-- NRCS Engineering Tools --
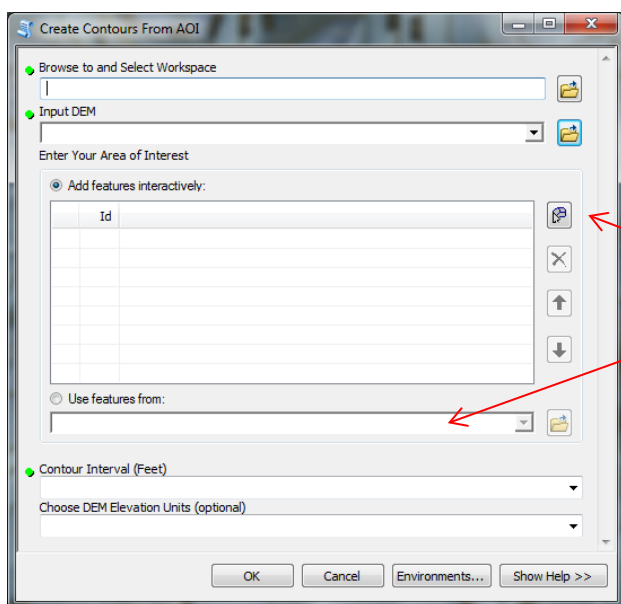Field Office Tools

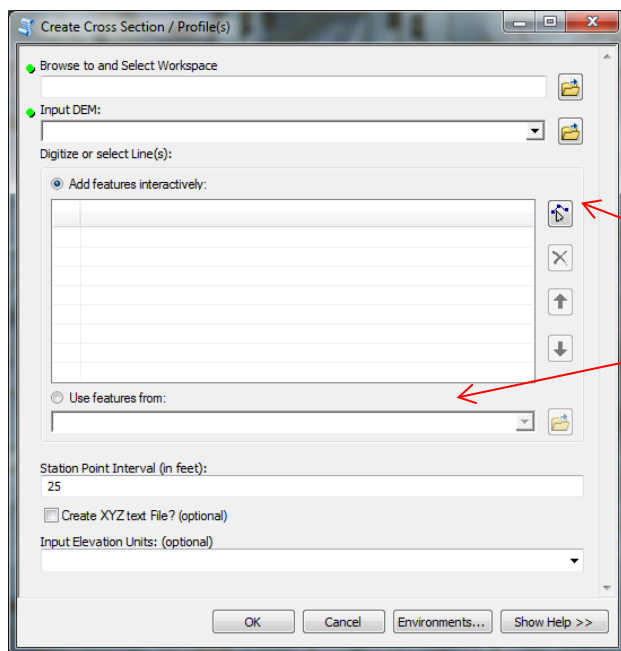|	
Field Office Tools: Create Contours from AOI	
Allows a user to create smoothed contours for an area of interest at a specified interval	
	Browse to and Select Workspace: Provide the path to a local folder that will serve as your project workspace. *It is highly recommended that you choose a local (C:) folder without spaces or special characters in the path name. If you have already established a workspace, you may specify the same path.*
	Input DEM : Choose your Input DEM from the Table of Contents or a file directory
	Enter Your Area of Interest: Select the Add Features Tool [icon] and draw a polygon on the map defining your area of interest, Clicking once to start drawing, and twice to finish. Alternately, you may choose the "Use Features From" option and specify an existing polygon to use as an area of interest.
	Contour Interval: Select the desired contour interval (in feet). Contours will be created in feet, with every fifth contour value indexed.
	Choose DEM Elevation units: Optional -- If the Z units (Elevation values) of your input DEM are different from the XY (Linear) units of the DEM select the appropriate value from the drop-down list. E.g. if your DEM has Elevation values in Feet, but the XY units or cells are in Meters, you would specify Feet. If XY & Z values are the same, you may leave this option blank.

