Enlarging Rivers in Eaton County, Michigan's Water Flowline

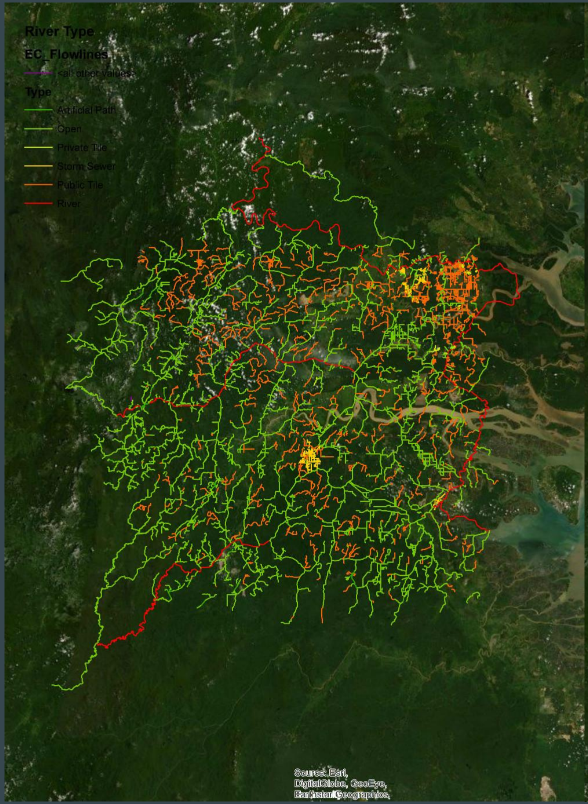
2019 Fall Geospatial Software Design Assignment 9

