

Direct Output from Evac Tool

The output you see here is one of four output choices. This choice uses parcels for boundary selection along with storm surge limits (category 1-5) layer.

This particular output is most like what Pinellas County actually uses. This Zone Creation Tool has multiple options for zone assignment triggers. Parcel percent coverage is the most important, with barrier island and mobile home selected as well for this output.

The parcel coverage chosen in this demonstration was 30%. This means that if a parcel is 30% or more inundated, the entire parcel will be assigned the equivalent evacuation level for the category of storm.

Legend

- Roads
- Open Water

NewEvac Evac Level

- A
- B
- C
- D
- E
- M (Mobile Home)
- X (Non-Evac)
- N (Not Counted)



0 1 2 4 6 8 Miles



This map shows untouched output from Evacuation Creation Tool. Parcel Assignment option chosen.



Evac Zone Tool – Manual/Tutorial

Version 1.3 – March 2019



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Introduction

The purpose of this tutorial is to illustrate, step-by-step, how to install the ArcGIS Evac Zone Tool and use the major functionality available in the tool. This will mainly show how the tool operates and not what is happening in the processes underneath. The Evac Zone Tool is designed to produce a viable first-cut of evacuation zones in a specified area or county based on surge zone input and other layers for delineation in a real world situation. Surge zone boundaries are not shared by any physical features in the real world. The boundaries are solely based on where inundation derived from elevation marks out the territory for a category zone. Emergency Managers and Public Safety officials need to be able to define evacuation zones based on real world features and attributes. These can be property lines, roads, and even land use areas. This Tool will take surge zones and fit them to bounded areas that can be managed and used for orderly evacuation of the public.

Objective

This instruction manual will help you gain familiarity with the Tool by showing you the basics of operation and lead you through the processing of one type of scenario. After familiarizing yourself with the functions and types of output this Tool can create, a brief tutorial will show the steps to achieve the results of one of the options.

Getting Started

Software Requirements

- .Net Framework 4.5.2 for ArcGIS 10.5
- ArcGIS 10.5 (Note: Evac Zone Tool is fully functional for ArcGIS Advanced only).
- Data Input files (See below)

Note: Data Input requirements

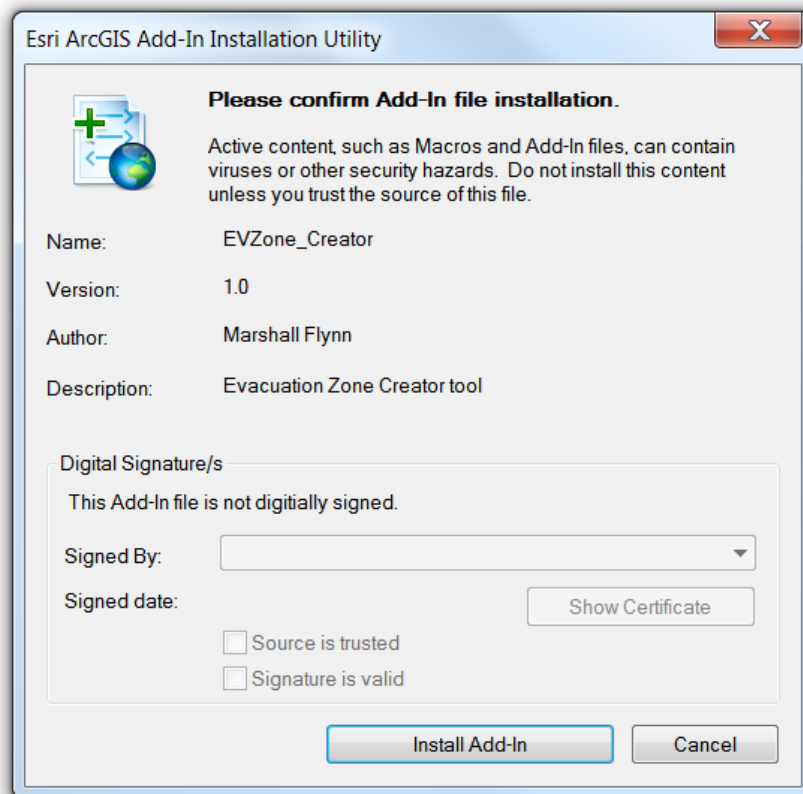
The Evac Zone Tool requires the use of some particular input layers to create the final zones. These layers are available from two places. From the same source where you got this tool, two layers will be available: Land Outline layer for Florida, and Land Cover/Land Use layer for Florida. For using property parcel methodology, the FDOR parcel outline and NAL data files will be necessary (source link below). Road centerlines will also be needed, but they may be derived from your county or the state of Florida statewide dataset.

Setting Up ArcGIS Evac Zone Tool

As indicated in the software requirements, the Evac Zone Tool requires Microsoft .Net Framework 4.5.2, ArcGIS 10.5+, and unlike other Evacuation Study Tools – no Spatial Analyst is necessary.

Installing ArcGIS Evac Zone Tool

- Download the ArcGIS Add-In to a readily available folder
- While ArcGIS is not open, double-click on the Add-In. You will see this:
- Click 'Install'



- Then open ArcGIS. Click on 'Customize' in the menu bar at top.
- Click on Add-In Manager. You should see the newly installed Tool on the left.
- Click on the 'Customize' button at bottom. You might want to create a new Toolbar.
- If you made a new Toolbar, or want to add Tool to an existing, click the 'Commands' tab.
- Find the 'Tropical' collection – on the right you will see the Tool. Drag to Toolbar.

Post-Installation

After installation, you can prepare a folder, or preferably Geodatabase for your input source data. If you are in the State of Florida, you will have surge zones created as a result of the Statewide Evacuation Studies Program. Depending on the version you choose to use, you can use limits or boundaries of all surge zones at once, or the depth layer zones, or even the new Universal Height Zones.

First, we suggest creating a file geodatabase. If you create a feature dataset within the file geodatabase, then you can select your projection (State Plane zone, etc.) for all poly and point features to reside in. By exporting your needed layers into that feature dataset, the projection will be the same for all layers within. If you are on the east coast, that would be State Plane West 901, for instance.

If you are planning on using the depth surge zone layers or the Universal Height layers, then it is easier to use the existing output geodatabases that were delivered by the one who ran the surge model. If you would like to use composite surge output (one layer for all 5 zones), you may export that into the new file geodatabase you created.