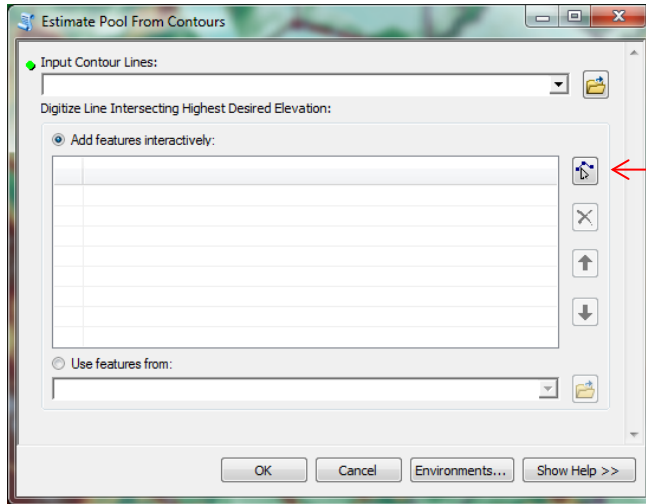|	
Field Office Tools: Create Cross Section / Profile(s)	
Creates cross sections or profiles from a user defined line and creates XYZ points at a specified interval.	
	Browse to and Select Workspace: Provide the path to a local folder that will serve as your project workspace. *It is highly recommended that you choose a local (C:) folder without spaces or special characters in the path name. If you have already established a workspace, you may specify the same path.*
	Input DEM : Choose your Input DEM from the Table of Contents or a file directory
	Enter Your Area of Interest: Select the Add Features Tool [icon] and draw polyline(s) on the map where you wish to create cross section(s) or profile(s), Clicking once to start drawing, and twice to finish. Alternately, you may choose the "Use Features From" option and specify any existing polylines to use as transects or cross sections.
	Station Point Interval: Specify a station point interval in feet - e.g. the desired distance between points.
	Create XYZ Text File?: Optional -- Select if you wish to export a CSV delimited file or the generated station points
	Choose DEM Elevation units: Optional -- If the Z units (Elevation values) of your input DEM are different from the XY (Linear) units of the DEM select the appropriate value from the drop-down list.

Field Office Tools: Estimate Pool From Contours (ArcInfo / Advanced License Level Only)

Quickly evaluate the storage potential of a proposed pool or structure by intersecting contour lines with a user provided dam, dike or berm.
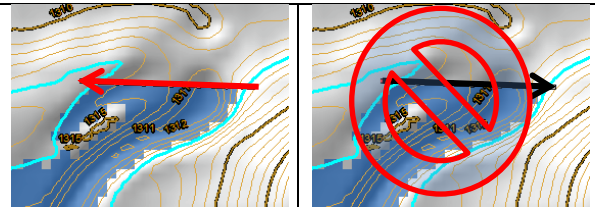

Input Contour Lines:
Select the contour line layer that corresponds with your area of interest. The input contours must have been created with either "Create Contours from AOI" or the Define Area of Interest tool in the watershed delineation toolset.

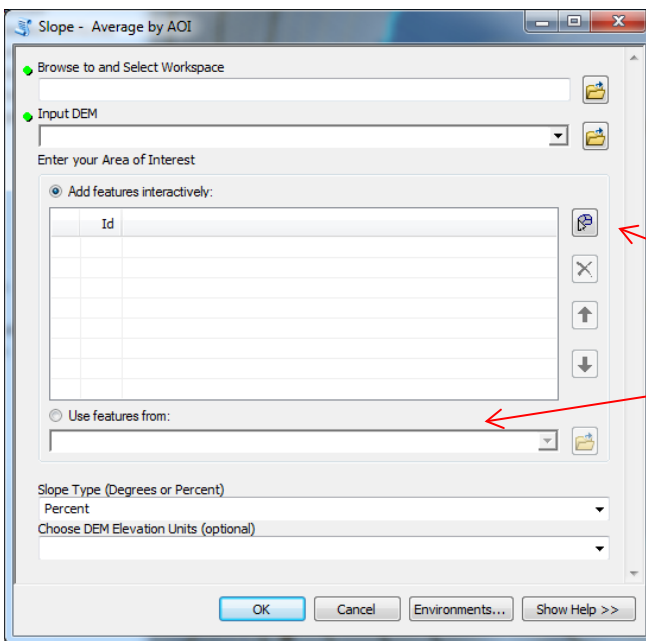**Digitize Line Intersecting Highest Desired elevation:**

Select the Add Features tool and digitize or line(s) that will serve as a dam or dike, making sure both ends intersect the highest contour you wish to close. As with other tools, you may alternately select the "Use Features From" option and specify the path to an existing polyline file.