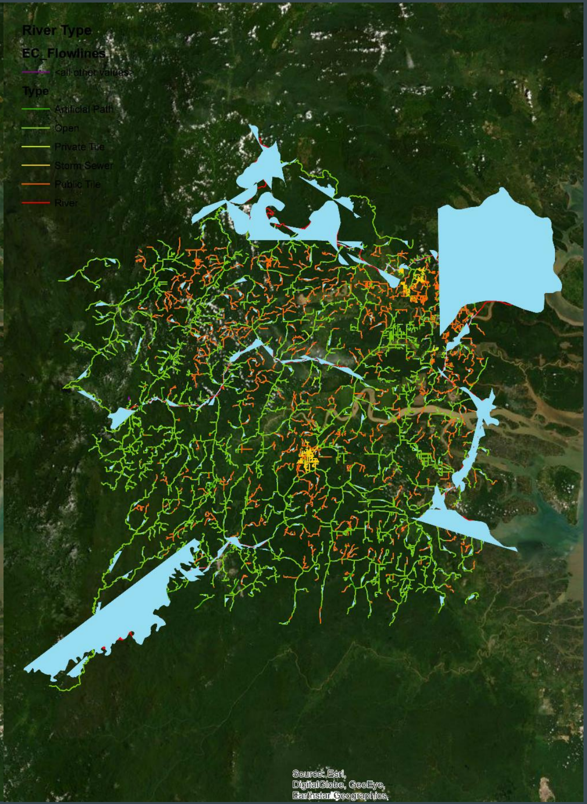
•••

Zixi Liu

Nov 4, 2019

Overview: Resize Rivers in Field “Type” of Flowline Shapefile

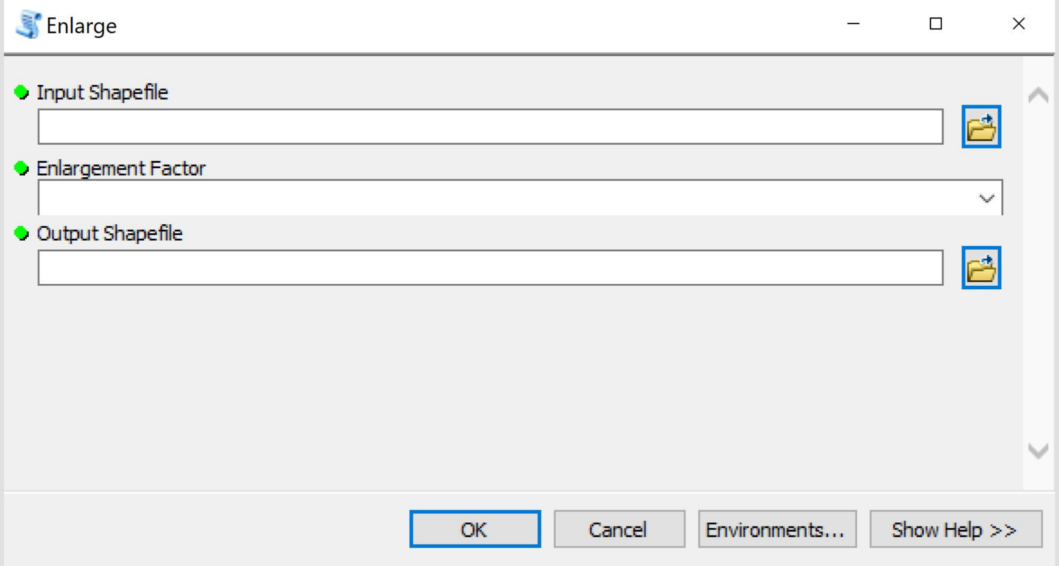




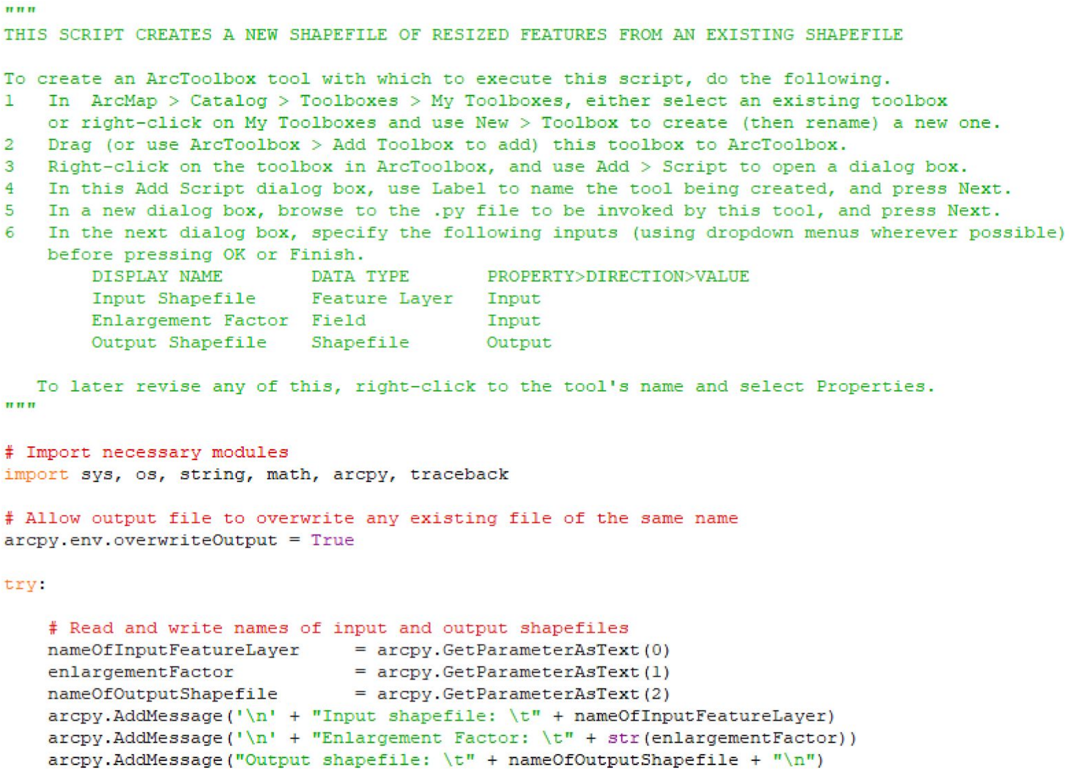
Flowlines colored in red are real rivers and public tiles. Flowlines colored in other colors are storm sewers, private tiles, and open water. Since we only need rivers for agitation, we want to resize (enlarge) these river vertices by factor 3 and others by factor 0.5.

