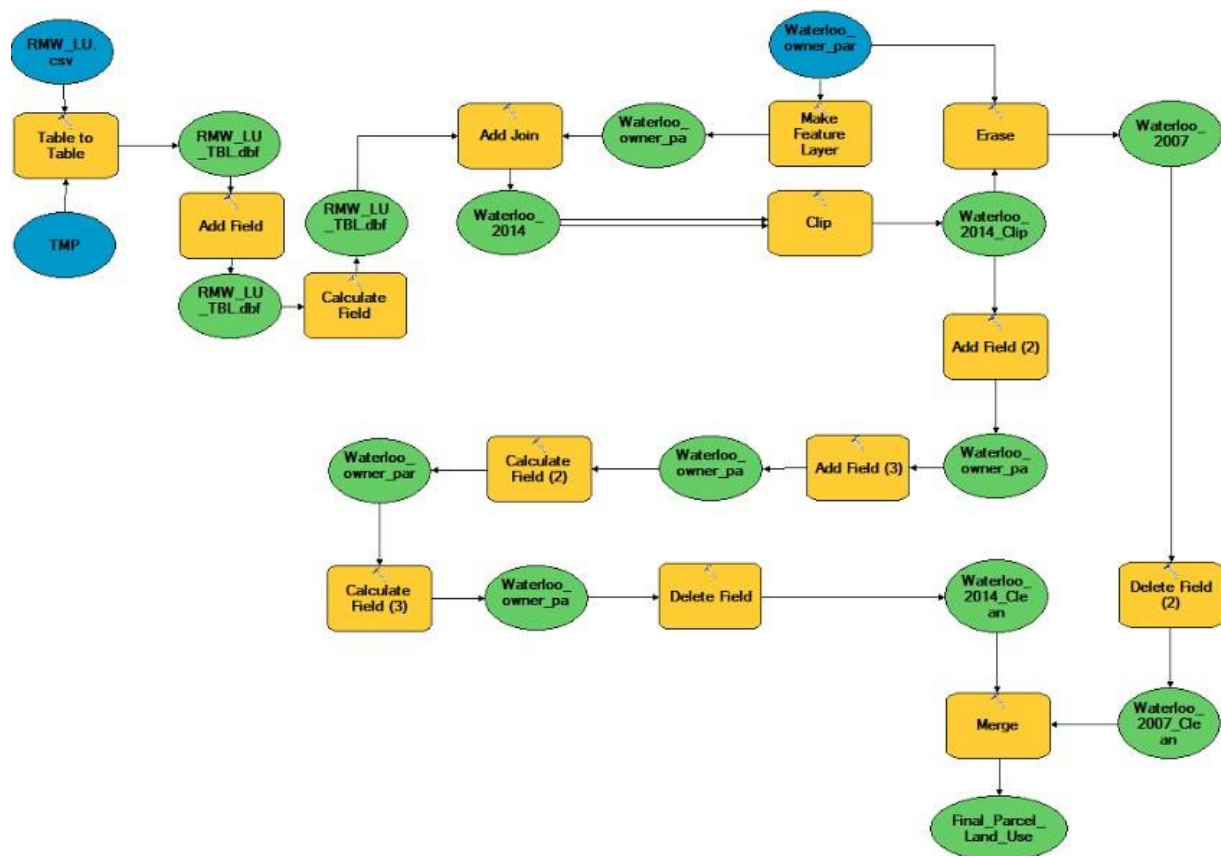


# USING MODEL BUILDER IN ARCGIS Pro

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UNIVERSITY OF WATERLOO

**GEOSPATIAL CENTRE**

## What is Model Builder?

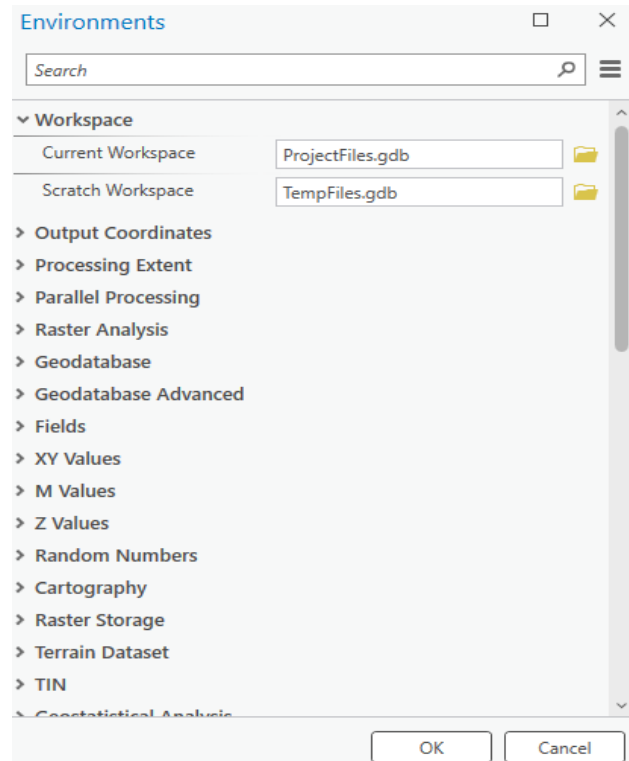
Model Builder is an alternative way of running tools, allowing you to build a flowchart. Rather than running tools one by one, Model Builder allows you to set up a chain of tools to run one after another, making it ideal for either monotonous work or documenting a large workflow in a report. It is also a good way to start getting comfortable with the idea of scripting.

Model Builder is recommended for more advanced GIS users, as you must know the steps and tools to solve the problem before you start using it.

## Changing your workspaces

You may have noticed that in the past when you run a tool, it saves by default into the default geodatabase. This same issue occurs when you use Model Builder. To fix this, browse to Geoprocessing > Environments (Located on the menu bar in the Analysis Ribbon) and modify the Workspace section to have a temporary and permanent workspace GDB in a better location.

Now, when you run a tool in Model Builder, it will put all the files into your Scratch workspace. This is to avoid cluttering your main workspace.

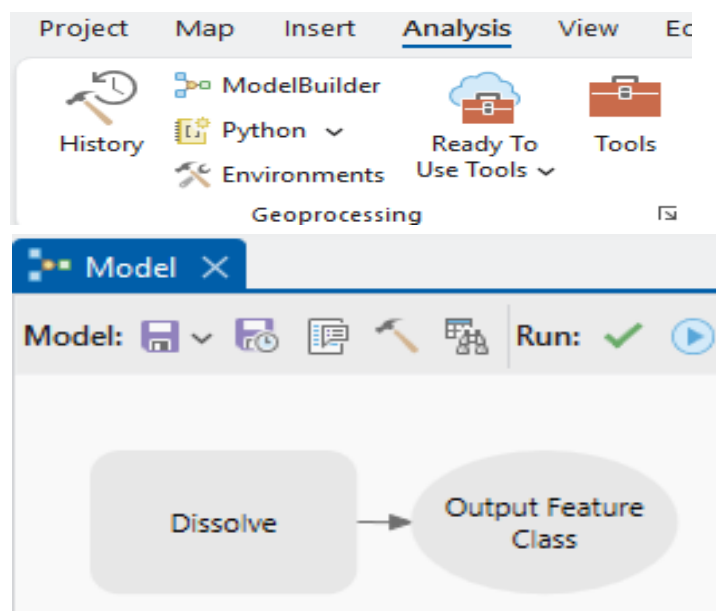


## Using Model Builder

To access the Model Builder window in ArcGIS Pro, navigate to the 'Analysis' Ribbon. Select 'ModelBuilder' in the geoprocessing bar to create a Model Builder.

## Adding a tool

To add a tool, open the geoprocessing toolbox by clicking on 'Tools' in the Analysis Ribbon as shown above. You can also find the toolbox in the ModelBuilder Ribbon and Toolbar. Drag the correct tool from the Search Results into the Model Builder window (i.e. Dissolve). Once in Model Builder, you may notice that the tool is not multicoloured like the title page image is. This is because there are no inputs (i.e. data) for the tool yet.