The proposed pool area must be on the topographic left of the line(s) provided -- i.e. the water must pool on your left if you are standing on the digitized line and looking in the direction the line is drawn.

Field Office Tools: Slope – Average By AOI

Calculate the average slope for one or more polygons

Browse to and Select Workspace:
Provide the path to a local folder that will serve as your project workspace. It is highly recommended that you choose a local (C:) folder without spaces or special characters in the path name. If you have already established a workspace, you may specify the same path.

Input DEM : Choose your Input DEM from the Table of Contents or a file directory

Enter Your Area of Interest:

Select the Add Features Tool and draw a polygon on the map defining your area of interest, Clicking once to start drawing, and twice to finish.

Alternately, you may choose the "Use Features From" option and specify an existing polygon to use as an area of interest.

Slope Type: Specify Percent (default) or Degrees

Choose DEM Elevation units: Optional -- If the Z units (Elevation values) of your input DEM are different from the XY (Linear) units of the DEM select the appropriate value from the drop-down list.

Field Office Tools: Slope – Percent By AOI

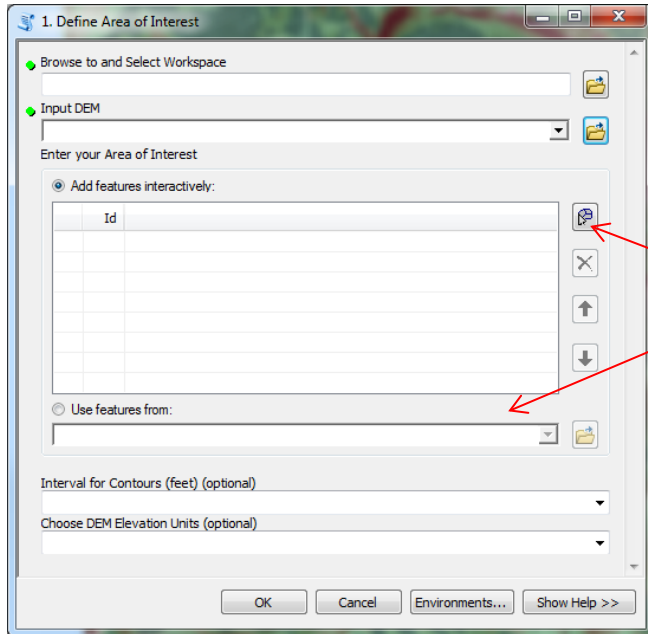Create a slope Raster for one or more area(s) of interest
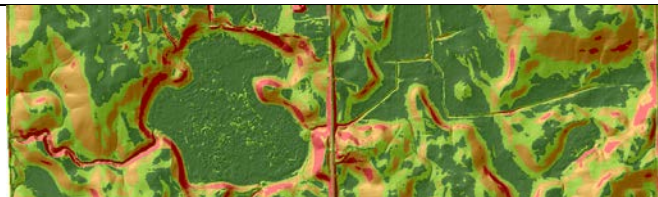
Inputs are the same as the "Slope – Average by AOI" tool, Except there is no need to specify slope type.

Results are returned as a Slope Raster, With Percentage breaks symbolized at 0-3%, 3 – 6%, 6-12% and > 12%.

Watershed Tools
Watershed Delineation

Watershed Delineation Toolset: 1. Define Area of Interest

Clips a DEM to an Area of Interest and Creates Contours (optional), Project DEM, Hillshade and Depth Grid

Browse to and Select Workspace:
Provide the path to a local folder that will serve as your project workspace. It is highly recommended that you choose a local (C:) folder without spaces or special characters in the path name. If you have already established a workspace, you may specify the same path.

Input DEM : Choose your Input DEM from the Table of Contents or a file directory

Enter Your Area of Interest:

Select the Add Features Tool and draw a polygon on the map defining your area of interest, Clicking once to start drawing, and twice to finish.

