

Lesson 1: Geoprocessing in ArcGIS

With your internet browser go to USU Blackboard (<http://bb.usu.edu>) and download the Lesson1.zip file from the course webpage. You will need to use your A# and password to access the course website. Unzip the folder and put the Lesson1 folder on your USB flash drive. Then begin.

Assignment 1a: Creating a simple Model

- 1) Open ArcCatalog and navigate to the Lesson1 folder. Note, you'll have to establish an ArcCatalog "connection" to the flash drive first.
- 2) While in the Contents tab, right-click in the window and choose New, then choose Toolbox (make sure you are in the Lesson1 folder).
- 3) Rename the new toolbox Z_lesson1.
- 4) Double-click on Lesson1.mxd to open it in ArcMap. If data paths need to be repaired, repair them (r-click on layer > Data > Repair Data Source).
- 5) In ArcMap open the ArcToolbox window. Right-click on ArcToolbox and choose Add Toolbox.
- 6) Right-click on the Z_Lesson1 toolbox and choose New, then choose Model.
- 7) In the Conversion Tools toolbox, find the To Raster toolset and drag the Polyline to Raster tool to the ModelBuilder window.
- 8) Double-click on the Polyline to Raster tool in the ModelBuilder window.
- 9) For Input Features choose flowline.shp, for Value field leave as FID, for Output Raster put fl_grd (note the path for the output raster should be to the Lesson1 folder). Change the Cellsize to 30, and leave the other inputs as default. When done, click OK.
- 10) At the top of the ModelBuilder window, click on the Auto Layout button, then click on the Full Extent button.
- 11) From the Model menu, click on Save.
- 12) Close the Conversion Tools toolbox, and open the Spatial Analyst Tools toolbox.
- 13) From the Conditional toolset, drag and drop the Set Null tool to the window.
- 14) For the Input conditional raster choose fl_grd, for Input false raster or constant value, put 1. Name the output raster fl_nodata, and for the Expression put VALUE < 0. When done, click the OK button. [If a message says "not licensed" go to Tools > Menu > Extensions and check Spatial Analyst.
- 15) To find the Thin tool, click on the Search tab within the ArcToolbox window, and type in the work thin, then click the Search button.
- 16) Drag the Thin tool from the Spatial Analyst Toolbox to the Modelbuilder Window.
- 17) Double-click on the Thin tool and fill in the input parameters as follows. Use fl_nodata for the input raster, call the output raster fl_thin, Maximum thickness put 30, and for everything else use the defaults. Click OK.

- 18) At the top of the ModelBuilder window, click on the Auto Layout button, then click on the Full Extent button.
- 19) From the Model menu, click on Save.
- 20) Finally, from the Conditional toolset, drag and drop the Con tool to the window.
- 21) For the Input conditional raster choose fl_thin, for the Input true raster or constant value choose elev30m10, for Input false or constant value put elev30m, name the output raster fl_burn10, for Expression put VALUE=1. Click OK.
- 22) At the top of the ModelBuilder window, click on the Auto Layout button, then click on the Full Extent button.
- 23) From the Model menu, click on Save. Then from the Model menu click on Close. Save again, if it asks you to.
- 24) Right-click on the model and rename it streamburn.
- 25) Right-click on the streamburn model and choose Properties. Click on the Environments tab and open General Settings and click on Extent, then click on Values. Then click on General Settings and for the Extent choose the elev30m dataset to specify the extent (otherwise the final output of the model will be the extent of the streams which is smaller than the entire elevation grid). Then click on Current Workspace, click on Values and set the current workspace to the Lesson1 folder. Then click OK.
- 26) Right-click on the streamburn model and choose Edit, this opens the model again.
- 27) Right click on all the green ovals and make sure they are checked on for Intermediate and Add to Display (note you could click Intermediate off for the last output if you wish).
- 28) From the Model menu choose Run Entire Model. You should see all 4 steps of the model run, and the intermediate datasets added to ArcMap. Close the model (Model > Close), and examine the new data layers added to the ArcMap.
- 29) Right-click the streamburn model, and choose Copy.
- 30) Right-click the Z_Lesson1 Toolbox, and choose Paste.
- 31) Rename the copied model streamburn_p.
- 32) Right-click on the streamburn_p model and choose Edit.
- 33) Right-click on the blue oval for the Con tool that says elev30m10 (this grid assigns the grid values where the Thin grid = 1, in other words the elevation minus 10 meters).
- 34) Check on a Model Parameter for this input.
- 35) Since the input is now a parameter, we also want to have control over what we name the output, so right-click the output green oval for the Con tool and make it a parameter as well.
- 36) Save the model, and close.
- 37) Now double-click (also right-click 'Open') on the streamburn_p model and you will see that the default input parameters are there, but you can also change them easily. Instead of elev30m10, use the elev30m100 (100 meter burn). And change the output name to fl_burn100. Then click OK to run the model.
- 38) Zoom in and you should see that the fl_burn100 is quite different from the fl_burn10. You can also test this with the identify button with the Identify from: set to <All layers> instead of the <Top-most layer>, which is the default.

