Documentation for Data Extraction Process

The objective of this toolset is to prepare the input files for running SLEUTH model. When user opens this toolset in ArcMap, the structure is shown as Figure 1. User can apply some of the tools to conduct data preparation process. It contains two types of preparation, one type is to prepare data for all the counties automatically, in another type user can manually select a number of counties and prepare data for this extent.
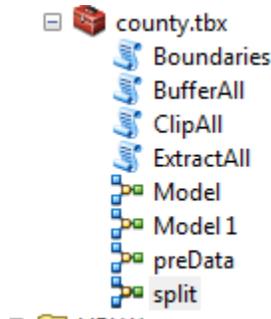

Figure 1. Structure of the toolset

1. **Automatic preparation of all the counties**
(1) Generate all the individual county ShapeFiles

In this study, we focus on the county level. The first step is to get all the individual county polygons, since the input layer is composed of all the counties, we can use split model to split all the counties. Right click on **split** model, and select **Edit**, it will open the interface shown in Figure 2. Double click the **Split** tool, and select attribute FIPS as **Split Field**, in this way, all the split counties will name after its FIPS.
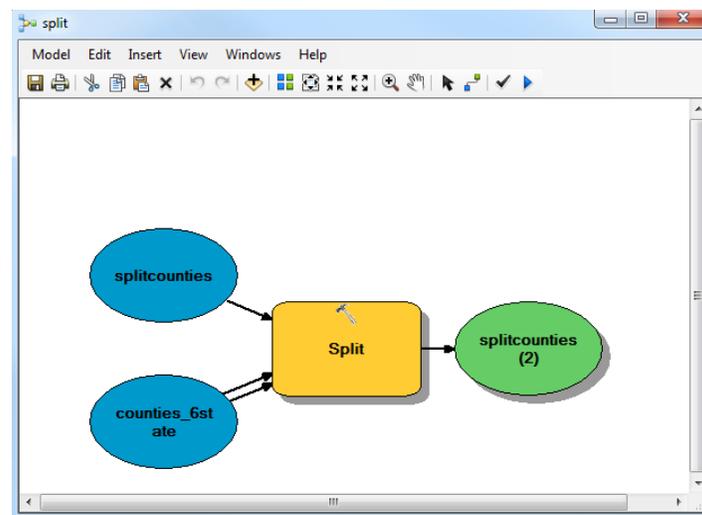

Figure 2. Tool for splitting all the counties

(2) Generate all the boundaries

In Sleuth model, the range of input data should be rectangular. We use tool **Boundaries** to generate the rectangular extents for all the counties. Input folder should be the output folder of the **Split** tool (see above). And then user defines the output folder to store the newly generated boundaries.
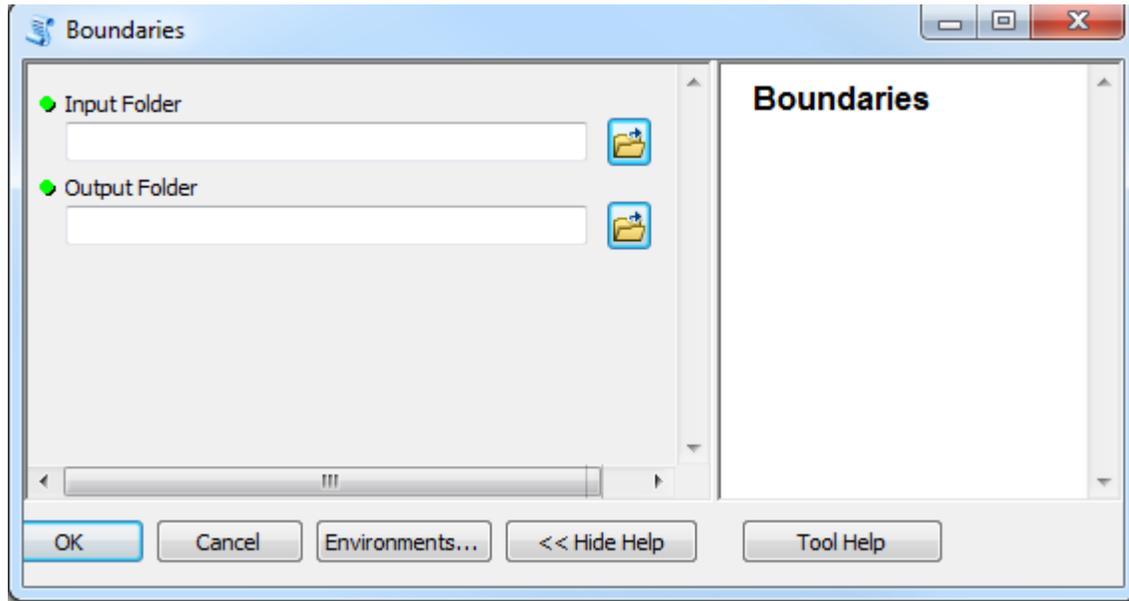