What Our Arctoolbox Looks Like:

- ➔ Input Shapefile is a shapefile.
- ➔ Enlargement Factor is a field we choose from the Input Shapefile.
- ➔ Output Shapefile is the output after resizing feature.

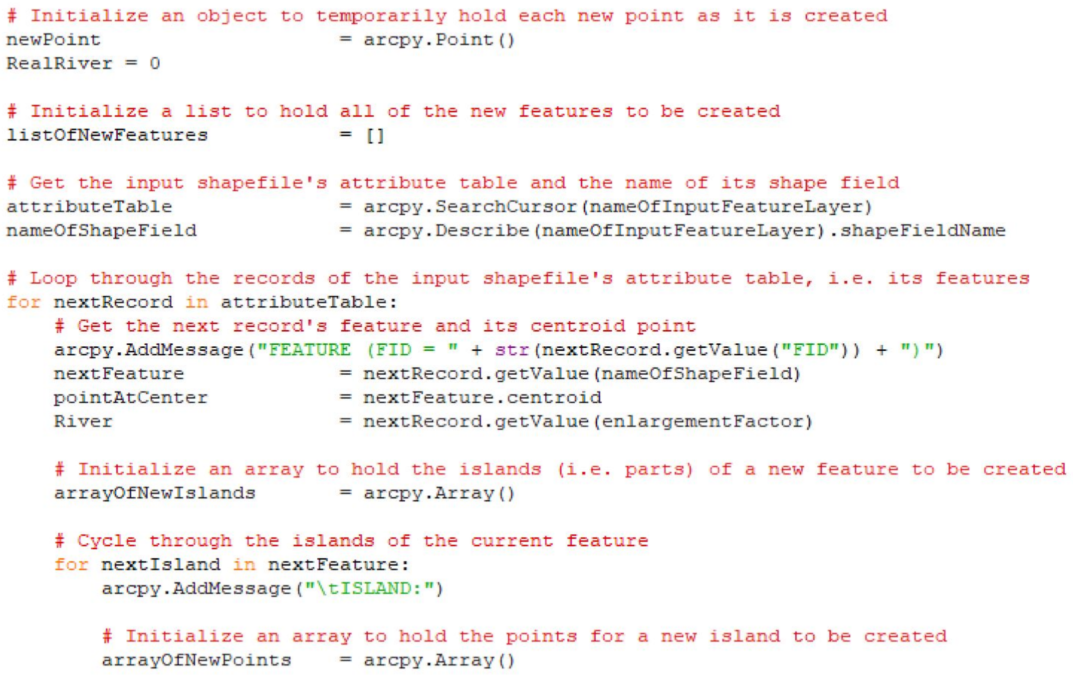


Understanding the Python Script



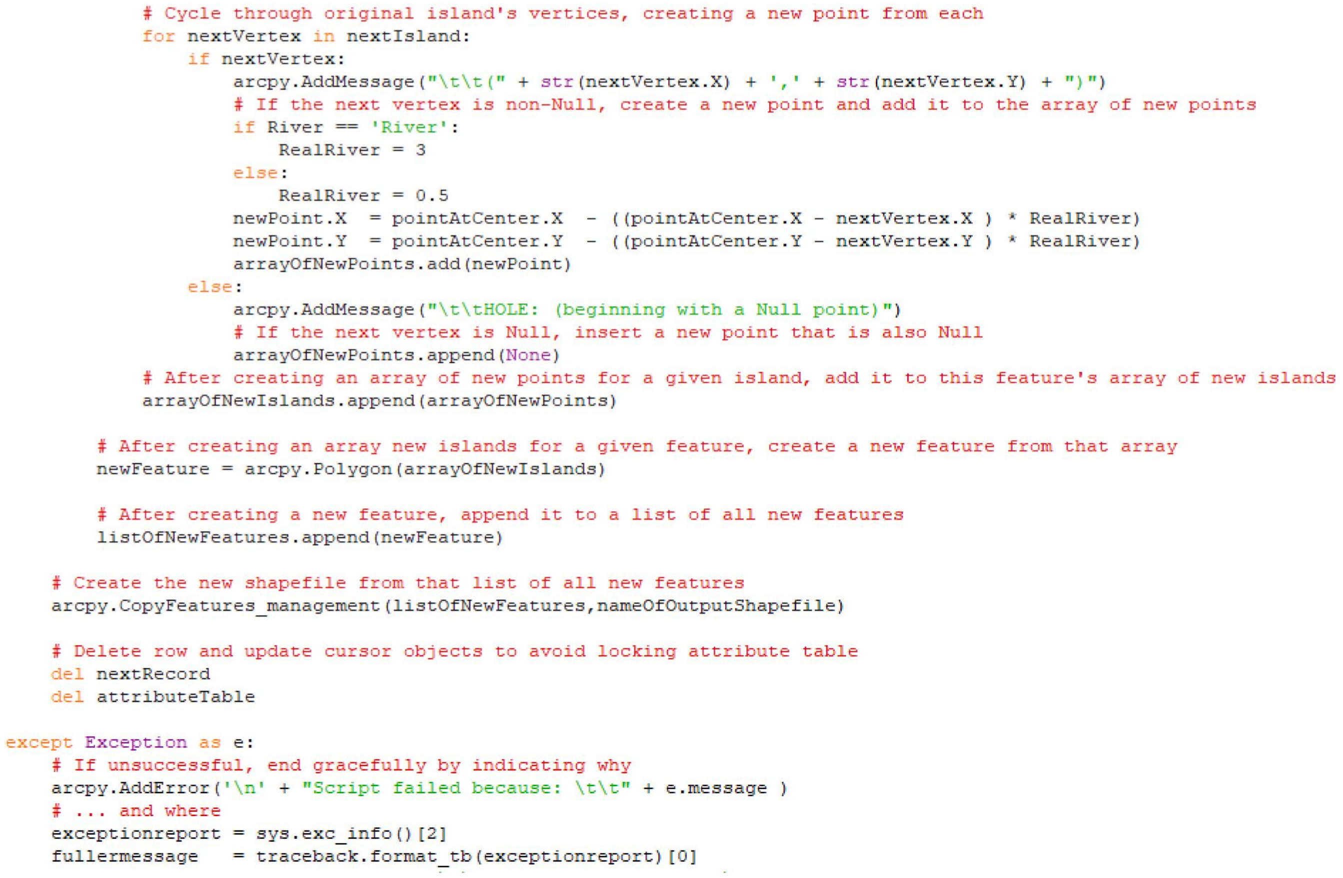
```
"""
THIS SCRIPT CREATES A NEW SHAPEFILE OF RESIZED FEATURES FROM AN EXISTING SHAPEFILE

To create an ArcToolbox tool with which to execute this script, do the following.
1   In  ArcMap > Catalog > Toolboxes > My Toolboxes, either select an existing toolbox
    or right-click on My Toolboxes and use New > Toolbox to create (then rename) a new one.
2   Drag (or use ArcToolbox > Add Toolbox to add) this toolbox to ArcToolbox.
3   Right-click on the toolbox in ArcToolbox, and use Add > Script to open a dialog box.
4   In this Add Script dialog box, use Label to name the tool being created, and press Next.
5   In a new dialog box, browse to the .py file to be invoked by this tool, and press Next.
6   In the next dialog box, specify the following inputs (using dropdown menus wherever possible)
    before pressing OK or Finish.
        DISPLAY NAME        DATA TYPE       PROPERTY>DIRECTION>VALUE
        Input Shapefile     Feature Layer   Input
        Enlargement Factor  Field           Input
        Output Shapefile    Shapefile       Output

   To later revise any of this, right-click to the tool's name and select Properties.
"""

# Import necessary modules
import sys, os, string, math, arcpy, traceback

# Allow output file to overwrite any existing file of the same name
arcpy.env.overwriteOutput = True

try:

    # Read and write names of input and output shapefiles
    nameOfInputFeatureLayer     = arcpy.GetParameterAsText(0)
    enlargementFactor           = arcpy.GetParameterAsText(1)
    nameOfOutputShapefile       = arcpy.GetParameterAsText(2)
    arcpy.AddMessage('\n' + "Input shapefile: \t" + nameOfInputFeatureLayer)
    arcpy.AddMessage('\n' + "Enlargement Factor: \t" + str(enlargementFactor))
    arcpy.AddMessage("Output shapefile: \t" + nameOfOutputShapefile + "\n")
```

