

## Steps for creating DHSVM road layers:

These notes do not contain all of the key strokes to complete each task, but each command in ArcMap, ARCTOOLS, or ArcCatalog is noted.

1. In ArcCatalog
  - a. Copy needed files to your own local workspace.
  - b. You will need:
    - i. stream network coverage
    - ii. dem
    - iii. soil depth raster
    - iv. mask raster
  - c. Make a shapefile of the stream network coverage, if it will be edited.
2. In arc map:
  - a. Clip the road layer to the basin mask.
    - i. Add the basin mask raster and the roads shapefile to a project.
    - ii. Make a polygon of the basin mask using spatial analyst.
    - iii. Clip the road coverage so that only the roads within the mask polygon remain.
  - b. Clip the road crossing structure<sup>1</sup> layer (culverts, bridges, etc) to the basin mask.
    - i. Add the basin polygon and the road crossing shapefile to a project.
    - ii. Clip the road crossing coverage so that only the roads within the mask remain.
  - c. Edit the road and road crossing structures (culverts, bridges, etc.) so that the road crossings are lined up with the roads. When moving road arcs to a road crossing structure, or vice versa, be sure that the “snapping” feature is turned (in ArcMap 9.0 this is within the editing toolbar) for the road crossing structures to ensure the road arc is attached to the road crossing structure.
  - d. Populate the ‘Class’ field in the road layer.
    - i. If not available add a field in the attribute table titled ‘Class’.
    - ii. Populate each road arc with an appropriate class (from 1-9) based on width of road, width of road ditch, width of road arc, and road cutslope height. See the road class definitions in the create.road.network.aml for guidance. If necessary edit the road class definitions within the create.road.network.aml to personalize your road classes.
  - e. Edit DEM, road crossing structure locations, and/or stream arcs so that streams go through stream crossing structures, excess stream arcs are deleted (delete arcs created by the create.stream.network.aml that are not stream channels in the watershed), and move incorrectly placed stream arcs. Typically editing a combination of two of these map layers is necessary; edit those layers with the least accurate spatial information. Do not edit layers with accurate spatial information.
    - i. Edit DEM in isolated situations where stream arcs do not travel through DEM pixels with a culvert or where stream locations are obviously wrong. This process I did by “brute force” by having a text file open of the DEM grid and viewing the DEM within ArcMap (however this can be done within

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<sup>1</sup> If there is not a road crossing structure coverage then only edit DEM and stream network in step 2 as necessary.

Arcinfo as well). When a group of pixels were edited I would perform a search of the text file for those values and make my changes. Only edit DEM in situations where other data, stream arcs, field observations, or culvert location are considered more accurate than DEM. Once the DEM text file editing is completed it must be converted to the new DEM layer.

- ii. Edit stream arcs as necessary. This is done within a shapefile created from the stream network layer. Move or delete stream arcs to give a more accurate representation of the stream network. Move stream arcs to ensure that stream arcs travel through road crossing structures (bridges, culverts, etc.). Be very careful to consider DEM elevations, DHSVM routes water downhill and moving a stream arc to an improper elevation can cause an inaccurate hydrologic response. When moving stream arcs to a road crossing structure be sure that the “snapping” feature is turned (in ArcMap 9.0 this is within the editing toolbar) for the road crossing structures layer to ensure the arc is attached to the road crossing structure.
  - iii. Edit road crossing structure locations if these locations are considered less accurate spatially than stream arcs or DEM data. Move road crossing structures to ensure that stream arcs travel through road crossing structures (bridges, culverts, etc.). Be very careful to consider DEM elevations, DHSVM routes water downhill and moving a stream crossing to a stream arc with an improper elevation can cause an inaccurate hydrologic response. When moving a road crossing structure be sure that the “snapping” feature is turned (in ArcMap 9.0 this is within the editing toolbar) for the stream arcs to ensure the road crossing structure is exactly attached to the stream arc.
  - iv. If the stream network was edited use Xtools or some similar tool to calculate the new arc lengths.
  - v. Convert the edited stream network shapefile to a coverage (this should be done in ArcInfo see step 3).
  - vi. Convert the road network to a coverage (this should be done in Arcinfo see step 3).
3. Arcinfo
- a. To convert the stream and road shapefiles to coverages use shapearc.
  - b. Then use “clean” command to establish topology and clean errors.
  - c. Then use "matchnode" to match the node ends of the arcs to culvert points.
  - d. Run the create.stream.network.aml with the edited DEM and stream network coverages from step 2 to create input files for DHSVM.
4. ArcCatalog
- a. Convert the basin polygon shapefile into a line coverage “basinedge”.
5. In ArcINFO
- a. Change workspace to directory where you copied files to in step 2.
  - b. If you have a culvert coverage skip this step, if you do not then you can generate a stream crossing culvert coverage by running the script arcintersect, do the same for the basin edges.
    - i. &run arcintersect roads streams culverts
    - ii. &run arcintersect roads basinedge edges
  - c. Run the script roadbreak to create sinks at culvert locations

- i. &run roadbreak dem streams roads culverts
  - ii. &run roadbreak dem streams roads edges (if necessary)
- d. Run script createroadnetwork (NOTE: be sure that fixroad program is compiled and the path for executing the fixroad program in the createroadnetwork script is correct; the fixroad program is essential for a properly built road network).
  - i. &r createroadnetwork dem soildepth roads
    - 1. soildepth is the raster previously made when creating the stream network.