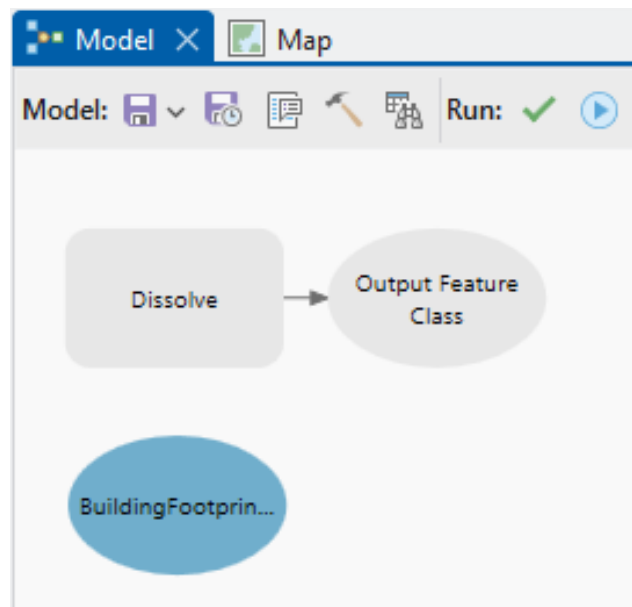


## Adding data

To add data to your model, you can click and drag data from the Table of Contents or from the Catalog pane into the Model Builder window.

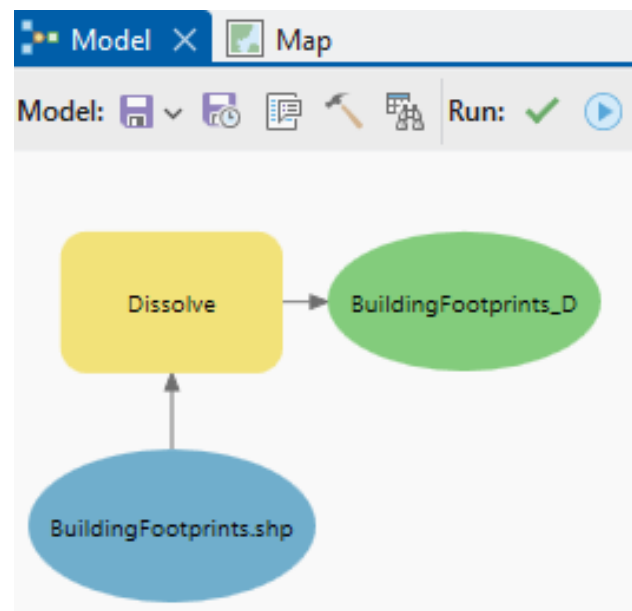
*Note: You can add multiple layers at once from either the Table of Contents or Catalog pane by highlighting all items and dragging them into model builder*

Inputs will appear as dark blue ovals, whether it be a layer file, raster file, or folder being inputted.



