# Exercise: Build a site selection model

In this exercise, you will build a model to help locate suitable sites for a new wastewater treatment plant in Ft. Collins, Colorado. Locating the most suitable site for a project involves working with suitability criteria. You will use the following criteria for the model you build in this exercise.

The new wastewater treatment plant must be:

Within 1 mile of Ft. Collins city limits.

Within 3,000 feet of the Cache la Poudre River.

At least 300 feet from residential parcels and parks.

On a vacant parcel that is bigger than 50,000 square feet.

Outside the flood plain.

Note: To complete this exercise, you must have successfully completed the previous exercise, *Prepare for your analysis*.

**Estimated completion time: 30 minutes**

To complete exercises, you need the following:

ArcGIS Desktop 10.0 or ArcGIS Desktop 10.1 or ArcGIS Desktop 10.2 (Advanced)

*Note:* This course contains four exercises. An Advanced license of ArcGIS for Desktop is required to complete two course exercises. An ArcGIS for Desktop Basic or Standard license can be used to complete the other course exercises.

## - Step 1: Create buffers

In the previous exercise, you selected the Cache la Poudre River for use in geoprocessing operations such as buffers. All geoprocessing tools work on every feature or on only selected features. You will use the Hydro layer as the input for various tools. The Hydro layer controls the Cache la Poudre River in the map (your criteria mention this river only and no other water body).

If you are continuing this exercise from the previous one, make ArcMap the active application (SitePlant.mxd should be open). Otherwise, navigate to **..\Student\BldgModels10_0** and open SitePlant.mxd.

First, you will add buffer tools to the model, which will satisfy the criteria for being within 1 mile of the city limits and within 3,000 feet of the Cache la Poudre River.

Restore the model.

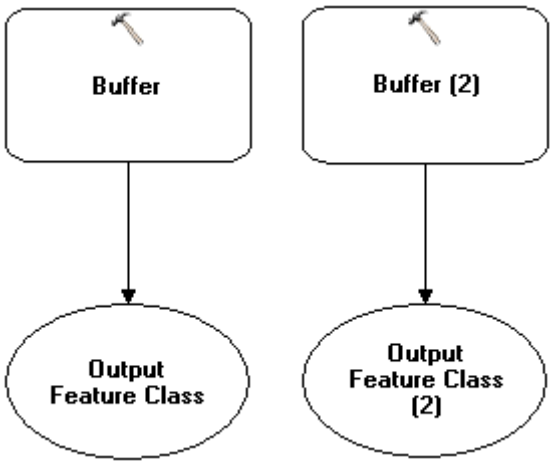
On the Standard toolbar in ArcMap, click the Search Window button  .

In the Search window, click Tools to include only tools in your search results.

Type **buffer** and click the Search button .

Drag two instances of the Buffer (Analysis) tool into the model.

Arrange them as shown in this graphic.




Step 1a: Create buffers.

**Note:** You may need to expand the size of the output feature elements in the model to see the names shown in the preceding graphic: Output Feature Class and Output Feature Class (2). To do so, select each element and drag a corner outward.

It does not matter whether Buffer (2) is to the left of Buffer instead of to the right of it (as shown in the graphic).

Double-click the Buffer tool to open its dialog box, and then set the following parameters.

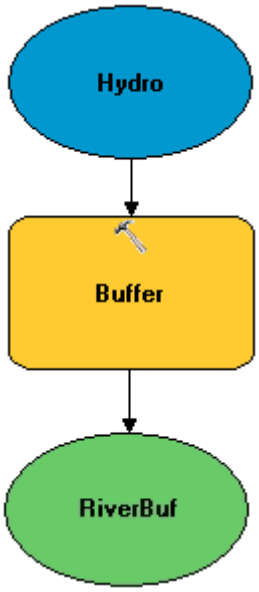
Input Features: Hydro

Output Feature Class: **RiverBuf**

Distance > Linear unit: 3000 Feet

**Note:** The instructions assume that you will click OK after entering the parameters for each tool.

Notice that the process elements are in color and therefore ready to run.




Step 1b: Create buffers.