Depending on what method you want use to delineate evacuation zones, you have some choices of what layers to include. Two layers are used in whatever method you choose, and those are the Florida land outline layer and some form of road centerlines (a line or polyline file). Both of these layers should be exported into the new File geodatabase (FGDB) you created. If you want simpler, less detailed evacuation zone delineation, you may want to use the LAND USE/LAND COVER layer available. This also should be exported into your FGDB. If you want detailed delineation that uses property parcels, a little more preparation is necessary.

Parcel Data

To be consistent, the parcel layers we will use are from the Florida Department of Revenue. All county Mass Appraisal databases are homogenized into a standard file structure using NAL codes. The location of the data is here: ftp://sdrftp03.dor.state.fl.us/Map%20Data/00_2018 You should unzip your county parcel boundaries and then download the corresponding NAL file to join to it. The NAL file can be found here:

<ftp://sdrftp03.dor.state.fl.us/Tax%20Roll%20Data%20Files/2018%20Final%20NAL%20-%20SDF%20DBF%20Files> The county numbers are not the familiar FIPS numbers, so you will need the spreadsheet here to decipher the codes, and then you can download the NAL file matching your counties number:

ftp://sdrftp03.dor.state.fl.us/Tax%20Roll%20Data%20Files/2018_NAL_SDF_NAP_Users_Guide

The parcel boundary file will contain only one field, and that is the parcel ID field, or the 'PARCELNO' field. This will be joined with the NAL DBF file. The NAL file may have the field named 'PARCEL_ID'.

2. Choose the table to join to this layer, or load the table from disk:

NAL37F20

☒ Show the attribute tables of layers in this list

3. Choose the field in the table to base the join on:

PARCEL_ID

Join Options

☒ Keep all records

All records in the target table are shown in the resulting table. Unmatched records will contain null values for all fields being appended into the target table from the join table.

Once joined, you will see all the parcel data relevant for the county. The important field that needs to be retained for creating evacuation zones is the 'DOR_UC' field. You may keep the other joined fields or hide them. Now you can export the joined parcel layer to the new FGDB you created and it will permanently retain the joined fields.

ASMNT_YR	BAS_STRT	ATV_STRT	GRP_NO	DOR_UC	PA_UC	SPASS_CD	JV	JV_CHNG
2018	09			060			207634	0
2018	03	8	4	060			92591	0
2018	09			060			106830	0
2018	03	8	4	060			80817	0
2018	03	8	4	060			445032	0
2018	09			060			177630	0
2018	03	8	4	060			72774	0
2018	09			060			185950	0
2018	03	8	4	060			96687	0
2018	03	8	4	060			2927813	0
2018	09			060			224926	0
2018	03	8	4	060			91796	0
2018	09			060			129636	0
2018	03	8	4	060			76950	0
2018	09			060			291903	0
2018	03	8	4	060			127775	0
2018	03	8	3	060			24008	0

(0 out of 115507 Selected)

After the join, these fields will be present

Base Layer Data

You will need the **Florida Land Layer** that comes with this Tool. It is a polygon layer that includes the whole State of Florida. This layer is necessary for defining barrier islands. Simply download from the source and export into the File Geodatabase you created for storing your data.

Another layer that is needed would be road centerlines. Any accurate **road centerline layer** is appropriate. No attributes will be used in the modeling. The Tool was built and tested using FDOT street data, which may be the desired layer for you as well. Whatever road layer you use, make sure it includes all classes of streets from highways to residential streets.

Surge Layer Data

The most important layer type for this Tool to define Evacuation Zones would be the Storm Surge or Storm Tide layers you have used from the Statewide Regional Evacuation Studies Program (SRESP). You may or may not have delineated your zones previously using GIS, but this process can cut down the time used to get to a final zone assignment. If you currently have Evacuation Zones that are essentially the same as the Surge Zone boundaries or limits, then this is the Tool for you. If your county has just been upgraded to a new Hurricane Center SLOSH Basin, then after you delineate surge zones, you will want to proceed to creating your evacuation zones. This Tool is what you need.

There are three types of surge layers defined in this GIS Tool. The first or **Composite Surge Layer** is essentially the simple form of Storm Tide Zones¹ that have been used by counties since the beginning of the SRESP. The zones are composite because they contain all the zones 1 through 5 in one layer. Inherent in the composite layer is that a higher zone covers all the area of the lower zones as well. This file may or may not be in a geodatabase. Export the file from its source into the File Geodatabase you created to store the data for the model run.

The second type is the **Multi-Tool Depth Surge Layers**. These depth layers are the output from running the SRESP Multi-Tool. A number of counties have run that Tool to delineate their surge zones. The output layers are contained in a geodatabase. Finding and selecting the output geodatabase is all that is necessary to use the individual depth layers in this Tool. The advantage of using the depth layers is you can define what depth you want to start assigning evacuation zones. If you do not want inundation at 1 foot to be included in your evacuation zones, simply choose 1ft as your starting depth.

The third type is the **Universal Surge Height Layers**. These are actually depth layers, but they are based on a universal surge height vs. Saffir-Simpson category storms. This is a newer product that came about from the need to decouple wind-based category definitions from storm surge. For each surge height level, there is a corresponding layer that defines depth of surge over land. In this Tool, you have the ability to define which surge height becomes what evacuation level. The output from the Universal Height Tool also is contained in a geodatabase which you simply can find and select for your surge input.

Now that the File Geodatabase has been populated with your source data and your surge layers are available, it is time to start readying the Tool.

Setting Default Scratch Workspace and Environment

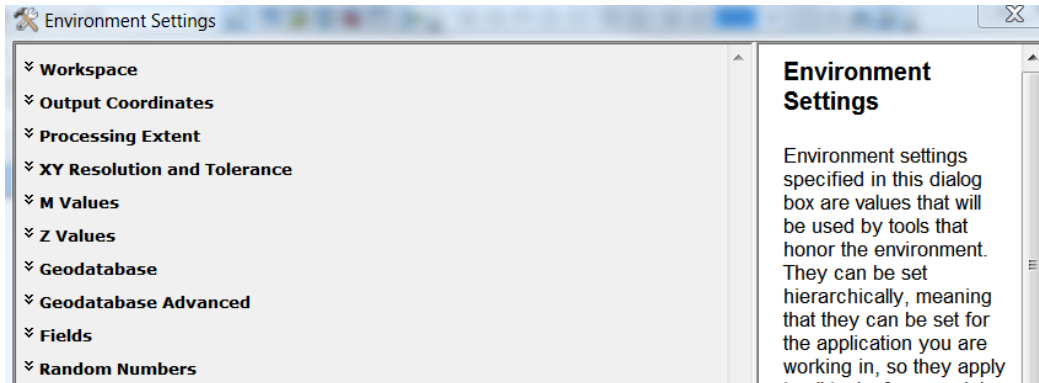
In ArcGIS 10+, the default scratch workspace may not be set. This is the space where some geoprocessing may place intermediate files during model runs. Windows also will default temporary environment inside your profile folders. ArcGIS during geoprocessing may place intermediate files in strange places like the C:\Windows\system32 folder. This may happen if your default Windows Environment variable TEMP is not set or is set inside a profile sub-folder.