Alternately, you may choose the "Use Features From" option and specify an existing polygon to use as an area of interest.

Contour Interval: If you wish to create contours, select the desired contour interval (in feet). Contours will be created in feet, with every fifth contour value indexed. If no contours are desired this may be left blank

Choose DEM Elevation units: Optional -- If the Z units (Elevation values) of your input DEM are different from the XY (Linear) units of the DEM select the appropriate value from the drop-down list.

E.g. if your DEM has Elevation values in Feet, but the XY units or cells are in Meters, you would specify Feet. If XY & Z values are the same, you may leave this option blank.

Watershed Delineation Toolset: 2. Create Stream Network

Allows for the inclusion of culverts (where necessary) , creates a linear stream network and builds required rasters for watershed delineation.
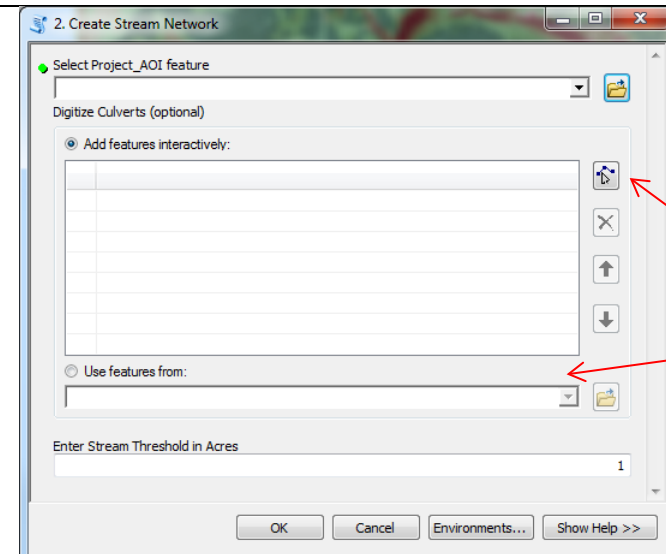
Select Project_AOI Feature:
Select the Project AOI established in step 1, "Define Area of Interest"

If you are resuming a project you may set the path to a previous AOI.

Digitize Culverts (Optional):

If the depth grid created in step one, imagery or local knowledge indicate the need for culverts to properly route flow, use the "Add Features" tool to digitize or t line features defining the culvert location(s).

Alternately, you may choose the "Use Features From" option and specify an existing polyline file to use as culverts.

Enter Stream Threshold:
Enter the desired minimum contributing area required to form a stream (in acres). Default is 1 acre.

Watershed Delineation Toolset: Create Watershed

<div align="center">

Delineates a watershed or multiple watersheds from a user
provided line defining pour point location

</div>
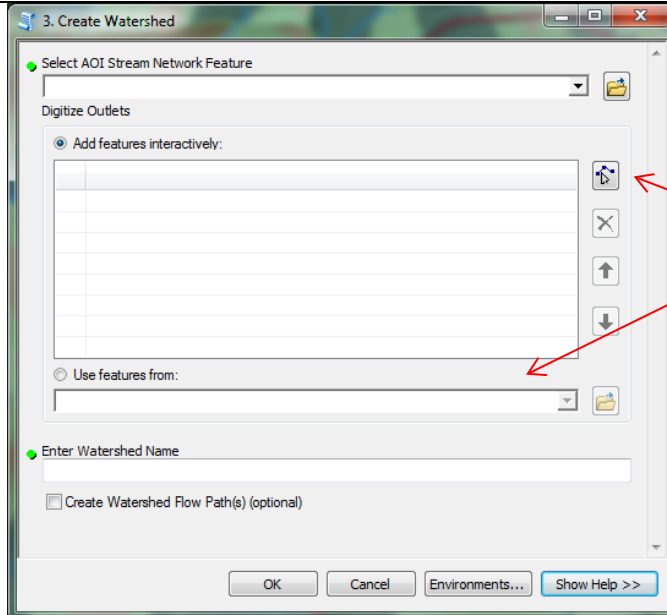
|	
	Select AOI Stream Network Feature: Browse to or select the streams feature corresponding with your area of interest that was generated in step 2.
	Digitize Outlets: Use the "Add Features" tool to digitize or line feature(s) at the desired pour point, dam, dike or terrace location(s). As With other tools you may also choose the "Use Features From" option and provide an existing line as input. The entire area contributing to the provided line(s) will be delineated , so make the line features as long or short as is appropriate to your desired outcome. Multiple lines may be provided, a unique Subbasin will be created for each line.
	Enter Watershed Name: Enter the desired name for the resulting watershed features.
	Create Watershed Flow Paths: (Optional) Select if you wish to derive the primary flow path of the resulting watershed(s). Results may be edited after execution if routing or other changes are necessary.