Understanding the Python Script



```python
# Initialize an object to temporarily hold each new point as it is created
newPoint                    = arcpy.Point()
RealRiver = 0

# Initialize a list to hold all of the new features to be created
listOfNewFeatures           = []

# Get the input shapefile's attribute table and the name of its shape field
attributeTable              = arcpy.SearchCursor(nameOfInputFeatureLayer)
nameOfShapeField            = arcpy.Describe(nameOfInputFeatureLayer).shapeFieldName

# Loop through the records of the input shapefile's attribute table, i.e. its features
for nextRecord in attributeTable:
    # Get the next record's feature and its centroid point
    arcpy.AddMessage("FEATURE (FID = " + str(nextRecord.getValue("FID")) + ")")
    nextFeature             = nextRecord.getValue(nameOfShapeField)
    pointAtCenter           = nextFeature.centroid
    River                   = nextRecord.getValue(enlargementFactor)

    # Initialize an array to hold the islands (i.e. parts) of a new feature to be created
    arrayOfNewIslands       = arcpy.Array()

    # Cycle through the islands of the current feature
    for nextIsland in nextFeature:
        arcpy.AddMessage("\tISLAND:")

        # Initialize an array to hold the points for a new island to be created
        arrayOfNewPoints    = arcpy.Array()
```

Understanding the Python Script



```
                # Cycle through original island's vertices, creating a new point from each
                for nextVertex in nextIsland:
                    if nextVertex:
                        arcpy.AddMessage("\t\t(" + str(nextVertex.X) + ',' + str(nextVertex.Y) + ")")
                        # If the next vertex is non-Null, create a new point and add it to the array of new points
                        if River == 'River':
                            RealRiver = 3
                        else:
                            RealRiver = 0.5
                        newPoint.X  = pointAtCenter.X  - ((pointAtCenter.X - nextVertex.X ) * RealRiver)
                        newPoint.Y  = pointAtCenter.Y  - ((pointAtCenter.Y - nextVertex.Y ) * RealRiver)
                        arrayOfNewPoints.add(newPoint)
                    else:
                        arcpy.AddMessage("\t\tHOLE:  (beginning with a Null point)")
                        # If the next vertex is Null, insert a new point that is also Null
                        arrayOfNewPoints.append(None)
                # After creating an array of new points for a given island, add it to this feature's array of new islands
                arrayOfNewIslands.append(arrayOfNewPoints)

            # After creating an array new islands for a given feature, create a new feature from that array
            newFeature = arcpy.Polygon(arrayOfNewIslands)

            # After creating a new feature, append it to a list of all new features
            listOfNewFeatures.append(newFeature)

        # Create the new shapefile from that list of all new features
        arcpy.CopyFeatures_management(listOfNewFeatures,nameOfOutputShapefile)

        # Delete row and update cursor objects to avoid locking attribute table
        del nextRecord
        del attributeTable

    except Exception as e:
        # If unsuccessful, end gracefully by indicating why
        arcpy.AddError('\n' + "Script failed because: \t\t" + e.message )
        # ... and where
        exceptionreport = sys.exc_info()[2]
        fullermessage   = traceback.format_tb(exceptionreport)[0]
```