For this Tool and other Statewide Regional Evacuation Program Surge Tools, the scratch workspace must be set to a folder that is writable and located in the Root Directory (C:\). We suggest that a folder be created like this: 'C:\gistemp'. This folder (whatever

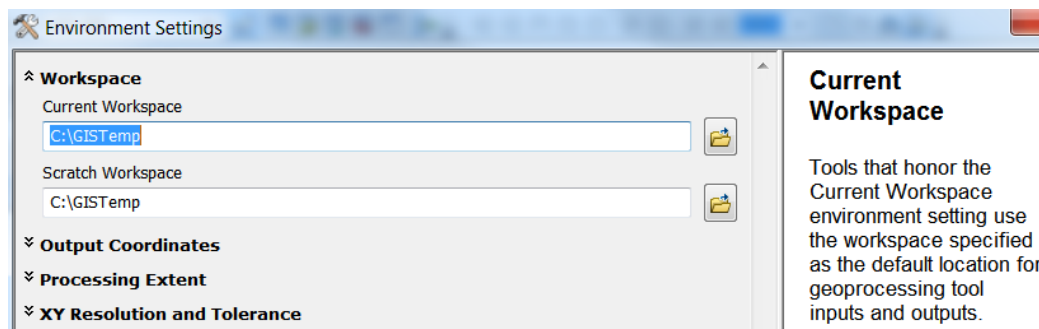
¹ Storm Surge Zones with astronomical tide. SRESP surge zones incorporate high tide, so also Storm Tide Zones.
March 2019

you name it) should have full rights by everyone. Then it should be assigned as the Scratch Workspace. This is done in ArcCatalog.

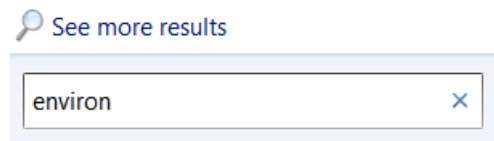
Proceed to open Environment Settings under the Geoprocessing Menu:



Under the workspace option, you would enter the directory you created in both 'Current Workspace' and 'Scratch Workspace':



Close ArcCatalog and proceed to set Windows TEMP variable. To set your Environment Variables, just type 'environ' in your program search tool (Cortana for Windows 10):

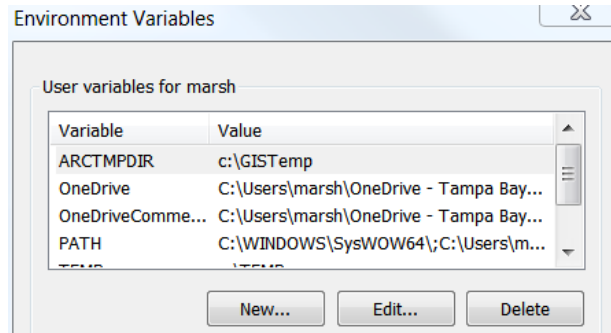


This will bring up choices to change your Environment Variables. If you have Administrative Rights, you can change both Account Variables and System Variables. We will show Account Variable changes in this document.

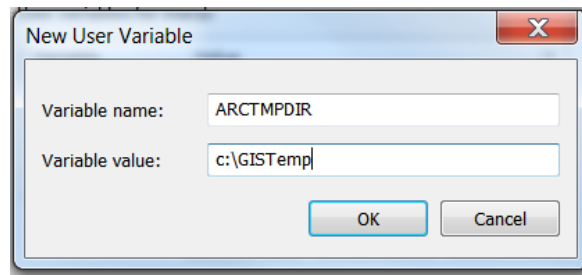
Control Panel (2)

-  Edit environment variables for your account
-  Edit the system environment variables

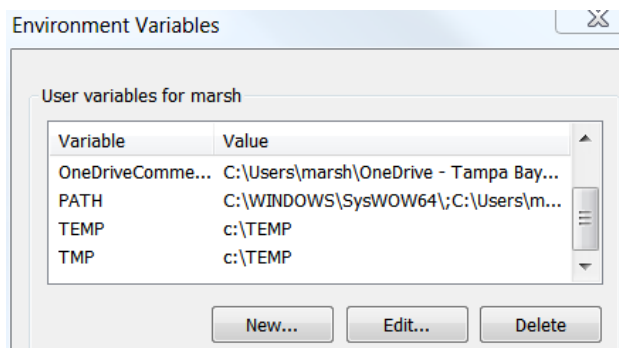
The first variable you want to change or create is the ARCTMPDIR Variable. This will be the same directory you created for ArcCatalog. If it already exists, it will look like this:



If you do not see it, you create it by clicking 'New' and adding the values:

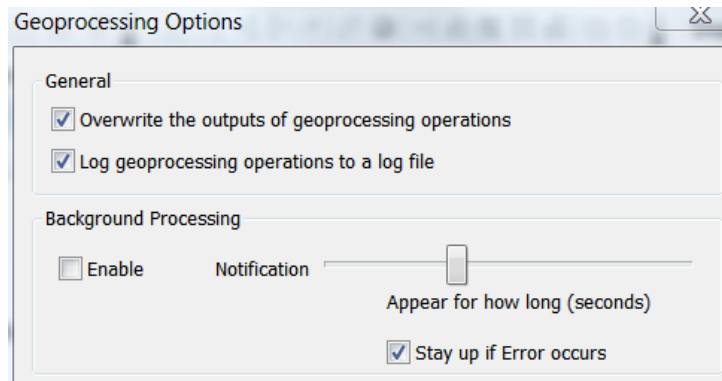


The same goes for the Windows TEMP Variable. You most likely will see this already populated, but ESRI recommends having the variable point to a folder in the Root Directory (C:\), not unlike the Scratchspace Folder. Create a directory in C: called 'temp' or whatever you want to name it. Then edit the User variables for TEMP:



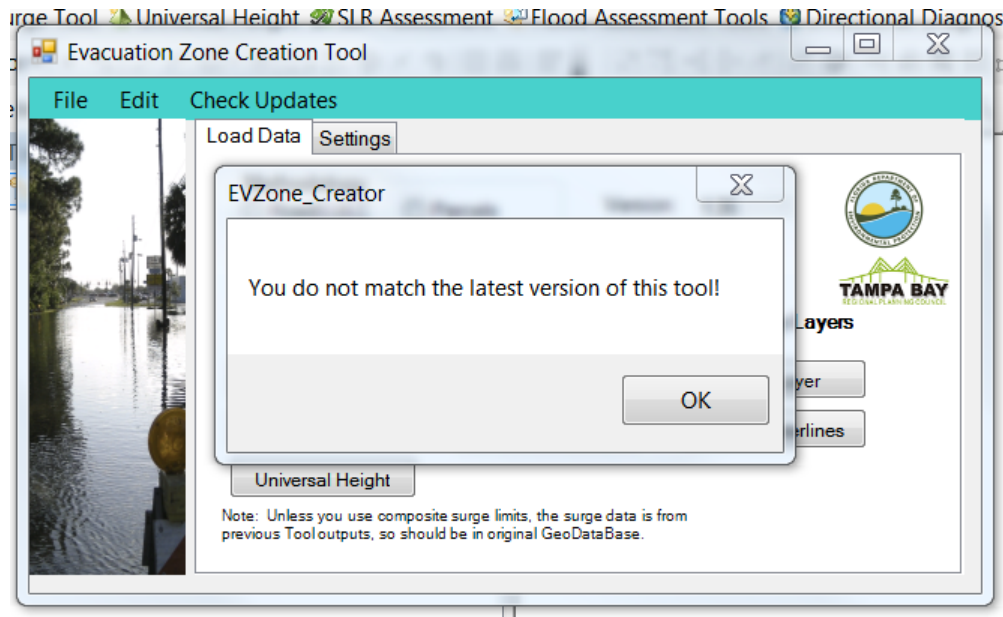
Setting Background Processing Off

One more thing to set for any Add-In that is incorporated in ArcGIS (ArcMap) is the Background Processing Setting. If one is doing geoprocessing with ArcTools or manual selection of geoprocessing tasks, Background Processing can be helpful to allow other processes to continue in the foreground. However, if there is a program or linear set of scripts running, Background Processing will derail the order of processing and ultimately cause the program or in this case, ‘modeling’ to fail. To do this, you go into your Geoprocessing Menu and choose ‘Geoprocessing Options’, where the setting for this is found. Uncheck the ‘Enable’ box in the background processing section:



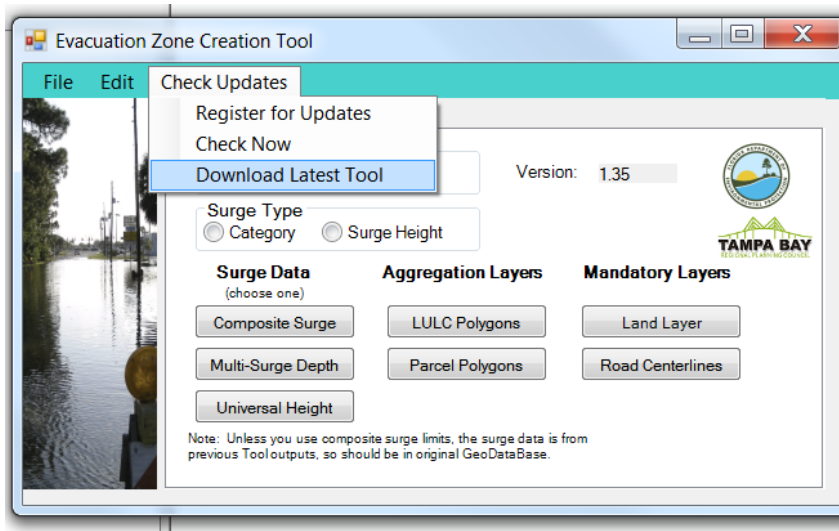
Versions and Updating the Tool

At the time you want to run a model to create evacuation zones, you may encounter that the Tool has a newer version released. You can tell this when you open up the tool.



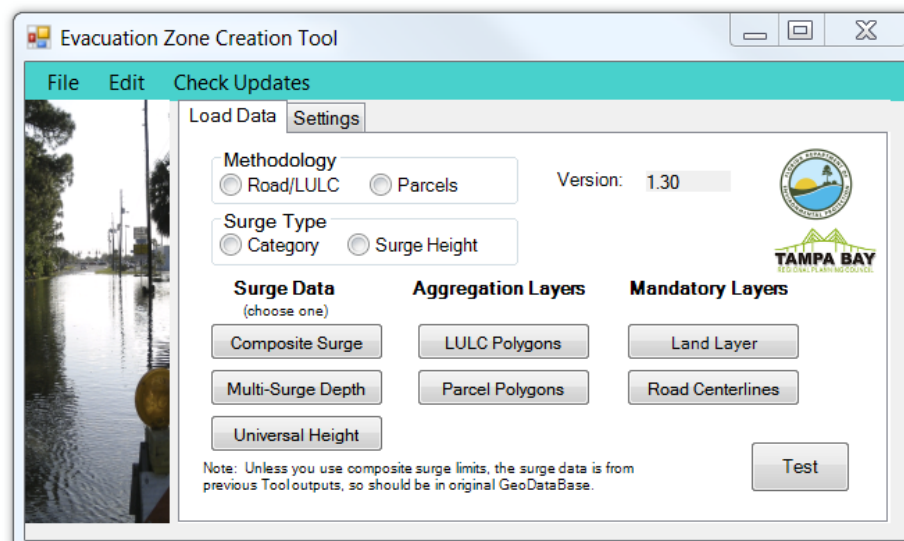
At this point you would want to double-check and manually check the version that is available online. You click on 'Check Updates' menu and check version. If the online source version does not match the version you have showing on the interface of the Tool, you want to download the latest. There may have been bug fixes or enhancements that you would benefit from. To download, choose that option in the Updates menu and choose the folder you want to download to. You should have write permission on that folder before doing so.

Once the Add-In is downloaded, close ArcMap and simply double-click it to install the new version. It will overwrite the old version automatically.