Figure 3. Tool for generating all the boundaries

(3) Extract data

We use the newly generated boundaries in the previous step as masks to extract data from the whole study area. Double click **ExtractAll**, we can see the interface shown in Figure 4. User needs to specify all the input layers, of which the extent is six states, and specify the input directory which contains all the county shapefiles. The output results will be all the layers for different counties. All the data layers for each county store in a folder named after county FIPS.
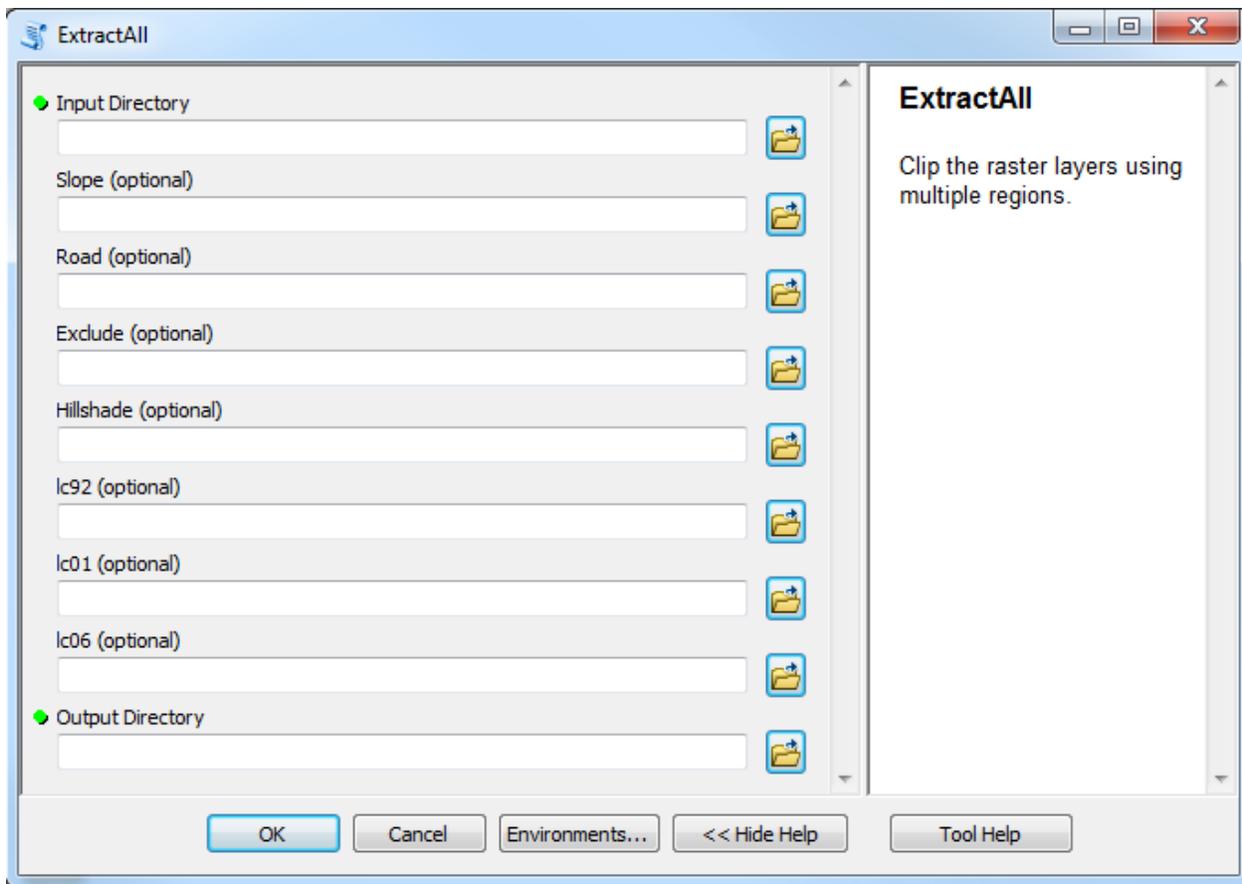
Figure 4. Tool for extracting all the data layers

2. Prepare user defined study area

For this type of data preparation, user first selects a number of adjacent counties in ArcMap, right click on the data layer, click **Export Data** and set selected features as export data. Then use ArcGIS inbuilt tool **Minimum Bounding Geometry** to generate the boundary shapefile. Use this shapefile as input polygon in **preData** model, see Figure 5, and this tool will extract all the layers. User needs to further define the processing extent and snap raster, see Figure 6. User can see this window from the model interface, select "**Model**" -> "**Model Properties**" to set the values.