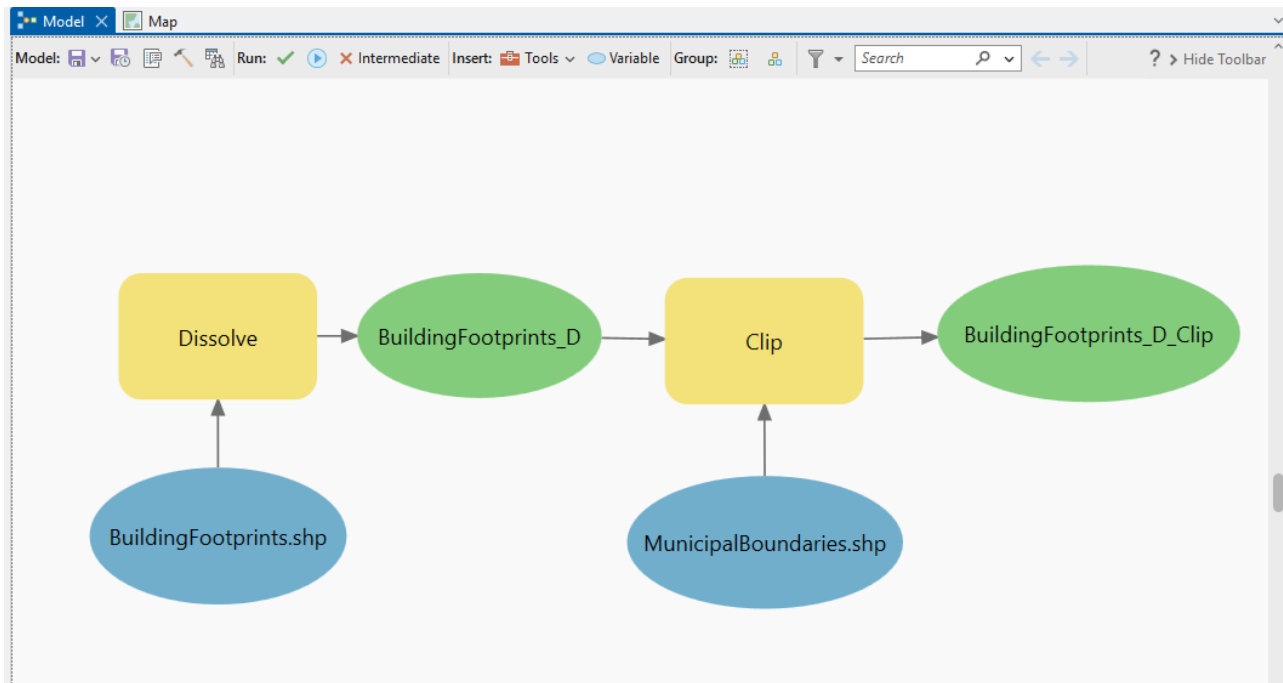
## Setting up tool inputs

Now that we have data and a tool in our model, we can now set that data to be an input to our tool. To do this, unselect everything, then hold click over your input feature and drag the line towards the tool you wish to connect. Select 'input features' to connect (You may want to select other input options for different tools). Alternatively, double click the tool and select your input from the drop-down menu. If no other settings need to be changed, the rectangle will turn yellow, and the output feature oval will become green. You may wish to change some settings on the tools before running the model. To do this, simply double click on the yellow rectangle and modify the settings. The input settings will be discussed later.



## Running two tools together

Now that we have an idea for how to add tools to the model, we can start connecting multiple tools together to create a product. The process is very similar to the previous steps we took, but now we are setting the tool output (The green ovals) to be inputs for tools. You can also create bends in your Connect arrow by clicking somewhere before you end up connecting with the tool rectangle.



## Running your model

To run the entire model, click the blue arrow in the Model Builder Toolbar or Ribbon. Using Model Builder means that all the steps are executed in the *foreground*, rather than in the *background* when you run a tool normally. Model Builder won't add the layers to the map automatically, so to show them, either navigate to your scratch folder location and add the data to the map or right click on the output layer and select "Add to Display".

*Note: With a very large model (especially raster manipulations), be sure that the drive that contains the scratch folder has adequate disk space free.*

## Saving your model

If you wish to work on your model another time, you can save your model and edit it later. To save the model, you must save it in a Toolbox. ArcGIS automatically creates a toolbox in the same file location as your Default.gdb. Your newly created models will also appear here.

## More advanced model building

So far, we've covered basic things with Model Builder. This next section will teach you how to begin to abstract your model and make it more applicable for multi-use purposes.

## Iterators

An Iterator is like a loop – it allows you to run a tool or generate variable input for something multiple times. To create an iterator, go to the ModelBuilder Ribbon and click 'Iterators' in the 'Insert' section. The iterator we will be looking at is the 'Iterate Feature Classes' iterator, which goes through a folder of ESRI feature classes (Either recursively – includes subfolders, or not recursively – only goes through root of specified directory) and outputs each file as well as the name of the file as a variable. This is useful, especially with a large project with a multitude of files you would like to do a batch operation on.