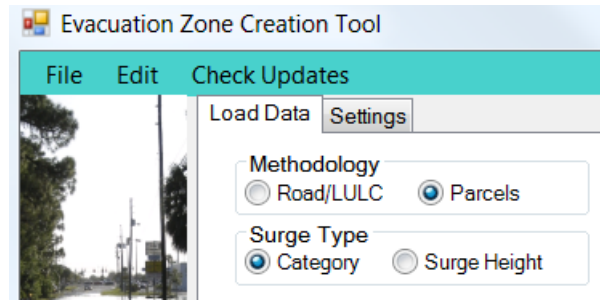
Running the ArcGIS Evac Zone Tool in ArcMap

You will first need to open ArcMap. Once opened, proceed to click on the Evac Zone Tool in the Toolbar you dragged it to. Upon opening, you will see an interface like this:

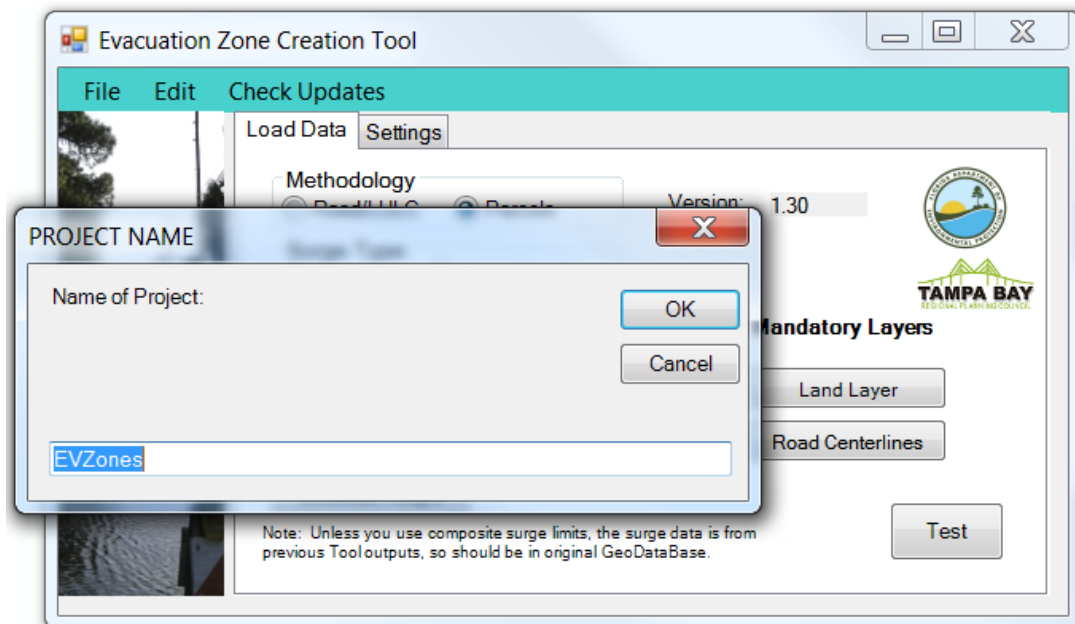


Loading your Data to Create Evac Zones

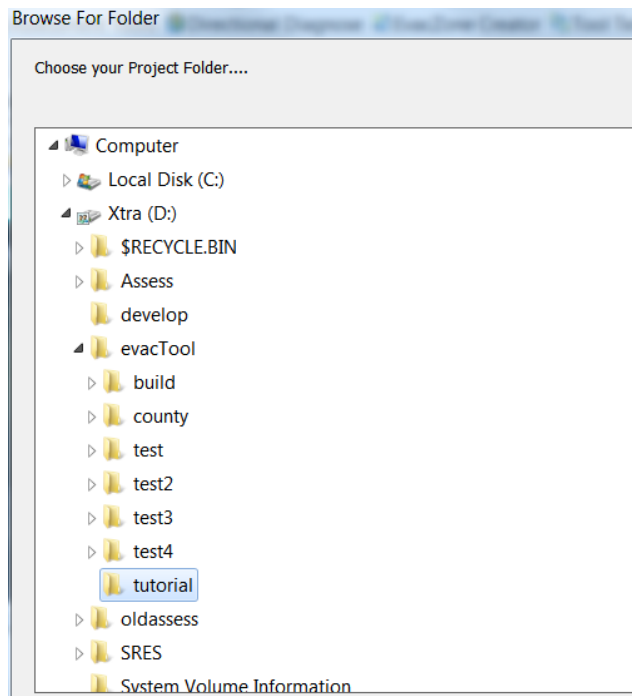
Before beginning, you will want to know which methodology you will use to delineate your evacuation zones. For this Manual, we will choose Property Parcels. The next decision is based on what data you have and what type of thresholds you will want to use. We will use Storm Tide Limits (storm surge composite layer at high tide, category 1-5 on one layer). The only prerequisite for this layer is that the field depicting category is named 'CAT'.



Before going any further you will want to select your output directory and tell the Tool your Scratch Folder, even though ArcMap has the default set. This is a precaution and extra safeguard. To do this, you click on the 'File' Menu to name your project (name it anything you want without any spaces):



Then it will ask to choose your folder for the project. We suggest a folder not too deep from the Root Directory:



It will then ask to choose your Scratch Folder. Choose the same one you setup with ArcCatalog. It will remind you that you have to have 'write' access to the folder.

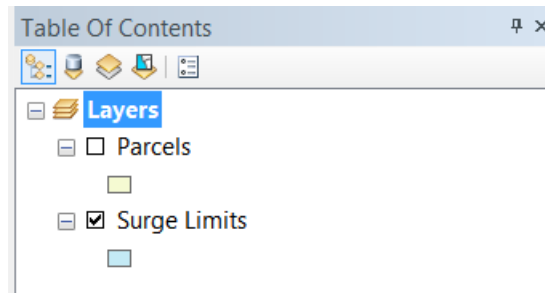
The three types of layers you will need are Surge Data, Aggregation Layers, and Mandatory Base Layers. Click on the surge layer type you would like to use.

- Composite Surge – Storm Tide Limits of all categories in one layer
- Multi-Surge Depth – Depth Surge layers in a geodatabase from the SRES Multi-Tool
- Universal Height – New Surge height-based layers decoupled from Saffir-Simpson

Once you choose the surge selection of your choice, the layer will populate the data frame and Table of Contents.

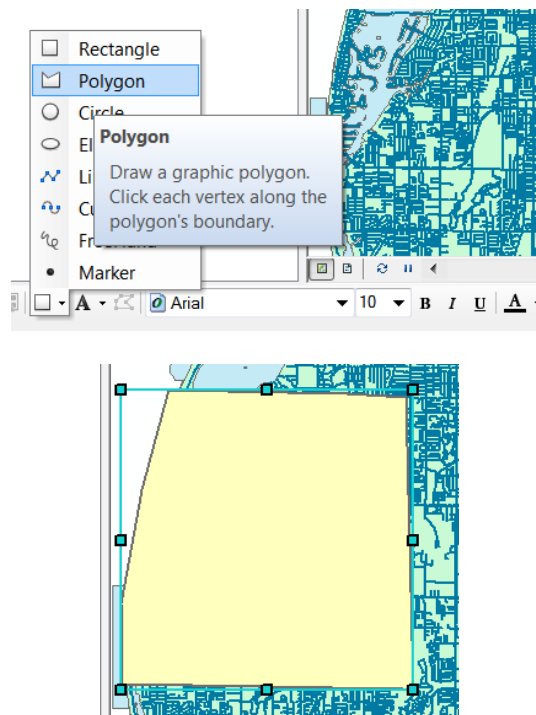


If you chose 'parcels' under the Methodology section, then the only choice to select would be the 'Parcel Polygons' button. The parcel layer will not be 'turned on' or visible due to the details and long redraw times of parcel layers.

