Introduction to the Automated Geospatial Watershed Assessment Tool

Running AGWA From Scratch (… raw data)

Introduction: In this exercise you will import raw GIS data into AGWA, process these data sets into useable form, and use them for a simple modeling exercise.

Goal: To familiarize yourself the steps necessary to commonly available GIS in AGWA.

Assignment: Download GIS data for a small watershed in Colorado; import these data into AGWA; use them to run KINEROS.

Keywords: Gisdatadepot.com, USGS DEM, NLCD, STATSGO

The Basic Components of Modeling in AGWA

There are 4 basic components necessary to run AGWA: land cover, topography, soils, and precipitation. AGWA is designed to use commonly available GIS data such as the National Land Cover Dataset (NLCD), 30m USGS digital elevation models (DEMs), and the State Soil Geographic Database (STATSGO). For more information on these data, please review the AGWA manual and visit:

NLCD: http://edcdaac.usgs.gov/glcc/na_int.html
http://www.epa.gov/mrlcpage/

DEM: http://edcwww.cr.usgs.gov/doc/edchome/ndcdb/ndcdb.html

STATSGO: http://www.ftw.nrcs.usda.gov/stat_data.html

In this assignment we will download USGS data from the internet. The NLCD and STATSGO data sets are freely available on-line, but to save time and resources we will import sub-sets of these data from the accompanying CD. The NLCD data are particularly large, and the exercise proceeds very slowly with the full Colorado data set.

An important note about projections

One of the problems with downloading data from various sources is that the data are not always in common projections. The NLCD data, for example, come in either "Interrupted Goode Homolosine" or "Lambert Azimuthal Equal Area" projections, while the STATSGO and NOAA Atlas 2 data are projected in "Albers Equal Area" and USGS data are mostly in "UTM". AGWA presumes that the user has working knowledge with projecting data, but it is ***crucial that the GIS data share common projections*** before geospatial assessments are made. In this assignment the STATSGO and NLCD data have been projected to UTM so they share a common projection with the DEM data you will import from the internet.

A Step – by – Step Tutorial for Getting Started

1. Add a new View to your ArcView project. Change its name (under "View… properties") to "Colorado".

2. Acquire the necessary DEM files from the internet…

Steps to Import USGS SDTS DEM Files Into ArcView 3.2

---

1. **Download SDTS archive files from the internet or copy off a CD**. A likely source for these data is www.gisdatadepot.com. This is an internet site that delivers DEM data free of charge.

> *In this tutorial, we will download and import three DEM data sets:*
> 1. *Cripple Creek South – File ID: 38105f2*
> 2. *High Park – File ID: 38105f3*
> 3. *Cover Mountain – File ID: 38105f4*

   a. Create a separate folder on your hard drive for each SDTS file, e.g. c:\arcdata\dems\cripple_creek, etc.

   b. Navigate to the DEM location on the web site. As of 11-01-01, this would entail clicking on "Enter the GIS Data Depot Here"… "Country Index of U"… "United States"… "Statewide Data"… "Colorado"… "Countywide Data"… "Fremont"… "Digital Elevation Models (DEM) - 24K"…

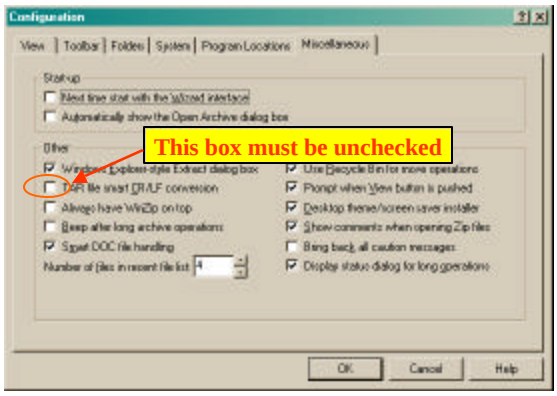
   c. Download the file into the newly created folder on your hard drive. For cripple creek, this file is called 1704061.DEM.SDTS.TAR.GZ.

   d. ** If you cannot gain access to this site, the SDTS data are available on the AGWA CD under "gisdata\colorado". **

2. **Prepare the data sets for import into ArcView**.

   a. Unpack the tarred and gzipped file using Winzip, Ultrazip, etc.

   b. **IMPORTANT** when using Winzip, you MUST make sure that the "TAR file smart CR/LF conversion" box is NOT checked on the Options/ Configuration/ Miscellaneous screen →



   c. Make sure the untarred files end up in the folder you created for the new DEM!