Create an Iterate Feature Classes object in the model and set the input folder to be the StreetFeatures folder that came with the tutorial data. This folder contains the road network, sidewalks, and manhole covers of Waterloo. If we wanted to buffer them all with a buffer of 100 meters, the Iterate Feature Classes tool will fit the bill perfectly. Set the input folder to the Iterate Datasets tool to be the StreetFeatures folder and set the Dataset Type to be FEATURE. Since this folder contains no subfolders, we don't need to check off the recursive option.

### Iterate Feature Classes

Parameters Environments Properties

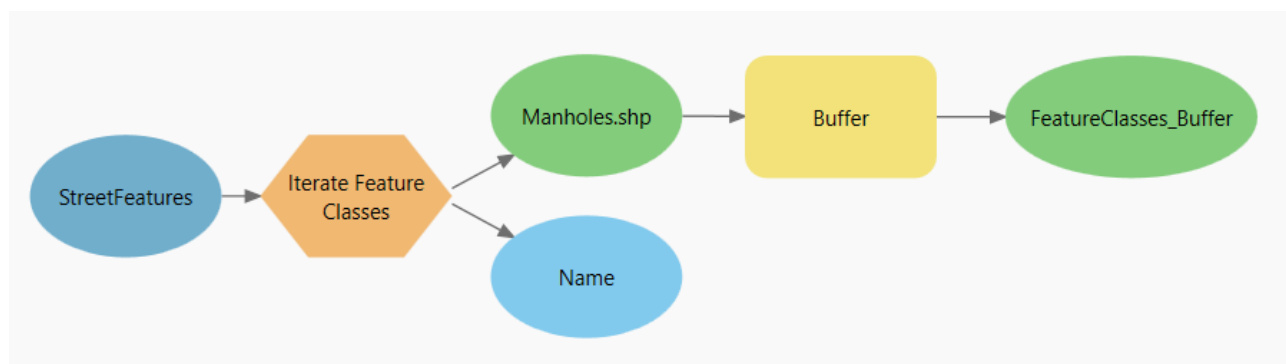
Workspace or Feature Dataset  
StreetFeatures

Wildcard

Feature Type

☐ Recursive

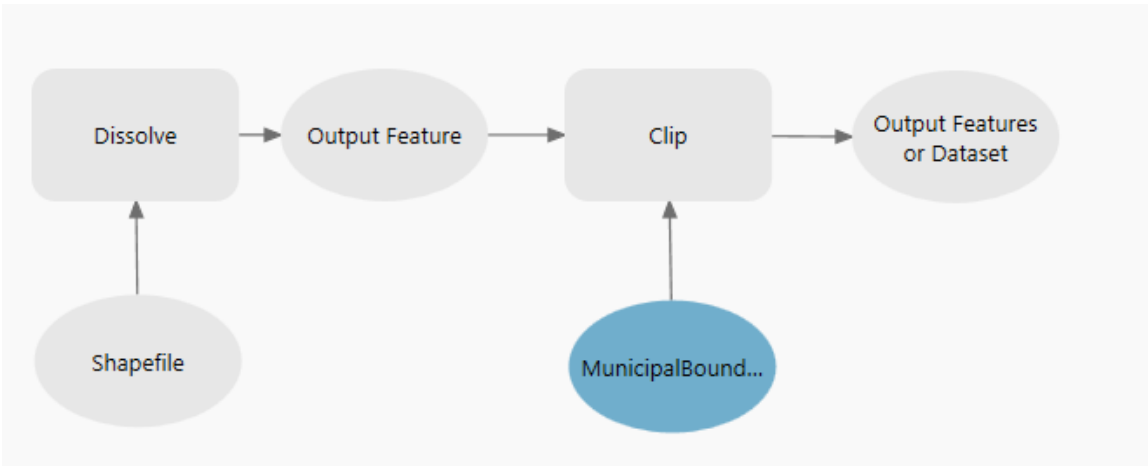
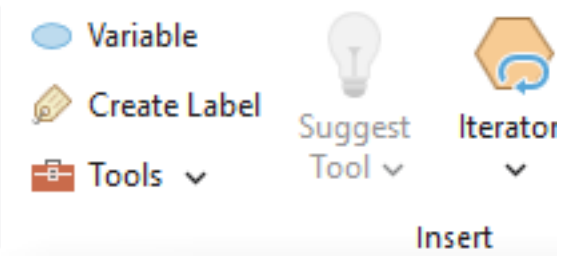
OK