<div align="center" style="color:red">

**After execution you may open an edit session and make any changes to the Watershed boundary or Flow paths.
Be sure to save your edits and close your edit session before moving on to another tool.**

</div>
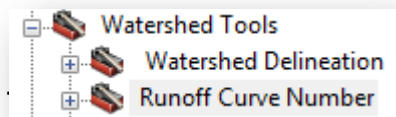
Watershed Delineation Toolset: Update Watershed Attributes

<div align="center">

Updates watershed area, Average slope, and Flow path length (if present) if any edits were made.

</div>
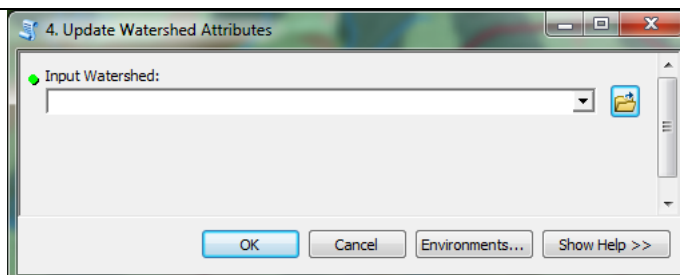
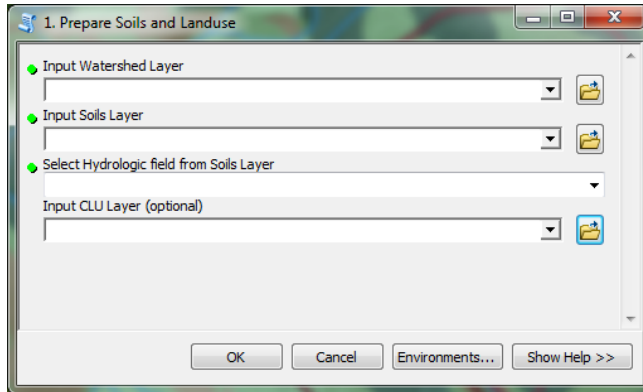|	
	Input Watershed: Select the desired watershed delineated with the "Create Watershed" Tool. Changes will be made in the attribute table of the specified watershed and flow path layer (if present).

Runoff Curve Number Toolset: 1. Prepare Soils and Landuse

Input Watershed Layer:
Select the desired watershed from the table of contents. You may use a watershed from the Engineering Tools workflow, or provide an existing Watershed boundary from another source.

Input Soils Layer:
Select the Soils layer corresponding to your area of interest. This layer must contain a MUNAME field and a field specifying the hydrologic group of each map unit.

Select Hydrologic field from Soils Layer:
Select the field containing hydrologic group values

Input CLU Layer(Optional):
If your watershed area contains more than one landuse you may use the features of the CLU (Common land unit) to split the landuse areas.

Select the CLU or other parcels, landuse or cadastral layer you wish to use to split landuse polygons. Other splits and edits can be performed in an edit session after preparing the soils and landuse data.

Once the tool has executed, Watershed Landuse and Soils layers will be added to the map.
You must start an edit session to attribute the Landuse and Condition fields of the landuse layer,
and address any Combined Hydrologic groups in the watershed soils layer.

Watershed Landuse:
Once Editing, merge / split polygons as needed.
Open your Watershed's Landuse Attribute table and expand the "Landuse" Column.

Select the appropriate landuse for each polygon.