- 39) Finally, double-click on the streamburn model (one without parameters). What happens? Can you see how setting parameters can be useful?
- 40) Before you exit ArcMap, remove all the intermediate datasets. Open in Edit mode one of the two models you created. Check that each output (green oval) has Intermediate checked. Then go to the Model menu within the ModelBuilder display area, and choose 'Delete Intermediate Data.' Check that the data are indeed deleted in ArcCatalog.

Assignment 1b: Running a Python Script from ArcToolbox

- 1) First, export the models we created from Lesson1a to Python scripts. Start the ModelBuilder window for both the streamburn and streamburn_p models by right-clicking on the model and choosing Edit. Under the Model menu, choose Export, and then export the model to a Python script. Create streamburn.py and streamburn_p.py, and make sure they're both in the Lesson1 folder.
- 2) Right-click on the Z_Lesson1 toolbox, and choose Add, then choose Script.
- 3) Right-click on the Script tool and go through the wizard.
- 4) Enter streamburn for the Name, Streamburn No Parameters for the Label, and a short description for the Description. Click on Store relative path names.
- 5) Specify the streamburn.py file as the Script file.
- 6) Click on the Parameters tab and don't do anything (this file has no parameters), then click OK.
- 7) Add the streamburn_p.py script in the same way as steps (2-3).
- 8) Open the Properties and click on the General tab. Enter streamburn_p for the Name, Streamburn With Parameters for the Label, and a short description for the Description. Click on Store relative path names.
- 9) Click on the Parameters tab and then click on the blank cell just below Display Name. For this parameter enter something like "DEM subtracted". To the right of that cell, select Raster Layer from the dropdown list for the Data Type.
- 10) For the Parameter Properties, leave it as Type=Required, Direction=Input, and MultiValue=No.
- 11) Click on the blank cell below the Display Name "DEM subtracted" and enter "Streamburn Output." For Data Type choose Raster Layer.
- 12) For the Parameter Properties, change Direction=Output.
- 13) Click OK.
- 14) Click on the Streamburn No Parameters script tool (or alternatively right-click and choose 'Open'). Click OK. The script should run correctly, but nothing gets added to the ArcMap Display.
- 15) Click on the Streamburn With Parameters script tool. Choose the elev30m100 grid as the Alternate DEM and call the output grid fl_burn100. Run the script and see what happens. Using ArcCatalog, look for the output grid you created and add it to ArcMap.
- 16) NOTES: If you wanted to share these script and model tools with someone (or move them to another location) you would give them the Z_Lesson1.tbx file and the .py files. Since the

scripts are stored with relative paths, they should work as long as the .py files remain in the same location relative to the .tbx file.

Assignment 1c: Introduction to PythonWin

- 1) If a PythonWin icon is not on the desktop, copy and paste the icon there.
- 2) Start PythonWin by double clicking on the PythonWin icon.
- 3) Under File choose Open and browse to the Lesson1 folder and open the streamburn.py script. From the Windows menu choose Tile, and put the script window at the top and the interactive window at the bottom.
- 4) We'll talk about the code, though you're not expected to understand what it all means at this time.
- 5) To run the script click on the Run button, or choose Run under File. And see what happens.
- 6) The script executes correctly when the message on the bottom bar says 'returned exit code 0.' If it doesn't say this we have a problem.
- 7) Let's change the line that says `flowline = "flowline"`, to read `flowline = "flowline.shp"`.
- 8) Then run the script again....and hopefully it works. If it doesn't then delete any existing grids that causing the problem, using ArcCatalog (e.g. fl_grd may still be there).
- 9) Now open the streamburn_p.py file. This one has arguments which we find in the code (we'll learn more about arguments later).
- 10) To run this script from PythonWin we provide the arguments in the Run Dialog, separated by a space.
- 11) There are two arguments: the "subtracted" DEM input, and the name for the output streamburn grid. We must enter the complete paths for these two arguments **separated by a space in the Arguments entry box of the Run Dialog**.
- 12) The easiest way to do this is to open ArcCatalog and navigate to the Lesson1 folder, then copy and paste the pathname to the Arguments entry box, adding the two names we wish to use (e.g. elev30m100 for the input and fl_burn100 for the output).
- 13) We will probably have to edit the line that says `flowline = "flowline"`, to read `flowline = "flowline.shp"` again.
- 14) Run the script with the arguments and see what happens....
- 15) Run the script a second time and see what happens. There should be an error in the Interactive Window—the intermediate datasets and the final output datasets already exist.
- 16) To fix that we'll add one more line of code.
- 17) After the `gp.workspace = "C:\\\\..."` assignment, add the following line of code: `gp.Overwriteoutput = 1`. Then try running the script again. If everything went okay (and the stars are in the right position), the script executed without a problem.