symbology** tab. Change the renderer from Stretched to Classified as shown below.



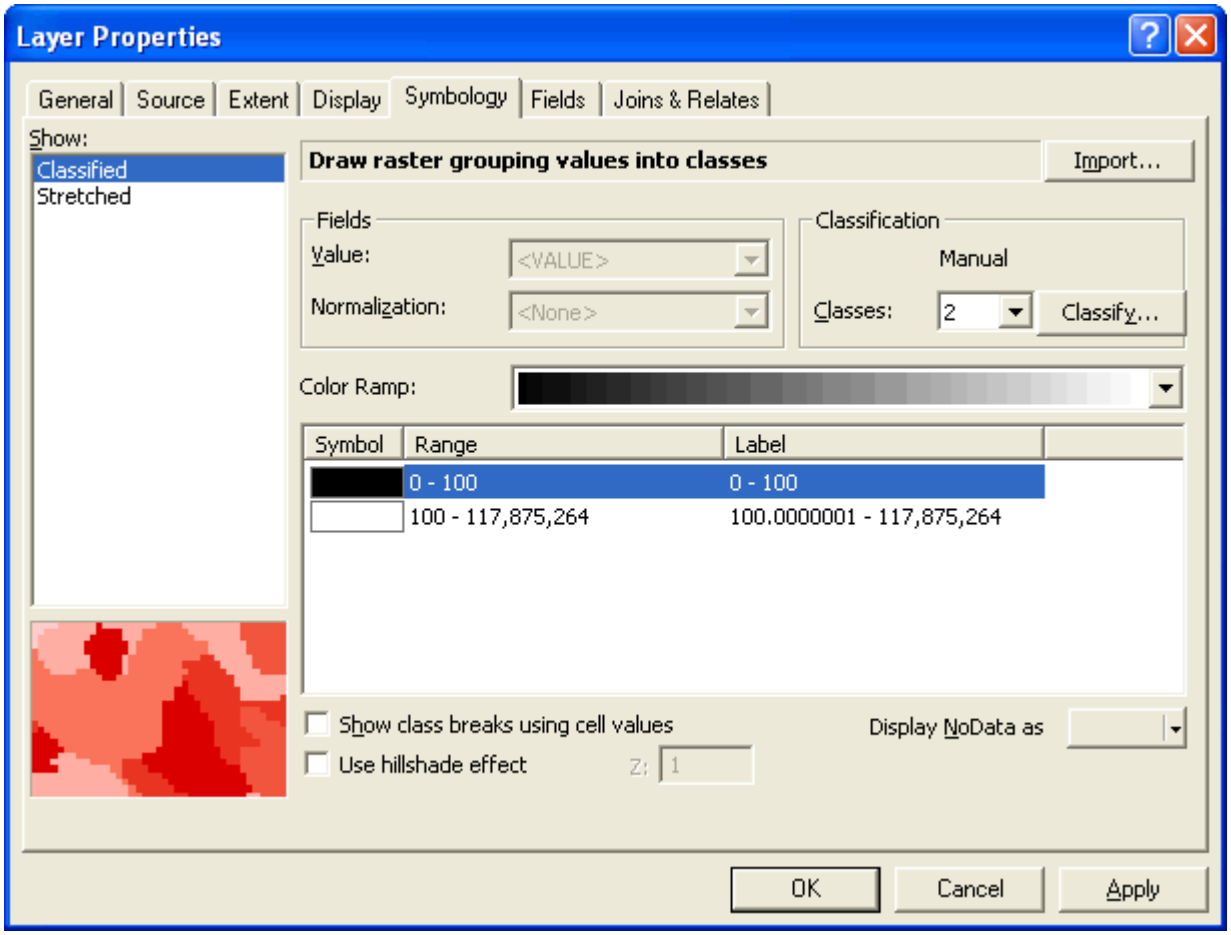
Click the **Classify** button next to the number of classes.

On the Classification menu, change the number of classes to 2, then change the first Break Value to 100, as shown below.