Some other tools are developed under this toolset, user can use them to assist data preparation. Such as the tool **BufferAll**, this is used to generate the buffering boundaries for counties. User can apply this tool if he wants to include certain neighboring regions around the boundaries and generate new masks.
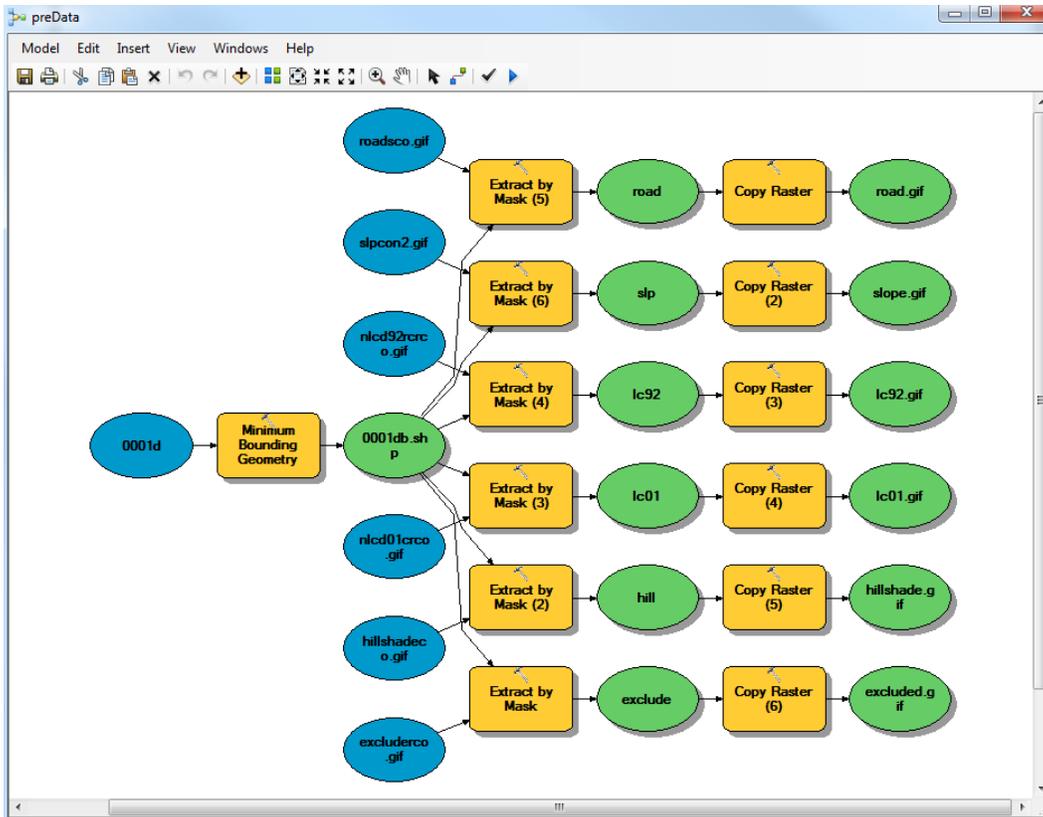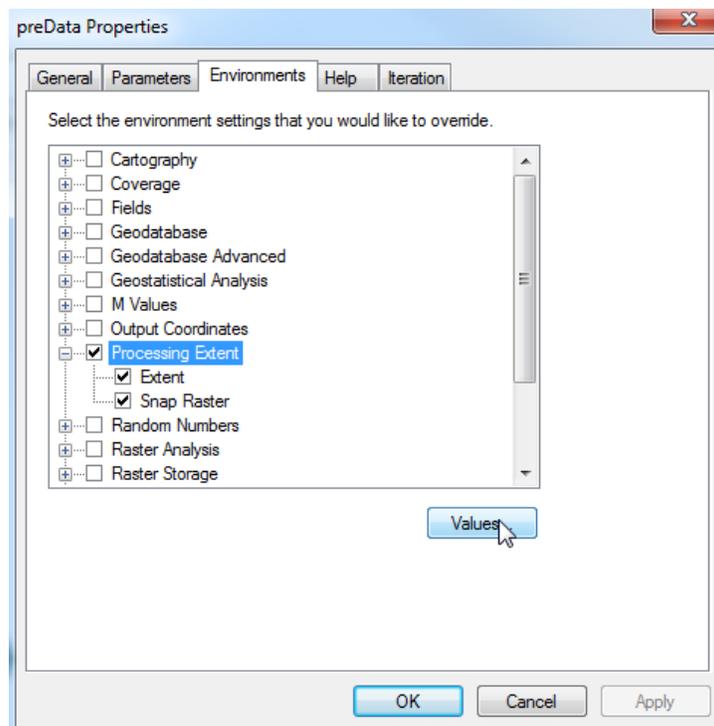
Figure 5. Model for extracting data

Figure 6. Environmental setting for **preData** tool