Variable inputs

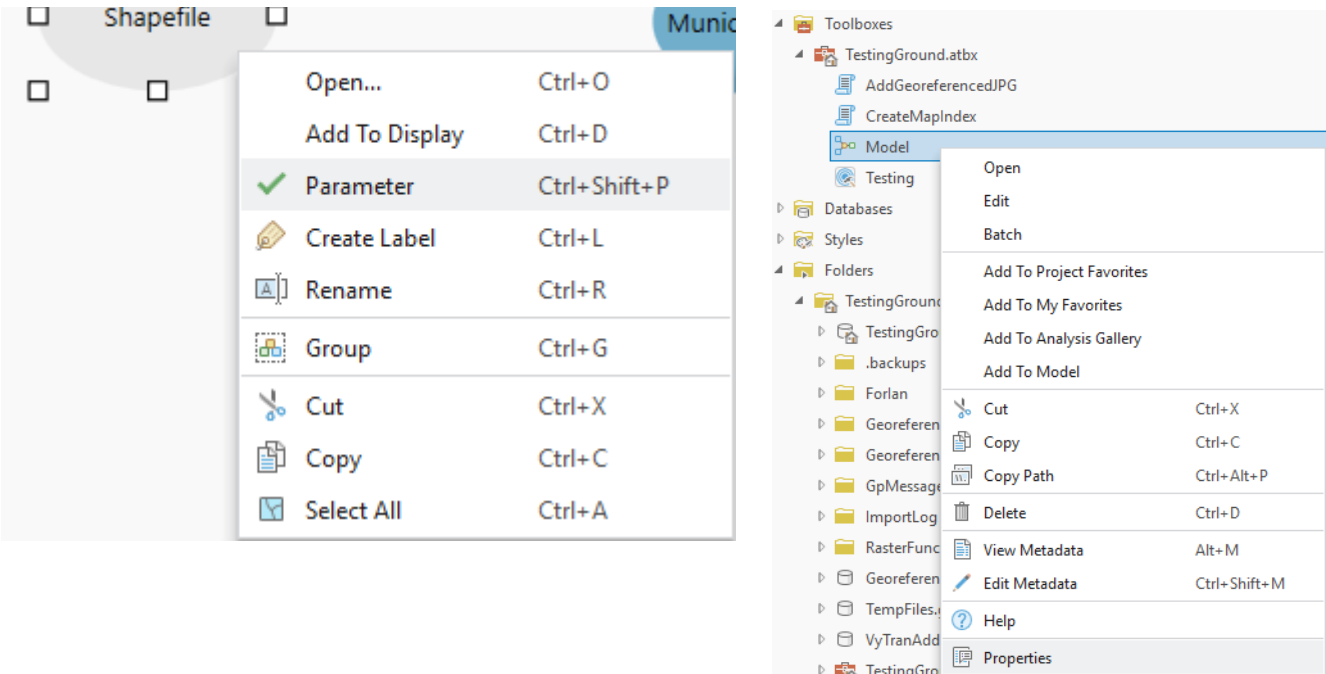
Sometimes, you may wish to take a workflow you’ve created in Model Builder and use it for multiple uses. This calls for setting a *variable* to be the input for a tool. To create a variable, simply navigate to Insert > Variable in the ModelBuilder Ribbon. The window that pops up will give a massive list of supported variable data types. For this tutorial, we only

need to use Shapefile as an input. Remove the Building Footprints input (The first dark blue oval) from the Model Builder and insert a Shapefile variable. Set that variable to be the input for the Dissolve tool.