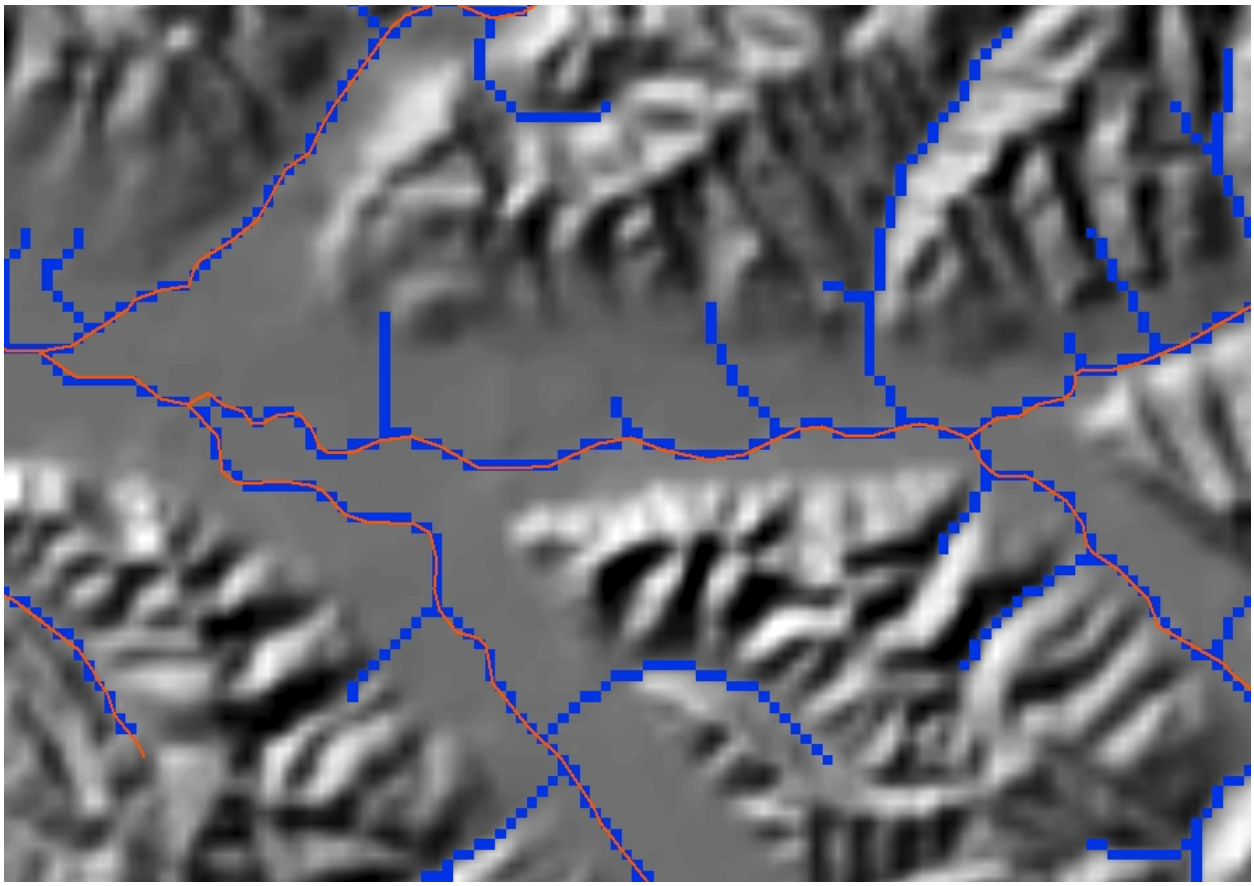
then click OK

Now back on the **Layer Properties Symbology** menu, double-click on the black box under Symbol next to the 0 - 100 Range, then choose No Color on the color menu that pops up.