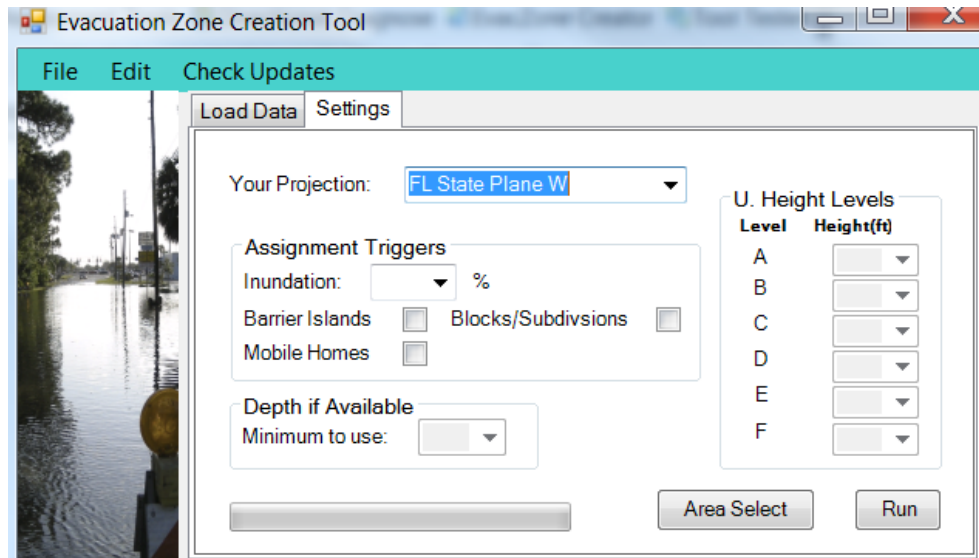


All two of the Mandatory Layers must be selected. The land layer is available where you got this Tool. It is for the whole State of Florida. It is necessary for the Tool to determine where barrier islands are located. The road centerline layer is needed for the Tool to break up areas where human population resides where there are otherwise no other boundaries. The road layer is essential to using the Land use/Land Cover methodology because the areas are larger to delineate evacuation zones.

When these last two layers are added, the area needs to be delineated so there isn't runaway processing. In this case, the surge layer is a regional layer. Typically, you would want to choose the area of one county. How this is done is by using the Drawing Tool (not the Selection Tool). This allows you to draw a polygon or a box to select your area.



Now the assignment thresholds are chosen to aid in your delineation. Select the Settings Tab to access these parameters. There is a drop-down that will attempt to force the type of projection you are using in your processing. The most elegant solution is to import your layers into geodatabase with a Feature Dataset, as mentioned previously. You have a choice of the 3 State Plane projections in Florida: North, West, and East. You also have the 2 UTM projections as well.



In the Assignment Triggers section, the **Inundation percentage** is a valuable trigger parameter. What this does is let you choose at what percentage a polygon area (in this case a parcel) triggers complete selection. If a property has 25% inundation by the surge layer, and you chose 30%, the parcel would not be assigned the value of the surge that partially inundated it.

Barrier Island trigger checkbox gives you the choice to assign all barrier island polygons (parcels) Evacuation Level A (the first evacuation zone) regardless of whether they are inundated or not.

Mobile Homes checkbox gives you the choice to assign all mobile home properties an Evacuation Level of M (you may change this to A, or whatever your county feels is necessary) regardless of whether they are inundated or not. This choice is not available when using the Land Use/Land Cover methodology.

The **Blocks/Subdivisions checkbox** will tell the Tool to aggregate parcels into larger chunks similar in size to subdivisions. This choice is not available when using the Land Use/Land Cover methodology.

If you are using a layer that includes depth, the **Minimum Depth to Use** will become available. This allows you to determine the lower limit of storm surge that will be counted for delineating evacuation zones. For instance, if you choose 1.5 (feet), inundation greater than

1.5ft will be used to determine inundation of your methodology type.

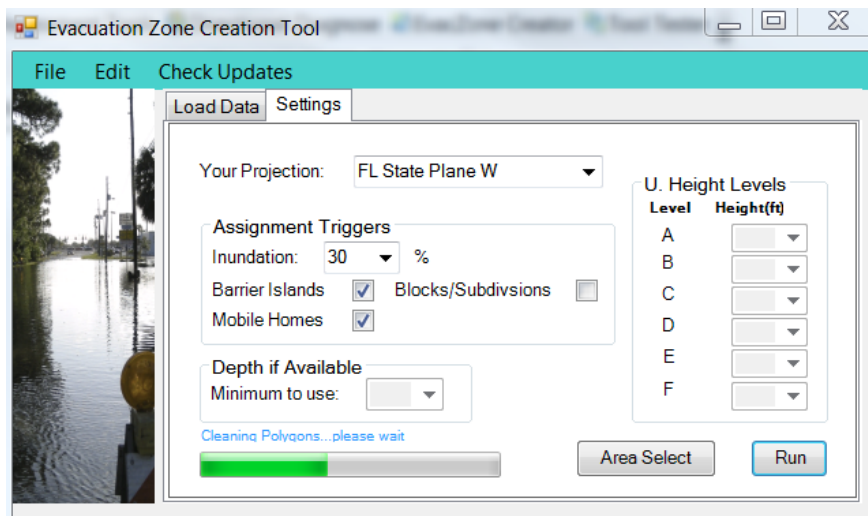
If you are using the Universal Height version of storm surge layer, you will have other options you should choose. These **Height Levels** allow you to assign an Evacuation level from A to F to available depth ranges found in your Universal Height layer.

Before running the model, you must **activate the selection area** you chose before selecting this page. By clicking 'Area Select', you will create the proper extents used for geoprocessing and prepare layers for the modeling.

Run the model by clicking '**Run**'.

What to Expect

During the run, you will see the Table of contents populate and various updates on the User Interface.

