VALLEY SEGMENT MODEL DOCUMENTATION

Directions for Geographic Information System (GIS) analysis of Watersheds and/or Sub-basins to provide physiographic and ecological characterization of hydrography. The Arc-Info ™ program associated with these instructions can be acquired by contacting John Nesser, Regional Soil Scientist, USDA Forest Service, Northern Region, Missoula, MT.

Inputs Themes Required:

1)Streams -best scale possible, usually 1:24k
2)DEM's -best scale possible, usually 1:24k
3)Watersheds -best scale possible, usually 1:100k
4)Sub-basins -best scale possible, usually 1:100k
5) Landtype Associations, SSURGO soils (attributed with upper-level ecological units.

Purpose of Program:

To provide stream characteristics to aid in watershed comparison and develop valley bottom characteristics. Analyses hydrography to associate ecological unit and physiographic attributes.

Organization of Data and Outputs:

Input data organized mostly parallel to analysis aml directory. This is optional as analysis routines have search capabilities. Output data created is stored under analysis directory by Sub-basin named, for example ../h10060006

A first time through would proceed as follows:

Starting in the analysis subdirectory; /gisxx/analysis.
Run arc: &r streamclass3

Streamclass3 asks for a watershed number. Then checks for existence of the Sub-basin directory and analysis cover as well as a DEM named by HUC. If not found in the proper place /gisxx/analysis/h<Sub-basin> the directory is created and the HUC is extracted from the Statewide Hydrologic Unit Code coverage. The program will analyze streams within Sub-basin or smaller hydrologic units (watershed). The same procedures are used for the watersheds at either the 1:100,000 or 1:24,000 scale. When the watershed is clipped out the program will return with a menu of selections for analysis parameters, including a matrix of gradient/sinuosity parameters with an associated stream-type classes. Press the set defaults button, then edit the input fields. The program will also allow for a user-specification of the desired contour interval, and length of stream segments to which the analysis attributes will be assigned. It is helpful to know what the attributes of the analysis streams cover are. It is better to reselect for perennial and intermittent line features and not run the analysis on canals, ditches or

polygon features often stored in the streams cover as lines. The attributes can be used to reselect only those streams that you want analyzed for gradient and sinuosity. Example: reselect cffcode1 for 402 (stream, perennial) 405 (stream, intermittent) etc.

2. a) The first program that will run is get4huc.aml, this program sets up the analysis window for merging the DEM's (needed for gradient classification).

b) get4huc.aml reselects from the master fifth code cover for the Sub-basin HUC to be used as the DEM setwindow. The created cover is stored in /gisxx/analysis as h<Sub-basin>. Example: /gisxx/analysis/h10060006
get4huc.aml can be run stand-alone as follows;
example: Arc:&r get4huc
A window will pop-up. Enter a Sub-basin HUC number.

c) The next routine to run is get5huc.aml, this program creates a fifth code HUC analysis cover. get5huc is similar to get4huc in that the program reselects from the master fifth code huc cover creating a polygon coverage for the analysis area. Created cover is stored in subdirectory named after Sub-basin HUC as huc<fifth>.
Example: giswxx/analysis/h10060006/huc010 (HUC 010 fifth in Big Muddy)
Get5huc can be run stand-alone as follows;
example: Arc:&r get5huc
A window will pop-up. Enter a fifth code HUC number.

d) Now getdemproto.aml will run, this program creates a lattice from DEMs. getdemproto creates a lattice by querying the q100k quad cover for the latitude/longitude halves that make up the fourth code HUC. Then extracts from disk the files needed and merges them using the Sub-basin HUC as a setwindow. The created lattice is stored in /gisxx/dem24k as d<fourthcode>
example: /gisxx/dem24k/d17010205 (DEM for Bitterroot Sub-basin)
getdemproto.am. can also be run stand-alone as follows;
example: Arc:&r getdemproto
A window will pop-up. Enter a Sub-basin HUC number.

NOTE: Both get4huc and get5huc set up the directory structure for storage of the output coverages created by any of the analysis programs. It does not matter what order get5huc and getdemproto are run in.

3. a) After assembling the DEM into a grid and the streams reselected to the fifthcode HUC. Createcon2 is called to create contours from the DEM at a user specified interval. Createcon2 is a separate aml run by streamclass3.aml

b) Calc_stream_sinuosity is a routine next called by streamclass3.aml

This routine within streamclass3.aml uses a copy of the streams coverage reselected for the item code if populated in the menu. An item is added and calc'd equal to the arc# to use as a unique link. A second copy of the reselected streams is generalized by length the user entered on the menu as Stream Coverage generalization value:. The spline arcedit command is used with a grain set to the above value converted to meters (coverage units). This yields acceptable results compared with the generalize arcedit command.

c) Merge_with_streams is a routine that intersects the streams coverage with the contour coverage. From the nodes created on the streams coverage an elevation is obtained that is used to calculate gradient for a stream segment.

d) The Calc_Stream_Gradient routine uses the elevation from the stream node created above. The elevation is added to the node using the latticespot command then a relate using the from and to node# to calculate the elevation change. Any gradient less than 0 is reselected and multiplied by -1 to flip the elevation direction. The final gradient is arrived at by dividing the elevation change by the arc length multiplied by 100 to get a percentage.

e) The Assign_channel_types routine uses the gradient and sinuosity values entered into the gradient/sinuosity matrix described above.

5. The report programs (gradmilescomp.aml and strmileslta.aml) create ascii summary reports of stream miles by gradient class and stream miles by Landtype Association under a 'rpt' directory parallel to the fourth code directory for example: /gis16/analysis/rpt. Both amls run off an ascii list of full fifth code numeric ids. The reports are named after the fourth code with extensions as follows; <list>.grad.rpt or <list>.lta.rpt
example: bitterroot.list Would look like the following ascii file;

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17010205010
17010205020
17010205030
etc
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a) The gradmilescomp or strmileslta.aml are run from either arc or arcplot. They create ascii reports summarizing the stream miles; by gradient class in miles and percent of total miles for the fifth code, or by Landtype Association in miles and percent of total miles for the watershed.
example: &r gradmilescomp <list> (where <list> is the full fifth code number).
example: &r strmileslta <list> (where <list> is the full fifth code number).

4. Mapper.aml can now also be run against the analyzed fifth code.
The mapper program creates map compositions in a directory 'cmp' parallel

to the fourth code directory (/gis16/analysis/cmp). Mapper.aml is run from the arc or arcplot prompt and queries for a fifth code to create a map of streams overlaying one or two of the following themes...

1) the contours generated from the DEM.
2) either the LTA or Slope grid, but not both as they are each solid shades.

The mapper requires a unique composition extension to be more detailed in naming the map. Example: h100600060101.slope for the slope map, or h10060006010.lta for the lta map.