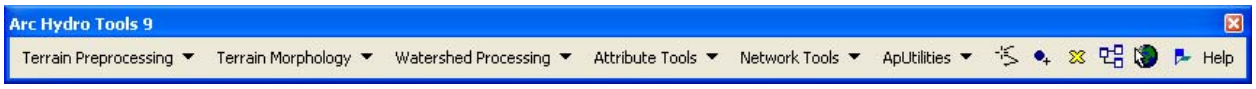


In a similar manner, change the color on the 100 - 117,875,264 range to a dark blue. Zoom in somewhere so you can see the dark blue ***fac*** grid cells. The ***fac*** cells that

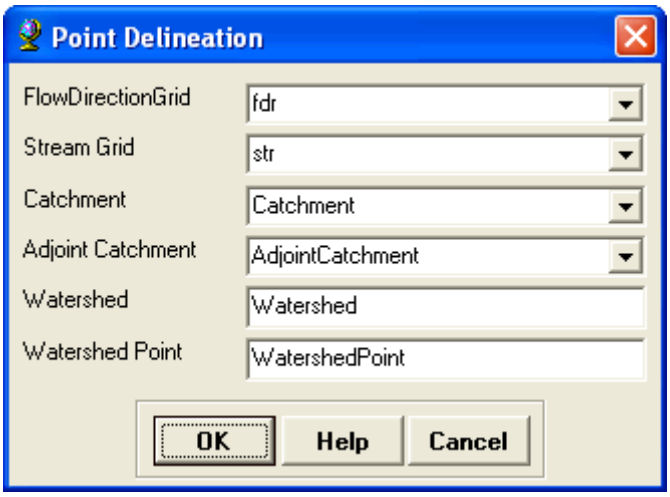
are dark blue are cells having 100 or more cells upstream, and indicate where drainage channels are on the HydroDEM. In general these should follow the NHD Flowlines closely, since all networked NHD Flowlines were burned into the HydroDEM. The threshold of 100 is shown for illustrative purposes, but any threshold may be chosen. A threshold of around 3000 to 5000 has been found to result in a drainage density similar to the medium resolution NHD Flowlines, although this varies considerably throughout the NHD. Below is an example showing the 100-cell threshold fac grid in dark blue, with nhdflowline in orange, overlaid on the ShdRelief grid (which was produced in the Preprocessing step.)



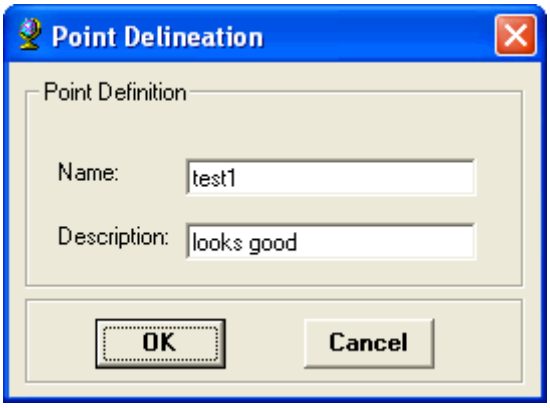
4. If it is not already turned on, turn on the ArcHydro Tools toolbar by selecting **View, Toolbars, ArcHydro Tools 9**. The toolbar looks like this:



Select the Point Delineation  tool on the ArcHydro Tools toolbar, then click on one of the dark blue ***fac*** cells. The following menu will come up the first time you do this. Fill it in to look as follows:



If you missed clicking exactly on one of the dark blue ***fac*** cells, the program may ask if you want to snap to a stream grid cell. Snapping can sometimes give unexpected results, so the best policy is to zoom in enough to clearly see the ***fac*** cells, and to click carefully on one of those cells. If asked about snapping, then you can respond No. The delineated polygon will first pop up in red hatching, with a window that lets you enter a name and comment for the polygon. Fill this in with whatever you want, then click OK.



You have now completed a watershed delineation. Using these tools you generally can delineate a watershed from any point in less than 30 seconds. Try delineating a watershed from several points. Note you can click on a point that is not on one of the dark blue ***fac*** grid cells, but you are likely to get a very small watershed.

The ArcHydro Tools may also be set up to compute watershed characteristics, and can be set up to do something called Global delineation, which would be used for watersheds that span multiple processing units or even multiple hydrologic regions. These advanced topics are beyond the scope of this exercise. More information on these topics may be found in the Help for the ArcHydro Tools, and on the web at:
http://support.esri.com/index.cfm?fa=downloads.dataModels.filteredGateway&dmid=15