Condensed Version - Obtaining a DEM and Pour Point for VELMA 2.0

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Obtaining an Original DEM

1. Download a DEM that has the best possible quality for your area
2. Projected into a <u>meter based</u> coordinate system. An integer cell size is preferred. Do not project your raster in ArcMap, instead use BlueSpray to reproject.

Preparing a DEM and Pour Point for VELMA using BlueSpray

The following steps assume that you have downloaded the latest release of BlueSpray from http://gsp.humboldt.edu/Websites/BlueSpray/STUsersGuide/Download.html. Note that BlueSpray requires a 64-bit installation of Java.

Obtaining a High Quality DEM

1. **Obtain the Correct Area:**
   a. Load the DEM by dragging the DEM file into a view panel in BlueSpray
   b. Use the Marquee tool to select the area to crop
   c. Right click on the DEM layer and select "Transforms General -> Crop Raster" Click OK. This will create a new layer.
   d. Right click on the new DEM layer, select "Export to File…" to save the DEM
   e. Note that BlueSpray keeps everything in memory, not on disk. This makes processing very fast but dangerous! Remember to save any layers you need.
2. **Projecting:**
   a. If the DEM is not in the desired Spatial Reference System, right click on the "Scene" and select "Change SRS". If this is greyed out, it is because you don't have a defined SRS and you'll need to "Define" one first.
   b. Select your desired SRS. BlueSpray will project all the data in the scene to the new SRS. Save the new DEM if desired.
3. **Resampling:**
   a. If the DEM does not have a desired cell size, change it by right clicking on the layer-> transforms->sample->change width and height to an integer.
   b. If this is not working in BlueSpray resample in ArcMap with interpolated or bilinear but not nearest neighbor to the desired cell size/resolution.
   c. This can also be used to down-sample to change the resolution of the DEM.
   VELMA needs to be in meters, so always <u>project into a meter based coordinate system and change the cell size into meters.</u>

Finding the Direction Raster, Accumulation Raster, & Stream Network in BlueSpray

1. **Finding the Direction Raster**
   a. Right click on the DEM and select "Transforms: Water -> 2. Find Flow Direction". Make sure the DEM is selected as the first input and click OK. This will create the Flow Direction layer.
2. **Finding the Pour Points**
   a. Right click on the Original DEM and select "Transforms: Water -> 3. Find Pour Points" and click OK. This will create a Pour point layer.
3. **Finding the Initial Watershed Raster**
   a. Right click on the Pour Point raster and select "Transforms: Water -> 4. Find initial watershed raster".
   b. Make sure you have the correct Pour Point raster and Flow Direction raster selected and click OK. This will create a watershed raster.
4. **Finding the rest of the Watershed**
   a. Right click on the Watershed raster and select "Transforms: Water -> 5. Add Pixels to Watershed Raster".
   b. Use the watershed raster that was created above and the same direction and elevation raster and click "OK". This will create a new direction raster.
5. **Find the Accumulation Raster**
   a. Right click on the New Direction raster and select "Transforms: Water -> 6. Find accumulation". This will create an accumulation raster.
6. **(Optional) Find the Stream Network**
   a. Right click on the Accumulation raster and select "Transforms: Water -> 7. Find stream network".
   b. Select the new direction raster for the "Directions".
   c. Set the "Minimum Accumulation" value. If unsure, leave at the default of 100.
   d. Click "OK". A vector layer showing each of the streams while be created.

Obtaining output for VELMA

The process below will provide a raster and pour point for VELMA.

1. **Making a DEM with all the pixels flowing to Pour Points**
   a. Right click on the original DEM and select "Transforms: Water -> 8. Make pixels flow to pour point"
   b. Select the DEM and the new direction raster and click OK. This will create a New Elevation Raster.
2. **Create the Pour Point for the desired**
   a. Right click on the "Scene", Select New Layer, and select "Point Layer..." leave all default settings, click OK.
   b. Right click on the eyeball/Black cursor icon and select "Editable". A pencil icon will appear. Make sure the pencil is selected in the drop down box in the toolbar.

  c. Move the Flow Accumulation layer so it is visible just below the new point layer.

  d. Zoom to where the pour point should be, ideally it will be at or near a gauge station. Click in the desired accumulation pixel to add the pour point.

3. Create the new Watershed

  a. Right click on the Newly Created Pour Point layer and select "Transforms: Water -> 4. Find initial watershed raster". Select the New Direction raster for the direction input layer. This will create a watershed layer.

  b. Use the Marquee tool to crop the Flowing Elevations layer to the desired area. <u>Make sure you have at least a 10% buffer around the entire watershed.</u>

  c. Export the newly cropped layer as an ASCII file (see instruction below)

  d. Select the information ("I") tool and click on the pixel that overlaps with the pour point. Note the X & Y pixel location for VELMA.

  e. Right click on the cropped layer and select Settings > Raster tab > and note the Column, Rows, and Cell Size for VELMA.

Exporting files in ASCII format from BlueSpray

- Right click on your file and select Export to File.
  - Select the file type ASCII Grid (.asc)
  - Save in your outputs folder

Changing Cell values of a Raster to Export

The sets below are to create "test" data maps that can be used as place holders when running a VELMA simulation for Tree Age, Tree Cover, and Soil. Keeping in mind using the test data will not produce highly accurate VELMA results.

- Open your final DEM ASCII file and select, Transform General
- Click Classify, under the New Value box type the Test Data value number.
  - Test Data Values:
    - Soil : **3**
    - Tree Age : **80**
    - Tree Type: **1**
  - Click Okay
- Ensure that you are exporting integers not float rasters for all ASCIIs except for the DEM
  - Transforms General, Data type, and the desired bit as an integer
- Export your raster using the instruction from above.
- Repeat for each test parameter you need to create (Age, Cover, Soil).

Congratulations!! You have now have a DEM with all pixels flowing to a pour point, the location of your Pour Point, and (possibly) test data for Tree Cover, Tree Age, and Soil Type!