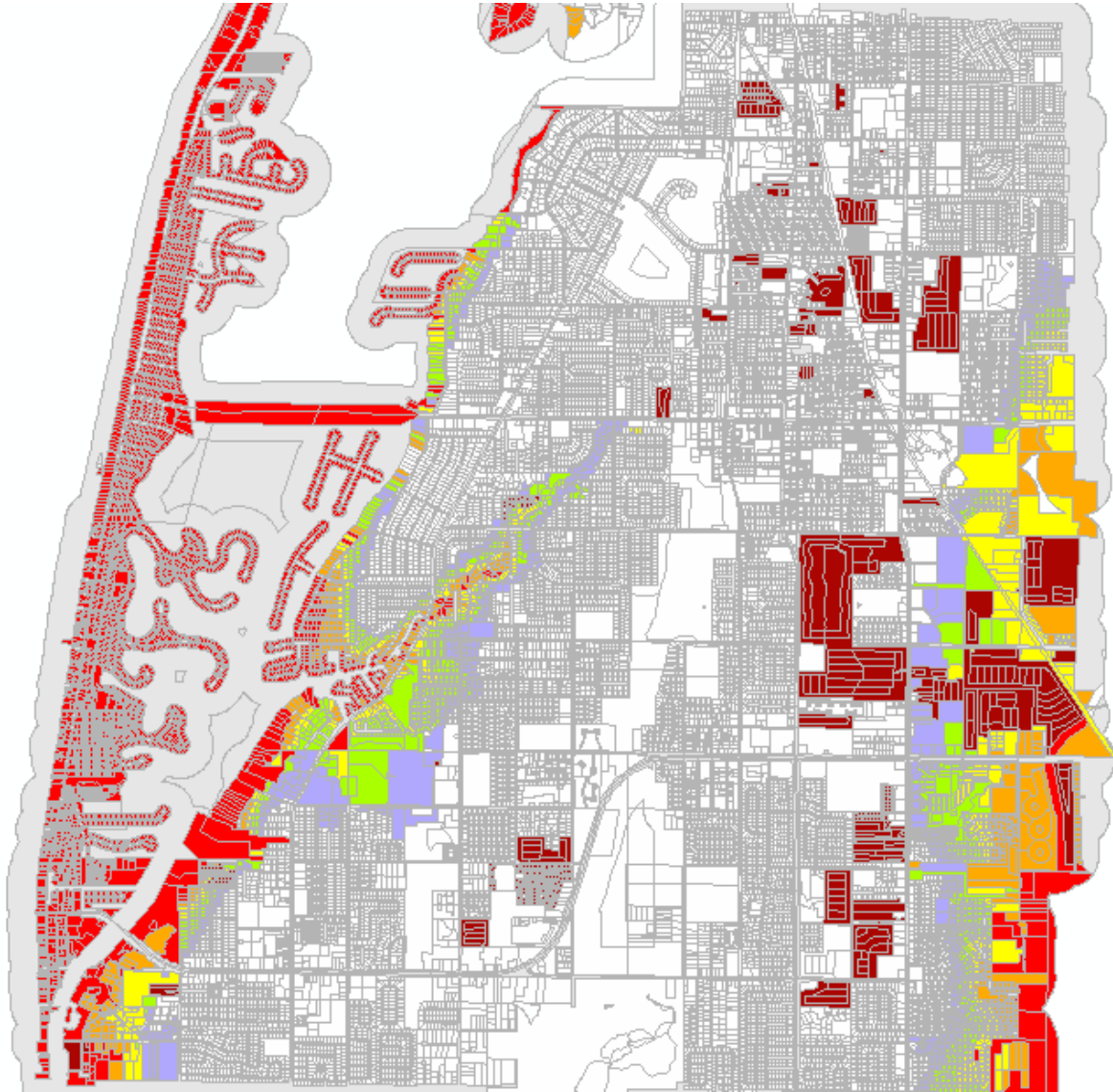


For many of the processes, you may see the green bar progressing telling you how far a particular process has come and how much further is expected. Above the progress indicator, there is also text alerts and feedback to give you an idea what is happening.

If you have checked off the assignment triggers of Barrier Islands and Mobile Homes, when the run is complete, you will notice that all the barrier island polygons (parcels) will be colored red and assigned Level A. You will also notice that the Mobile Home parks and parcels will be colored a deeper darker red and assigned Level M. As mentioned previously, you can re-assign the Level M parcels a Level A if that is the policy of your county.

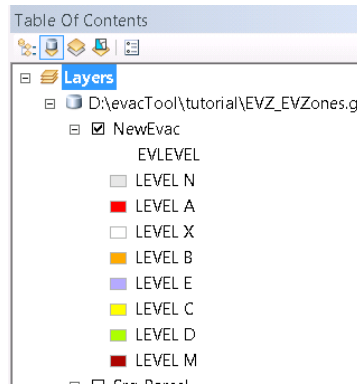
Symbology and Output

This is a typical output for choosing the Parcel methodology below. Depending on the percentage threshold chosen, you will see assigned polygons (parcels) closely resembling the storm surge inundation limits.

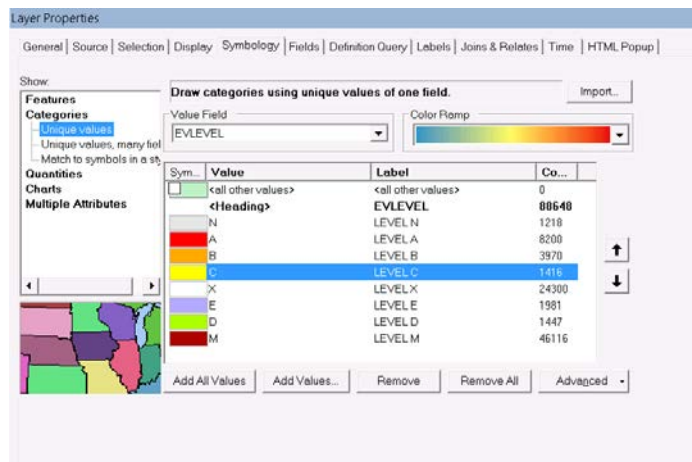


One thing to note about the symbology created during the run – The order of the symbology classes is depicted in the order of processing during the run. The model runs through the

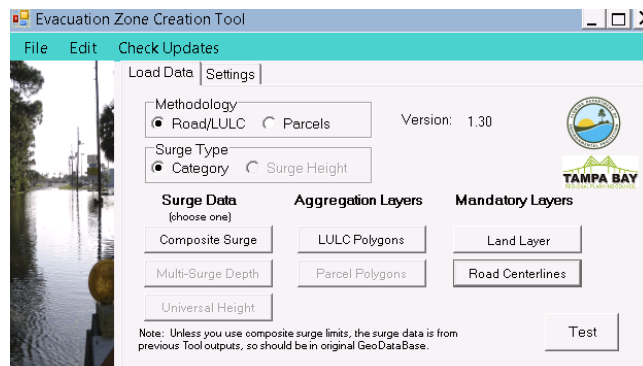
polygons based on feature ID and will assign based on parameters chosen. This can be corrected if needed.