Additionally, assign a Condition in the condition field or choose N/A where required.
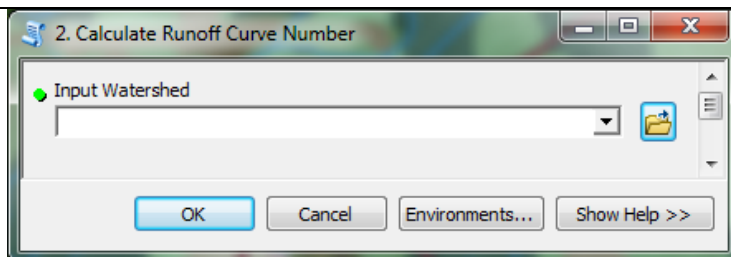
Watershed Soils:
If the soils layer or the messaging from tool #1 (Prepare Soils and Landuse) indicate any null or combined hydrolgic groups (A/D, B/D, C/D, Null or W), a single condition of A,B,C, or D must be assigned. Open your watershed's soil layer an select the appropriate values from the drop down options.

Once your edits have been completed, Save your edits and stop editing.

## Runoff Curve Number Toolset: 2. Calculate Runoff Curve Number

Calculates a Weighted Average Runoff Curve Number for a watershed or any subbasins

Input Watershed:
After editing Landuse and Soil attributes, Specify the desired watershed boundary.

A weighted average runoff curve number will be returned in the attribute table of the specified watershed and a corresponding RCN layer will be added to the map.
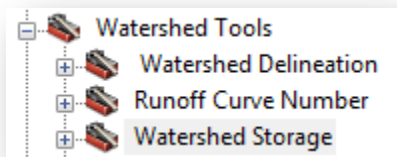
Watershed Storage Toolset: Calculate Stage Storage	
Calculates and returns the storage volume and surface area within a watershed or pool area at a user specified interval. Optionally creates pools at each elevation.	

	Input DEM : Choose your Input DEM from the Table of Contents or a file directory
	Input Watershed or Pool Polygon: Select the watershed or pool boundary for which you wish to calculate stage storage. The provided watershed or pool must be a singular feature. If your watershed or pool contains multiple features, first dissolve or export a single pool or subbasin to calculate.
	Maximum Elevation Value: Enter the maximum elevation to analyze. Storage will be calculated between the specified maximum and the minimum elevation within your provided boundary.
	Analysis Increment (in Feet): Specify an analysis increment in feet
	Input DEM Elevation units: Optional -- If the Z units (Elevation values) of your input DEM are different from the XY (Linear) units of the DEM select the appropriate value from the drop-down list.
	Create Pool Polygons Feature Layer: Optional -- Select to create pool polygons for each stage-storage elevation

A stage storage table will be written to your project geodatabase and added to the map.
If create pool Polygons option was selected, a single pool for each elevation is written to your project geodatabase,
then merged to a "All Pools" feature class and added to the map.

Watershed Storage Toolset: Create Pool at Desired Elevation	
Creates a pool polygon and calculates storage volume at a user provided elevation using a watershed, pool, or AOI boundary to limit analysis extent.	

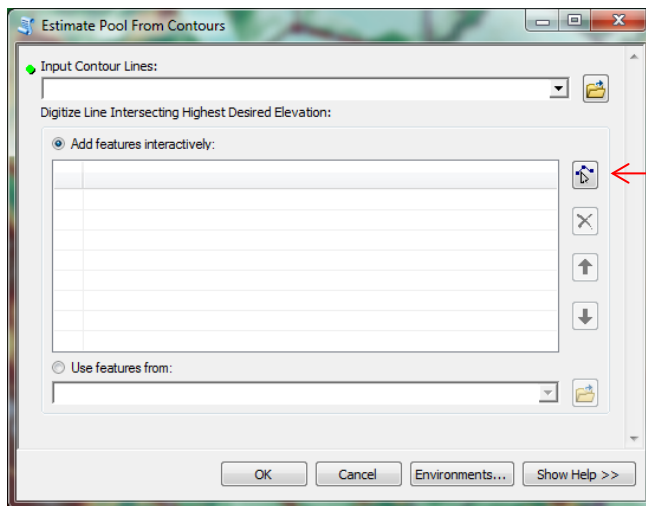|	
	Input Watershed Boundary: Select the watershed or other boundary containing the area where the pool will be created
	Pool Elevation : Specify an elevation for the desired pool (in feet).
	Input DEM Elevation units: Optional -- If the Z units (Elevation values) of your input DEM are different from the XY (Linear) units of the DEM select the appropriate value from the drop-down list.