Open the dialog box for the second Buffer tool and set the following parameters:

Input Features: City Limits

Output Feature Class: **CityBuf**

Distance > Linear unit: 1 Miles

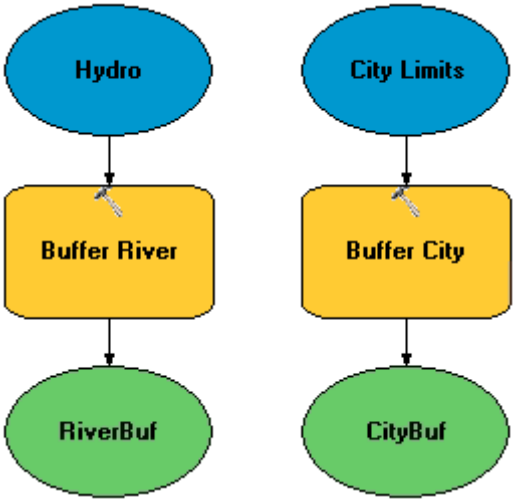
Click the Auto Layout button to align your elements.

Right-click the Buffer tool that has Hydro as the input and choose Rename.

You can rename model elements to make them easier to differentiate and more meaningful to your analysis. This model will have several buffers, so giving each of them a more significant name will enable you to determine what it is buffering.

Change the name to **Buffer River**.

Rename the other Buffer tool **Buffer City**.




Step 1c: Create buffers.

From the Model menu, choose Save, or click the Save button in order to save the changes to the model within the Site_Plant toolbox.

## - Step 2: Locate common areas of two buffers

Next, you want to locate the common areas between the two buffers (in other words, the suitable areas). This can be done in two ways: using the Clip tool or performing the Intersect overlay operation.

The Intersect overlay operation allows you to combine the attributes of these buffers. However, you do not need to do this, so you will use the Clip tool to extrapolate the common areas.

In the Search window, type **Clip** to find the Clip (Analysis) tool and add it to the model under RiverBuf and CityBuf.

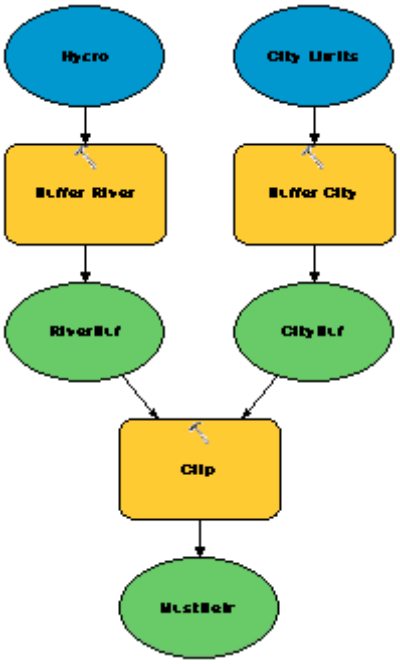
Open the dialog box for Clip and set the following parameters:

Input Features: CityBuf

Clip Features: RiverBuf

Output Feature Class: **MustBeIn**

Your model should resemble the following graphic. Positioning the model elements to match the graphic exactly is not required, but make sure that the elements in your model are connected as shown.




Step 2a: Locate common areas of two buffers.

Save the model.

## - Step 3: Locate initial unsuitable areas

The goal of this step is to create a new feature class containing all the *unsuitable* areas. You will create the new feature class in the model, using the Append geoprocessing tool to add the unsuitable areas to it.

Search for and add two more Buffer tools to the right of the initial two (Buffer River and Buffer City).

Open the dialog box for the new Buffer tool on the left and set the following parameters:

Input Features: Residential Parcels

Output Feature Class: **ResBuf**

Distance > Linear unit: 300 Feet

Open the dialog box for the other new Buffer tool and set the following parameters:

Input Features: Parks

Output Feature Class: **ParksBuf**

Distance > Linear unit: 300 Feet

Click the Auto Layout button .

Next, you will create a new empty feature class for storing all unsuitable areas.

In the Search window, type **create feature class** to locate the Create Feature Class (Data Management) tool, and then add it to the right of the Buffer tool for the parks in the model.

Open the dialog box for the Create Feature Class tool and set the following parameters:

Feature Class Location: FtCollins.gdb

Feature Class Name: **Unsuitable**

Geometry Type: POLYGON

Coordinate System: Scroll down and click the Properties button and import the coordinate system from the ..\FtCollins.gdb\CityLimits feature class.