3. **At this point there will be many files resident in the new folder**. These files will have the .DDF extension. Note that the important files all have the same structure:

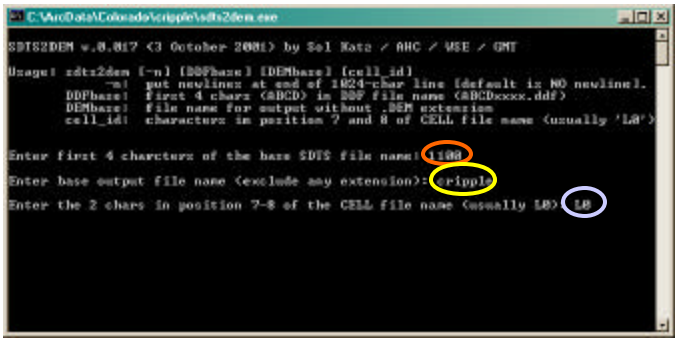
   a. A 4 character prefix: for Cripple Creek it is 1100
   b. A 4 character identifier (CATD, CATS, etc.)
   c. A 3 character extension (.DDF)

4. **Obtain a copy of the updated sdts2dem.exe program**. This may be obtained from http://www.cs.arizona.edu/topovista/sdts2dem.html. This program can be found on the AGWA CD under the "datafiles" directory. The AGWA team will also provide this program via e-mail: (agwa@tucson.ars.ag.gov).

5. **Convert the SDTS "*.DDF" files into a USGS standard DEM format**.

   a. Place the sdts2dem program in the folder containing the unpacked .DDF files.

   b. In Windows, double-click on sdts2dem.exe. You will be prompted with the following screen



There are 3 responses:

(1) the 1st 4 characters of the SDTS file - in this case, these amount to "1100"; (2) the output name of the grid – here called "cripple"; and (3) the last 2 characters in the CELL file – here the CELL file is called 1100CELL0.DDF, so these characters are "L0". Note that this is "L-Zero", not "L-oh".

6. **Convert the resultant .dem file into Grid format using ArcView utilities**.

   a. in ArcView, open a new View.

   b. Make sure the Spatial Analyst extension is turned on

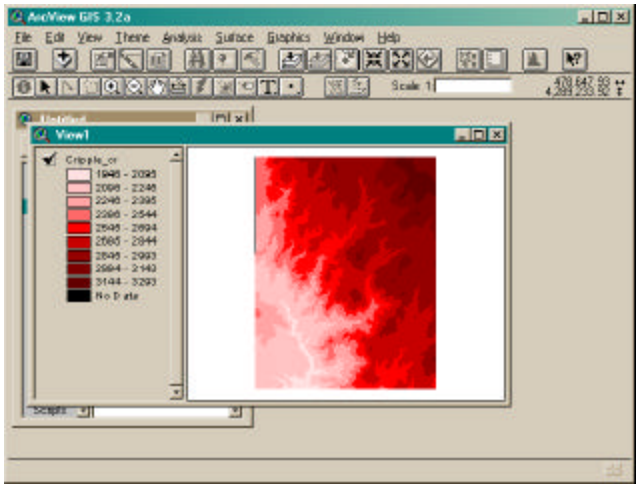
   c. Open the "File… Import Data Sources" dialog. Choose the "USGS DEM" format type as shown here…

   d. Navigate to the "cripple.dem" file you created in Step 5.

   e. Name the output grid, avoiding the use of overly long (>8 characters) or complex (special characters, such as %, &, ^, etc.) names. Here we name the new grid "Cripple_cr". ***Note: ArcView will start the Save process in the Working Directory. Make sure to navigate to the correct output location before saving the new grid.***

7. **Add the new grid to the view**. For Cripple Creek, your map should look something like:

8. **Repeat the above steps for the other 2 DEMs you downloaded.**



End of Section Detailing Importing USGS SDTS Formatted DEMs

3. At this point you should have 3 separate DEMs added to your Colorado View. Note that these grids have slight overlap along their East-West boundaries. These DEMs need to be stitched together properly to ensure hydrologic continuity.

> ***A Note About USGS DEMs***
>
> Not all USGS data share common datums or map units. When using these data you must be careful to check elevation and mapping units. Sticthing a map with metric units to one where the elevations are given in meters would yield odd results. Some older DEMs also had a 30 foot elevation offset. In all cases, these changes may be found in the metadata associated with the data.

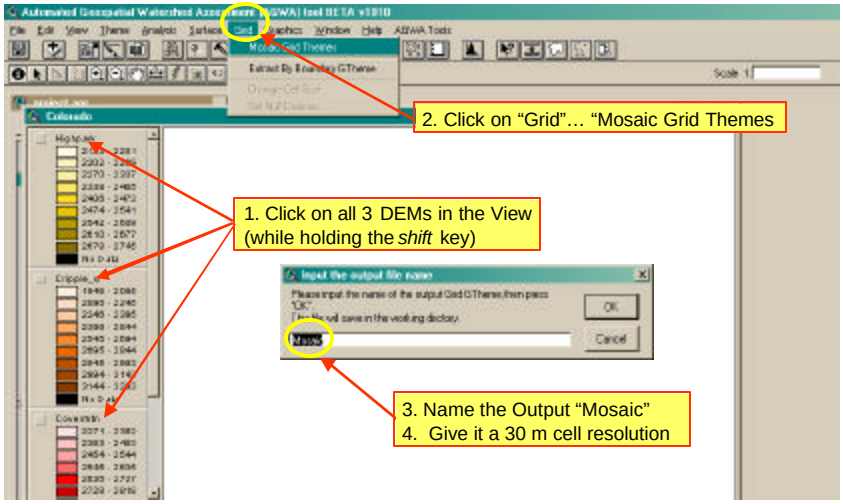
The process of stitching DEMs together is termed "mosaic-ing". AGWA does not currently offer an automated script for mosaicing DEMs, but we provide a separate extension that does. This extension can be found in the AGWA CD under "datafiles". To use the extension, follow these steps:

