**CSAT Task 2 -> Sub-Reach Post-Processing Script**

**Script**

* User Inputs
  + Path to shapefile
  + Path to CSAT outputs (or will this just be the output folder?)
  + Number of years for volume analysis (if user does not want to use default of 5 years)
* Process
  + Accesses Feature Service and creates a GeoDataFrame of desired fields
  + Determines that the shapefile provided and the GDF are located in the same Coordinate Reference System
  + Reads the provided shapefile and determines how many AOIs are present
    - Loops through each AOI is there are multiple
  + Clips the Feature Service GDF based on the provided shapefile
  + From the clipped GDF, takes the reaches that intersect with the AOI, finds the CSAT output rasters (Last Surveys and Shoaling Rates) for those reaches, and copies them into a new directory to work in
  + In the working directory, it clips the rasters with the polygon and outputs those clipped files into the designated output folder
  + In the case where there is more than one reach located within the AOI, it will merge those clipped files together
  + Once the raster files have been clipped, the script starts developing the volume and SPQ tables
  + The code takes the authorized depth, last survey, and shoaling rates to calculate the volumes
    - If there is more than one reach located in the AOI, it will take the deepest authorized depth
  + For the SPQ table, the script takes the reaches within each AOI (if there are more then one, it loops through them) and calculates the volumes based on the clipped raster files and the authorized depth
  + The exports are placed in a new folder with the name of the shapefile
* Exports
  + For each area of interest
    - Clipped raster files of the last surveys and shoaling rates for each reach, if multiple
    - Merged files of the last surveys and shoaling rates
    - Volumes table
    - SPQ table with the constrained reaches

Questions/Concerns

* Volume validation
  + Volumes are slightly off (deeper depth, more they’re off, usually about 100)
  + Error margin?
* Output location
  + Where do we want to put outputs?
    - In the same output folder as CSAT outputs?
    - Create folder in CSAT folder?

Possible Future Work

* If there are multiple AOIs, create a way to name them instead of having them numbered in the outputs
  + Maybe add a column to the attribute table of the shapefile and distinguish that as the name for each
    - Conditional statement for if the column exists?
* Add a way to process multiple shapefiles in one run
  + Loop through a directory of shapefiles and process each one with the script
    - Names would need to change, along with some variables
* Add a way to input coordinate file and convert to shapefile (if it would be useful…?)
  + Conditional statement
  + Similar to script for KC Reimbursable

**Initial ArcGIS Steps**

1. For the area you are trying to analyze, create a folder and include all nearby shoaling datasets. This will allow the program to process quicker and not have to sort through all the datasets from the district.
   1. Try to make a way where the user does not have to do this?
2. Once loaded into ArcGIS, we want to input our polygon into our map. We can do this inputting coordinates into the software or directly drawing in the polygon boundaries.
   1. If using coordinates:
      1. Have coordinates in an Excel file with clearly marked columns for latitude and longitude. If you are analyzing more than one area and have multiple polygons, each polygon must have a corresponding number to tell them apart, as seen below.

[PIC]

* + 1. Use the tool *Coordinate Table to Polygon* with the following inputs
       1. Input Table: Your table of coordinates
          1. This can be found by clicking the yellow folder on the right of the text box and finding your Excel sheet on your computer.
       2. X Field: Longitude
       3. Y Field: Latitude
       4. Output Polygon Feature Class: Name your area as you see fit
       5. Line Grouping Field: This field is optional. Only fill it out if you have more than one polygon. The value will be the column that states which polygon is which, as seen in the pic above as the “PolygonID” column.
       6. Output Coordinate System: This will be whatever coordinate system you are working in. How to describe this?

[PIC]

* 1. To draw directly in the software:
     1. Use the tool *Create Feature Class* to create a space for the polygon we are going to use to clip our datasets. The tool will need the following inputs.
        1. Feature Class Location: I try to put mine in the geodatabase for the project, which will look like “Name of Project”. Gdb, but you can place it wherever.
        2. Feature Class Name: This will be the name of the area we are restricting the reaches to.
        3. Geometry Type: Polygon
        4. Coordinate System: Select the current map, or if you are using a different coordinate system, find and select that one.
     2. After running that, travel to the **Edit** ribbon at the top of the screen. In the Features section, select “Create.” A pane will pop up. The feature class you just created should appear; select it. A few options should put up under it; these are tools to draw in your polygon. Select one and start drawing your polygon on the map.
     3. At the bottom of the screen, a little bar should pop up. When you are done drawing your polygon(s), select the check mark.

1. After your polygon has been created in the project, use the tool *Create Raster Dataset*. This will create an empty dataset that will allow us to merge our shoaling datasets together.
   1. Output Location: Similarly, to Step 2.b.i.1, I place my output file in the geodatabase.
   2. Raster Dataset Name w/ Extension: This will be the name of the merged datasets. If you plan to use this set again in the future, name it by the area or another feature. This name must have no spaces!
   3. Spatial Reference for Raster: Select the current map, or if you are using a different coordinate system, find and select that one.
   4. Number of Bands: With these datasets, it will be 1.
2. Next, we will use the tool *Workspace to Raster Dataset*. This will merge the shoaling datasets we set aside in Step 1 into the empty raster dataset we just created.
   1. Input Workspace: This is the folder on your computer with the needed datasets. Navigate to it on your computer by selecting the yellow file button on the right side of the text box.
   2. Target Raster Dataset: This will be the raster dataset we created in Step 3. Navigate to it by selecting the yellow file button on the right side of the text box.
   3. Ignore Background Value: This value needs to be 0 so there is no background.
   4. NoData Value: This value needs to be 0.
3. Lastly, use the tool *Split Raster.* This will split the raster based on the polygon.
   1. Input Raster: This will be our raster dataset we created in Step 4.
   2. Output Folder: Similarly, to Step 2.b.i.1, I place my output file in the geodatabase.
   3. Output Base Name: This will be the name of the split dataset.
   4. Split Method: Select Polygon Features.

\*After running Step 5, the split dataset will not appear automatically in the Contents pane. If you go to the View ribbon and select “Catalog Pane,” the Catalog will pop up on the right side of the screen. To find you dataset, look where you placed the dataset in the project, which will usually be in the “Databases” folder or the “Folders” folder. Drag and drop it onto your map, and it should appear. If you have more than one polygon, you will have more than one output file. The names of these files will be the “Output Base Name” from Step 5, followed by a number. If they do not appear in the Contents pane, right-click on your folder and hit “Refresh.”

**Troubleshooting**

* After Step 4, my data in ArcGIS would look wildly different than the initial shoaling outputs. If this happens to you, check your maximum and minimum values on your raster file, which you can see in the Contents pane on the left side of the screen. You can edit these values if you right-click on the dataset and go to Symbology. The only thing wrong is the visuals; the data is correct, so if you don’t need correct visuals, ignore this.
  + Most of the time, this will correct itself in Step 5.