Next, you will combine all unsuitable areas into a single feature class. You can do this in one of several ways. The Union or Intersect tools are commonly used, but you are not using the attributes for the analysis at this point, so you do not need to combine them. Both Union and Intersect would take longer to run and yield more information than you need. Instead, you will use Append with the NO_TEST option, which allows you to combine datasets without worrying about the attributes.

Search for and open the Append (Data Management) tool.

**Remind me how**

In the Search window, type **append** to locate the tool.

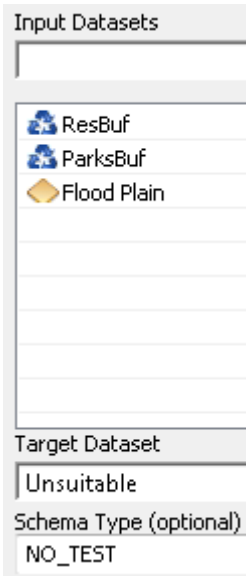
Add the Append tool to the model under the ParksBuf output element.

Open the dialog box for the Append tool and set the following parameters:

Input Datasets: ResBuf, ParksBuf, Flood Plain (*Hint*: Because Flood Plain on its own is unsuitable, no buffer is necessary.)

Target Dataset: Unsuitable

Schema Type: NO_TEST

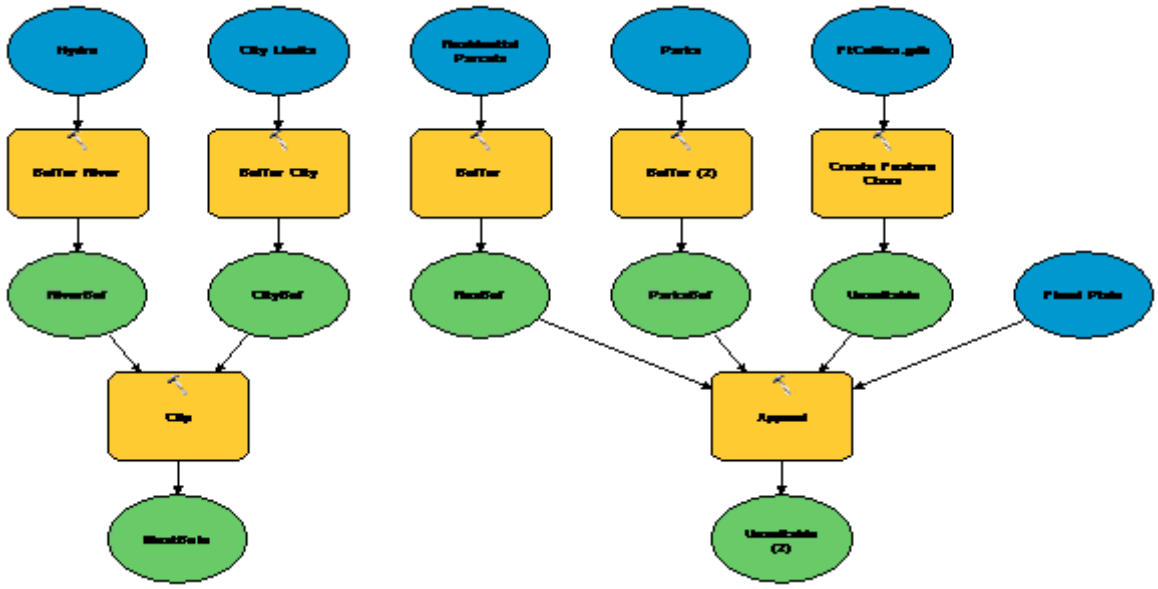



Step 3a: Locate initial unsuitable areas.

Notice that the Flood Plain dataset was added to the model as a result of being included in the Append tool as an input dataset.

Click the Auto Layout button.

Click the Full Extent button .



Step 3b: Locate initial unsuitable areas.

Unsuitable (2) is really the same feature class as the initial Unsuitable, but now it includes the combined features of ResBuf, ParksBuf, and Flood Plain.

Tip: If you want a closer look at the model element names, use the Zoom In tool in ModelBuilder.

Save the model.

## - Step 4: Exclude unsuitable areas

Next, you will use the Erase tool to eliminate all unsuitable areas.