1. Copy the "grid01.avx" file into your EXT32 directory, which can be found under the ESRI installations directory, e.g. "C:\ESRI\AV_GIS30\ARCVIEW\EXT32".
   - this extension was created by Min-Lan Huang, huang@dcpr.ncky.edu.tw

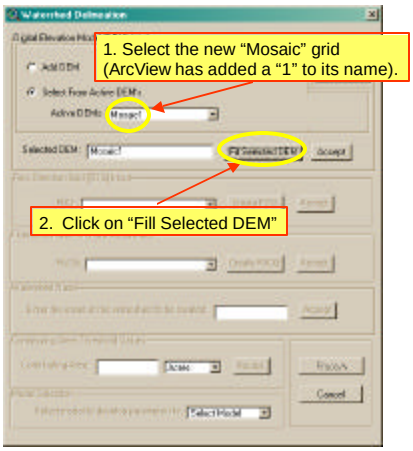
2. Turn on the "Grid Utilitys v1.1" (sic) extension. You will note that a new menu item called "Grid" has been added.

3. In the Colorado View, select all three DEMs you created in the previous steps.

4. Under the "Grid" menu item, click on "Mosaic Grid Themes". Name the output grid "mosaic" and give it a 30m resolution.



5. You now have a single DEM that is the compendium of the 3 DEMs you downloaded to start this exercise. However, this DEM is not yet ready for hydrologic analysis. It must be filled using AGWA. To do so, click on "AGWA Tools… Delineate Watershed". You will be prompted with the following screen → select the Mosaic DEM you created and the use the AGWA button to fill the sinks. This will create a new Grid called "Fill_Mosaic1".

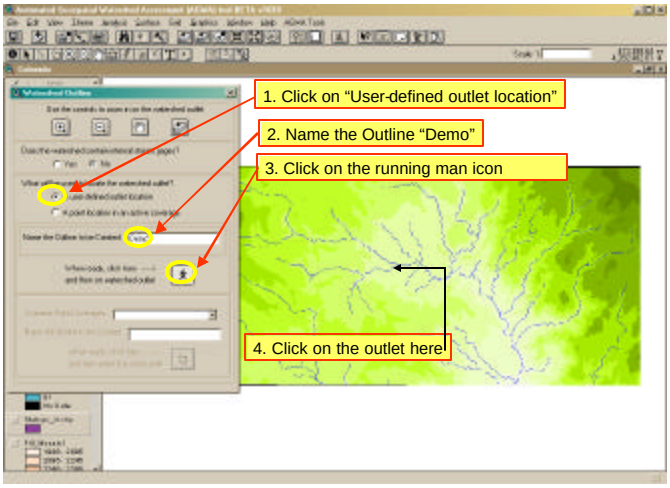


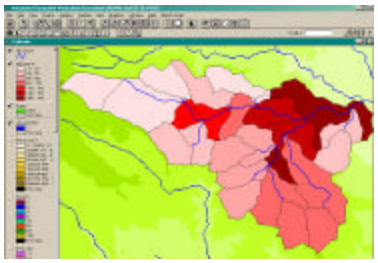
6. Use the newly created DEM to create a flow-direction map and then a flowaccumulation map. These 3 grids will serve as the basis for the rest of the hydrologic modeling exercise.

7. Add the necessary Land Cover and Soil data from the CD into the Colorado View. These data are found under the "gisdata\Colorado" directory and are called "nlcd" and "statsgo", respectively.

8. Run AGWA to delineate and subdivide the watershed using these inputs:

    a. **DEM**: the filled mosaic grid created in step 5
    b. **Flowdirection**: the map derived by AGWA from the DEM
    c. **Flowaccumulation**: the map derived from the flowdirection map (b)
    d. **Watershed Outline**: user-defined outlet location as shown here:
    e. **Watershed Name**: Example
    f. **CSA**: 300 acres
    g. **Model**: KINEROS





9. Given the above inputs, you should end up with a watershed like that shown above

10. Run the land cover and soils parameterization with the following inputs:
    a. Watershed name: Example
    b. Land cover grid: NLCD
    c. Land cover type: MRLC
    d. Soils coverage: Statsgo

11. Write the KINEROS precipitation file:
    a. Design storm
    b. Frequency & Duration: 10year 60minute
    c. Watershed saturation index: 0.4
    d. Watershed to use: wExample
    e. Save the rainfall file as: 10yr60min.pre

12. Write the output file & Run KINEROS:
    a. Watershed name: wExample
    b. Parameter file name: example.par
    c. Precipitation to use: 10yr60min.pre

13. View the KINEROS results:
    a. Watershed name: wExample
    b. Simulation: 10yr60min.out
    c. Output: runoff (mm).
    d. VOILA!!