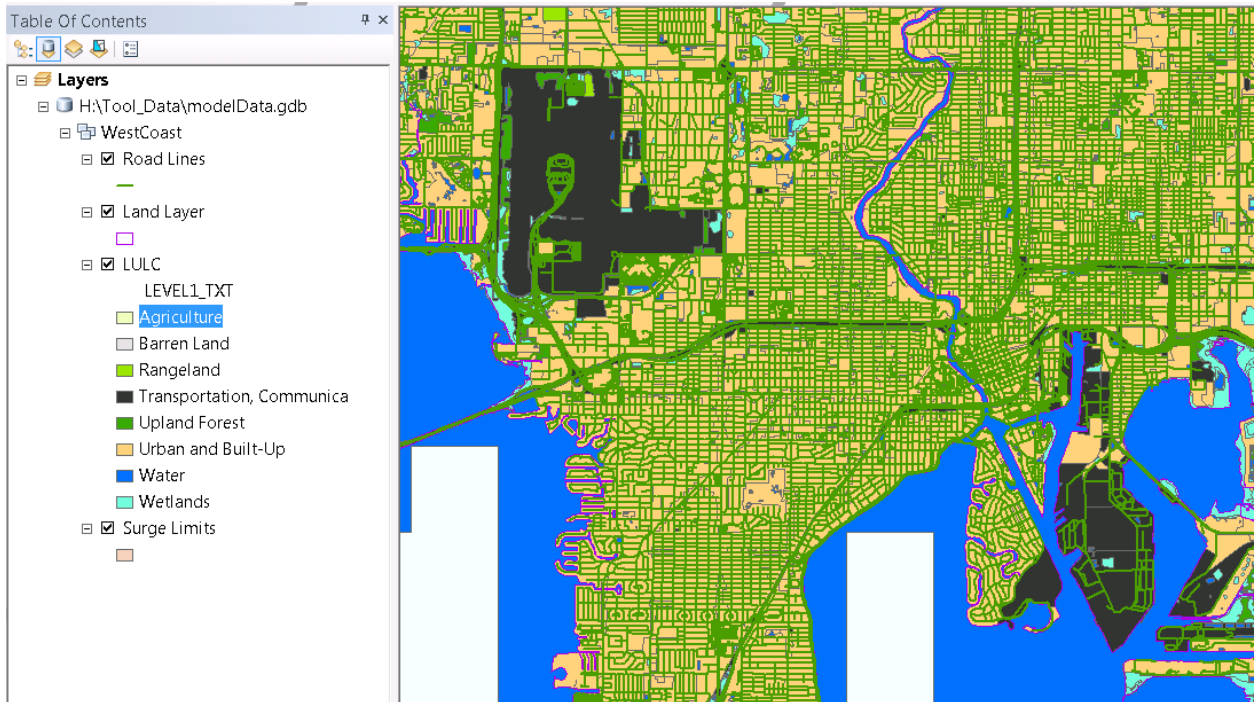
The symbology coloration is currently what is standard in most counties in the State of Florida. You may change these in any way you see fit for your county. If you would like to keep and use this symbology for your mapping, you would want to re-order the symbology classes (Evacuation Levels) first before exporting as a LYR file. It is simply a matter of selecting the symbol class and clicking on the **up** or **down** arrows to the right in the Layer Properties.



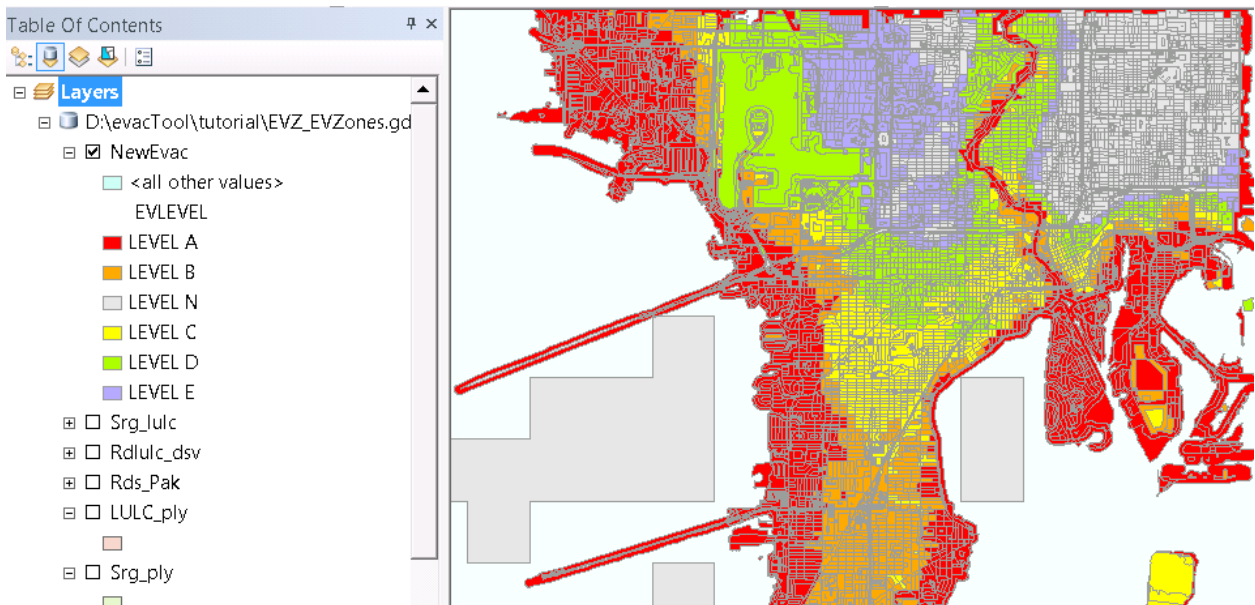
The following images portray various stages and choices in choosing the Land Use/Land Cover methodology.



This how all the layers look loaded for LULC methodology:



After the LULC methodology run, you can see the results:



What is interesting about this method to assign zones is the zones use street centerlines and are more comprehensive than Parcel method because in that methodology, there are no assignments for streets and non-parcel areas. The LULC methodology has a more continuous zone outcome, yet can managed effectively because streets and land use areas are man-made boundaries that are visible.