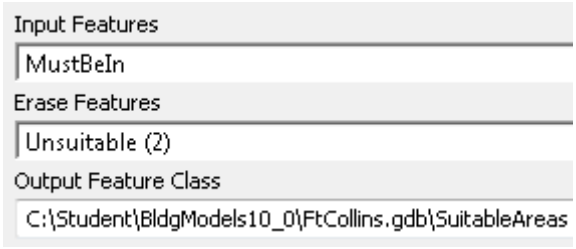
Search for the **Erase** (Analysis) tool and add it to the model directly below and centered between the MustBeIn and Unsuitable (2) elements.

Open the dialog box for the Erase tool and set the following parameters:

Input Features: MustBeIn

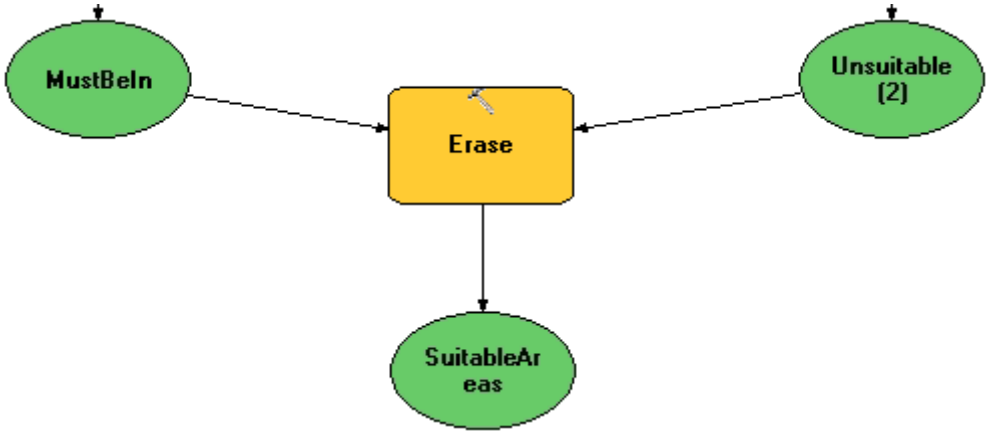
Erase Features: Unsuitable (2)

Output Feature Class: **SuitableAreas**




Step 4a: Exclude unsuitable areas.

Click the Auto Layout button.




Step 4b: Exclude unsuitable areas.

Save the model.

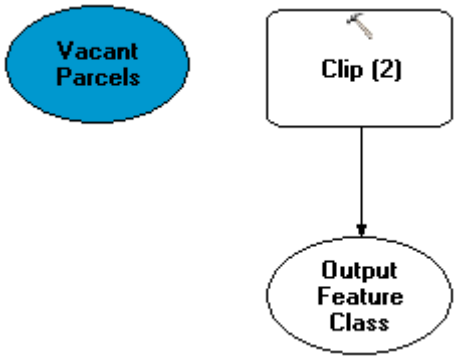
## - Step 5: Add a clip process to the model

Now you need to include the vacant parcels because the treatment plant must be on vacant land. To do so, you could use an overlay tool or you could use the Clip tool.

Search for and add another **Clip** tool below the SuitableAreas data element.

If necessary, move the model so that you can see the table of contents.

From the ArcMap table of contents, drag the Vacant Parcels layer into the model next to Clip (2).




Step 5a: Add a clip process to the model.

You can add data elements in any of the following ways:

By entering the parameters in the tool dialog box

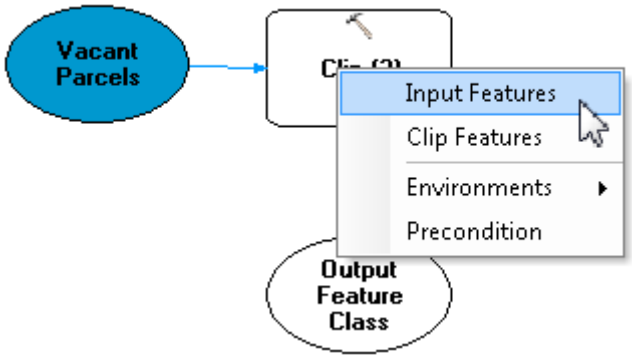
By dragging elements from ArcMap

By using the Add Data button in ModelBuilder

Next, you will connect a data element to a tool.

In ModelBuilder, click the Connect tool .