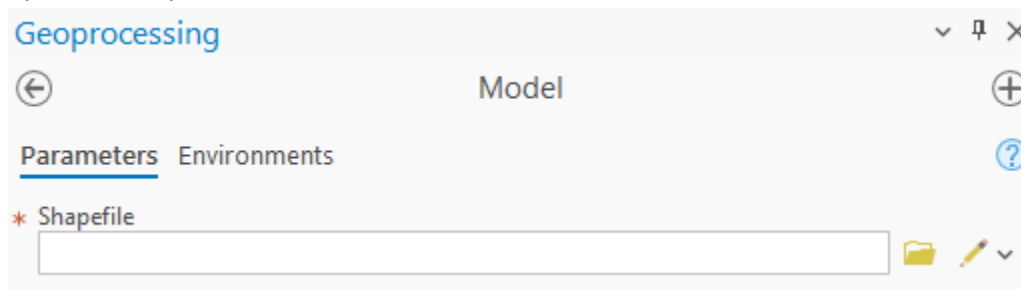
Setting up parameters

Right click your new variable and click ‘parameter’. Now that we have a variable in the model, save the model and right click on it in the Catalog pane and choose Properties. When you navigate to parameters, you should see your newly created variable in there.



	Label	Name	Data Type	Type	Direction	Description	Category	Filter	De
0	Shapefile	Shapefile	Shapefile	Required	Input			Feature Type	

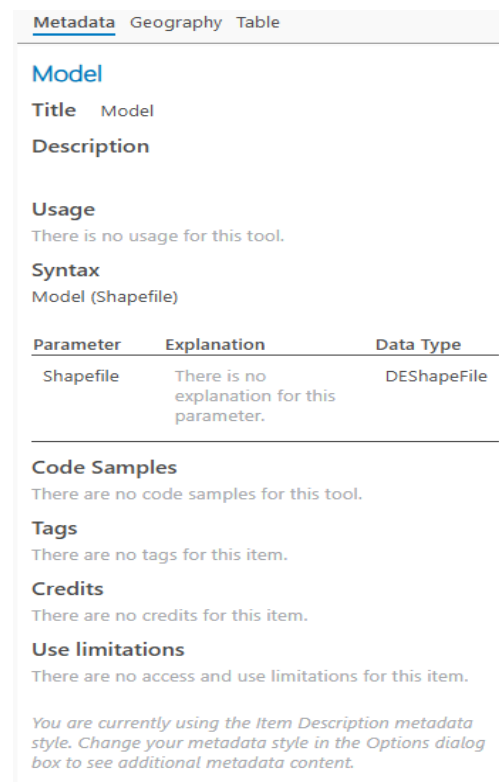
Now when you double click on your model you have created, you will be able to input a shapefile and run it as though it was a tool. It is important to note that certain processes may require additional parameter specifications (i.e. Distance values).



## Customizing your tool

You may have noticed that when you click the “Help” button, there is no data in the description box. This can be troublesome for people using the tool to ensure they give the tool proper input, as well as what to expect as output.

To add a description and supporting information, right click on the tool in the Catalog pane, and choose “Edit Metadata”. Begin adding information about the tool. ArcGIS will not let you save without adding tags, so add a few tags that are keywords you would use to search for this tool. For this example, we’ll put keywords Clip Multipart Feature, Simplify and Clip. Your keyword list is a comma separated list of values that ArcMap will use to search for your tool.



The summary section is the text that describes the tool when you first open it. Under Syntax, for Dialog Explanation, this is where you can write in what each input does. Once you are happy with the metadata you have provided, hit Save and then re-open the model tool. You can now read about what your tool does.

You have now mastered the basics of using the Model Builder! Remember, practice makes perfect, and as always, make sure to lay out your steps on what you plan on doing before you start using Model Builder.

*Tutorial created February 2015 by Alex McVittie; Updated by Netzach Straker, August 2017; Updated by Li Feng Xue, September 2025*