A Pool polygon will be created at the specified elevation, attributed with volume and surface area for the given scenario and extent.

Watershed Storage Toolset: Estimate Pool From Contours   (ArcInfo / Advanced License Level Only)

Quickly evaluate the storage potential of a proposed pool or structure by intersecting
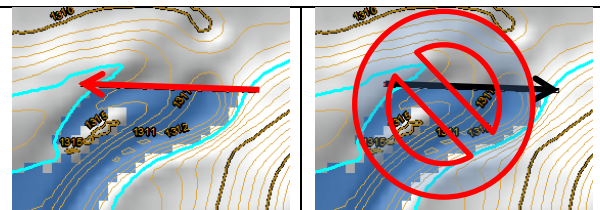contour lines with a user provided dam, dike or berm.

Input Contour Lines:
Select the contour line layer that corresponds with your area of interest. The input contours must have been created with either "Create Contours from AOI" or the Define Area of Interest tool in the watershed delineation toolset.

Digitize Line Intersecting Highest Desired elevation:

Select the Add Features tool and digitize or line(s) that will serve as a dam or dike, making sure both ends intersect the highest contour you wish to close. As with other tools, you may alternately select the "Use Features From" option and specify the path to an existing polyline file.

The proposed pool area must be on the topographic left of the line(s) provided -- i.e. the water must pool on your left if you are standing on the digitized line and looking in the direction the line is drawn.

A Pool Polygon will be created for the elevation of the highest closed contour, and surface area and volume will be calculated from the DEM.

The digitized lines will be attributed with Length, Max, Min, and Mean elevation, and an estimation of required top / bottom widths (based on min. of 3:1 side slopes) will be provided.
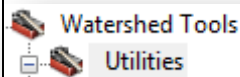
Watershed Tools > Utilities

Calculate Curve Number from NLCD

Uses a NLCD raster and Soils data to calculate a weighted Runoff Curve Number for a watershed.
Optionally allows for the creation of a Runoff Curve Number Grid for use in other models or workflows.
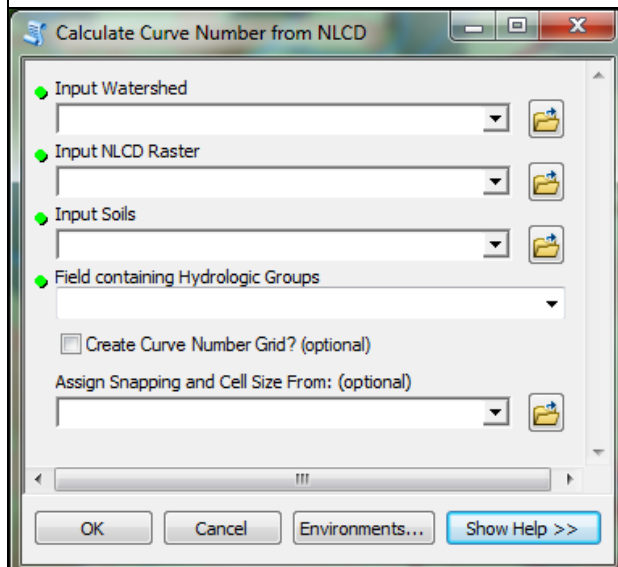
Input Watershed:
Select the watershed for which you wish to calculate a Runoff Curve Number.

Input NLCD Raster:
Select the NLCD Raster corresponding with your watershed or area of interest

Input Soils:
Select the Soils layer corresponging to your area of interest.
A MUNAME field and Field Containing hydrologic group values are required

Field containing Hydrologic Groups:
Select the field containing hydrologic group values.

Create Curve Number Grid?:
Optional -- Select if you wish to create a Runoff Curve Number Grid.

Assign Snapping and Cell Size From:
Optional -- If creating a Curve Number Grid, you may set snapping to the DEM corresponding with your area of interest.

The resulting raster will align with the cells of the selected snap raster, and be created in the same resolution and coordinate system