Click the Vacant Parcels input data element and then click the Clip (2) tool.




Step 5b: Add a clip process to the model.

Here, you have the option to connect the element as input features, clip features, an environment, or a precondition. You will use the vacant parcels as the input features (by default,

a vacant parcel is a suitable location), and you need to find other suitable areas located in vacant parcels.

Choose Input Features.

Connect the SuitableAreas green data element to the Clip (2) tool as Clip Features, and then open the dialog box.

Name the output feature class **VacantSuitable**.

Notice that the Input Features and Clip Features parameters are already entered because you used the Connect tool.

Click OK, and then click Auto Layout to zoom to the model's full extent.

Save the model.

## - Step 6: Select features that meet the size requirement

The Clip tool, which you used earlier, located all vacant parcels that meet the requirements of all criteria except square footage. The treatment plant must be on a vacant parcel that is 50,000 square feet or bigger. Using the Select tool, you will narrow down the suitable sites with a query.

? Should you build your query in the Select By Attributes dialog box or within the model as a tool?

You want to build the selection of the parcels that meet the size requirement into the model, so you will add the Select tool to the model instead of running the tool on its own.

Search for and add the **Select** (Analysis) tool to the model under VacantSuitable.

Connect VacantSuitable to the Select tool as Input Features.

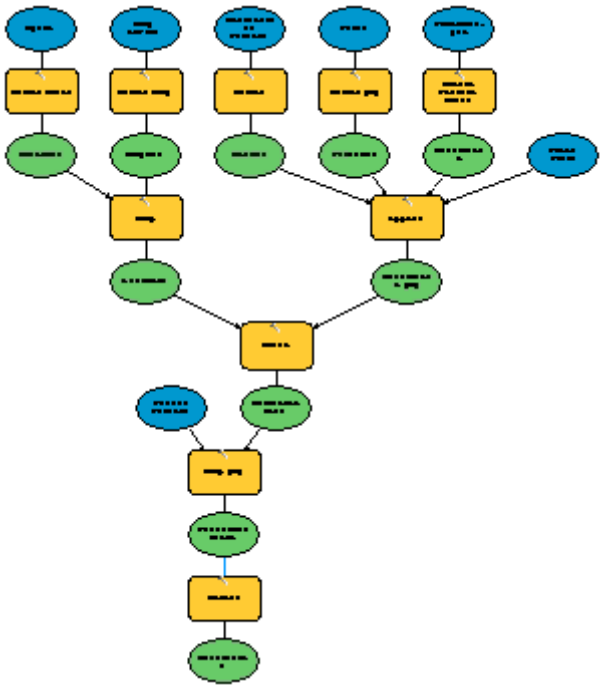
Open the Select tool's dialog box, and change the Output Feature Class name to **Candidates**.

Set the expression to: `Shape_Area > 50000`. ( **ArcGIS 10.0 or 10.1 users:** Enter the following expression: `"Shape_Area" > 50000`.)

Tip: If you are using ArcGIS 10.2, then the field name in expressions will not have double quotes around it. If you are using ArcGIS 10.0 or 10.1, there will be double quotes.

The Candidates feature class will contain the candidate parcels that meet all analysis criteria, including area.

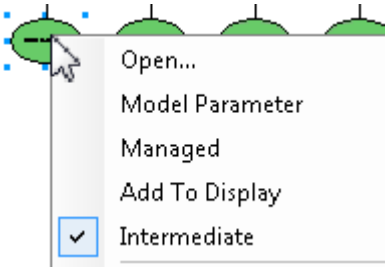
Click Auto Layout and zoom to the model's full extent.



Step 6a: Select features that meet the size requirement.

Because you want to view the final result right away, you will add it to the display. The rest of the data created in this model is considered *intermediate* data, which means that it was created only to be used in generating the final result. Sometimes, intermediate data is kept. But it is often deleted to save space in the geodatabase. You can manage intermediate data in each model from the Model menu or by right-clicking each output data element.

In the model, right-click several of the output elements from various tools and notice that Intermediate is checked.




Step 6b: Select features that meet the size requirement.

Right-click Candidates and click Add To Display.

Now that all criteria have been fulfilled, the model is ready to run.

Save the model.

Save the map.

If you intend to continue to the next exercise right away, leave ArcMap open. Otherwise, close ArcMap.