Introduction to Model Builder

ModelBuilder is a great tool for creating, editing and managing models. It allows the users to string together sequences of geoprocessing tools, feeding the output of one tool into another tool (Figure 1).

Example: “hdwco arc” is the initial layer and initial input used in this model. A Select tool is run and the output is “arc_Select.shp.” “arc_Select.shp” then becomes the Buffer tool's input. The Buffer tool is run and its output is “arc_Buffer.shp.”

Create the model:

1. In the catalog, choose the folder where you want to create and save the model. Right click the folder, go to “new”, and click “toolbox”. The toolbox should then appear in the folder.

2. Right click the new toolbox, click new, and click model. The model window will then appear.

3. You can edit model properties by clicking model, then model properties. In model properties, you can change the name of the model and various other properties (Figure 2).
Add tools and data to the model:

Once you have created your model, you are ready to use it for analysis. With the model, you can simply drag in the tools you need for your analysis.

1. In Arcmap, click the search tab (usually on the right side of your screen). Search for the tool that you need. In this example I will search for the select layer by attribute tool (Figure 3).
2. The tool shows up in the results section. To add this to my model, I’m simply going to click the tool and drag it into the model (Figure 4).

![Figure 4](image)

3. I’ve added a population layer to ArcMap. To add it to my model, I once again drag it from the table of contents into the model (Figure 5).

![Figure 5](image)
4. As you can see, the Select Layer by Attribute and Output Layer Name are currently white. This means that we cannot run the tool because it needs data/more information.

There are a couple of ways that I can add this data to the Select Layer by Attribute tool.

**Connecting Data and Tools:**

1. Right click the Select Layer by Attribute Box and select open (or you can double click the Select Layer by Attribute Box).

![Select Layer By Attribute](image)

Figure 6

This box is where we will specify which data we want to analyze using the Select Layer By Attribute tool. A green dot next to the field means that that parameter must be fulfilled in order for the tool to work (Figure 6).
*TIP* If you click the Show Help >> button in the bottom right corner, a help box will appear explaining the different parameters. Simply click on the field that you want to know more about.

2. Click the down arrow underneath Layer Name or Table View. Two datasets that have the same name appear. One has a blue recycling symbol and the other has a yellowish tan diamond. This is the difference between the two:

The blue symbol means that the data has been added to the model, while the yellow symbol means that the data is in the table of contents. They both contain the same data, it’s just that one is in a different location than the other.

3. Select the data with the blue symbol (Figure 7).

4. For now, leave Selection type at its default.
5. The expression box is where I can choose which attributes I want to select. In this example, I want to select all blocks that have more than 100 households per block. Input this by clicking the sql box by the expression box. The query builder appears. A picture of the query builder is shown below. Input "ApproxHous" > 100. Click OK in the query builder (Figure 8).

![Query Builder](image)

6. Click OK in the Select Layer By Attribute.

In the model, the select layer by attribute box turns yellow and the output oval turns green. This is an indication that all the required parameters have been fulfilled and that the model is in a ready-to-run state. When a model is run, all model variables are validated, and those tools in a ready-to-run state are executed.
Run the Model

1. To run the model, right click the select layer by attribute box and select run.

Once the bar is full and it says completed underneath, you know that the tool successfully ran (Figure 9). You can then look at Arcmap and see the results of the model (Figure 10).
General Tips:

1. **Save your model often.** Do this by clicking the save disk in the top left corner of the model.
2. If you have closed your model and want to open it again, go to the toolbox where you saved the model. Right click the model and select **edit**. This will allow to make changes to your model.

*TIP* Many people forget to click **edit** when they try to re-open their model. Instead, they click open and get a “This tool has no parameters.” message. To open and make changes in your model, click on **edit**.

Different commands in the Model Builder toolbar:

![Figure 11](image1)

1: “Add data or tool” allows user to add a file (shape file, raster layer, etc.) directly to the model.

2: “Auto layout” automatically arranges the model in a linear fashion (Figure 12).

![Figure 12](image2)
3: “Full extent zooms” in or out so that the entire model is showing (Figure 13).

![Figure 13](image.png)

**Tip: Use auto layout in conjunction with the full extent button to see the big picture.**

4: “Zooms in” on a fixed point in the model.

5. “Zooms out” on a fixed point in the model.

6. “Zooms in” in the model where the user chooses.

7. “Pan” allows the user to pan around in the model.

8. “Select” allows the user to select tools or data within the model. While selected the user can move the tool or data around. If users double click, they will open the tool.

9. “Connect” allows the user to directly connect data with the tools in the model. After clicking the connect tool, click on the dataset that you want to input into the tool (Figure 14). After clicking on the tool, you will have the option of choosing which data will fulfill the parameters (Figure 15). If you double click on the tool, you will see that the dataset you connected is already in the parameters.
10. “Validate” verifies that all data elements and parameter values are valid. If a parameter value or data element is not valid, it will become white. This tool is useful if the user wants to see if the model is ready to run without running the whole thing. If there is a problem, users can then pinpoint where it is.

11. The “run tool” on the Model Builder toolbar will cause all tools that are in a ready-to-run state to run.