The Map Composer is the main mechanism by which images in Imagine are sent to the printer. Its use requires that images be readable within Imagine and that the computer in use be attached to a printer, either locally or on a network. In this class, you will use the networked printer: the Minolta 6100 DeskLaser.

You printed an image directly from the viewer in Unit 2, and you have printed layouts from ArcGIS that can include ERDAS Imagine images. You may therefore question the need for the Map Composer. There is a great difference between these modules. When you print from the viewer, you simply print the image and a logo. You have very little choice. You have somewhat more with ArcGIS, but you do not have complete control. When you use the Map Composer, you have a great deal of choice of the layout of your map as well as the other things you wish to print along with it. The images produced are very high-quality maps and presentation graphics.

Maps produced with the Map Composer include continuous and thematic raster layers, vector layers, mixed images, etc. These maps can include text, legends, scale bars, grid lines, tick marks, borders, symbols, etc. You can select from over 16 million colors, multiple line styles, and over 60 text fonts.

In this unit, you will create an image from the "canned" Imagine image set. Once you have completed that, you will make hard copies of images you created in Unit 2.

In general, the process of creating a map involves a series of steps:

1. Plan the map. Determine the margins, decide on what elements will be included in the map, etc.
2. Start Map Composer.
3. Prepare the data layers, typically using a viewer.
4. Draw the map frame, and insert the data layers in the map frame.
5. Add the things you wish to include in the composition: e.g. Neatline, ticks, scale bars, legends, titles, north arrows, logo, etc.
6. Write whatever descriptive text you choose to add
7. Print the map

Making Your First Map Composition

You need to have a plan or blueprint to follow. The plan you will use in the first map is shown in Figure 1. It includes a title (centered and at the top), the image (centered, 8 x 8), and a legend, north arrow, scale bar, and text, all below the image. The image will be bounded by a neatline, and it will have appropriate tick marks. Before you can deal with some of these details, you need to know just what you want to include. To a degree, these issues are your choice, based on the purpose of your project. They are always issues you should consider seriously.

This map composition will include a number of different image elements, as indicated in Figure 2, which shows the Map Composer window containing a complete image ready to print. You will note that the window includes a ruler for both X and Y directions. You will also note that the page shown in the window is 8" by 10 ½" rather than 8 ½ by 11. This is because the image shown here is specified with a ¼" margin on all sides. This is one of the things you will specify when you set up your composition.

There are two ways to start the Map Composer. The more obvious is by clicking on the Composer icon on the main Imagine Control Panel. Then click "New Map Composition" to create a new map composition.
Alternatively, you can choose File-New-Composition from the viewer menu bar. When the New Map Composition dialog opens, type in a suitable name for the map and specify 8 as the Map Width, 10.5 as the Map Height, and Inches as the units. Leave 1.0 as the Display Scale and White as the background. There is good reason to set the width and height smaller than the paper size of 8.5 x 11. On one hand, it is useful to have a margin of at least ¼ inch on all sides. More important, few printers can print to the very edges of the paper. Almost all have a "dead zone" around the edge of the paper. By inserting a "live" size of 8 x 10½, you are simply recognizing the realities of the capabilities of your printer. Click on OK. A blank Map Composer viewer appears, along with the Annotation tools palette. You will recognize the icons on the Map Composer icon bar; they are essentially the same as those of the viewer icon bar. The Annotation tool palette includes a number of icons which allow you to place rectangles, squares, polygons, lines, circles, scale bars, legends, map frames, grid lines, tick marks, text, etc. on your map composition. You can see the function of any icon on the Tool palette by putting the mouse cursor over it and reading the function on the status bar of the Map Composition viewer. If for any reason the Annotation tool palette disappears from your desktop, you can replace it by clicking on the Tool icon on the Map Composer icon bar or by clicking on Annotation-Tools from the Map Composer menu bar.

To see the entire Map Composer window, right-click the mouse within the Map Composer window to raise the "Quick-View" menu. Then click on Fit Map to Window. You can also enlarge the image in the Map Composer viewer by dragging on the corners of the Map Composer window.

The next step is to prepare the data layers. This is done in a viewer. Move to an open viewer and open two raster images: CuyahogaPan and CuyahogaClass. Use the Fit to Frame option in the Raster Options for these images. You can load both at the same time; if you load them sequentially, be sure to unclick the "Clear Image" option on the Raster Options tab before you load the second image. CuyahogaPan is a 15-m panchromatic satellite image of Cuyahoga county; CuyahogaClass is a land-cover map of the county. Be sure that the CuyahogaClass image is on top.

The CuyahogaClass image is a land-cover image with 7 land-cover classes. Open the raster attribute table by clicking on "Raster" on the viewer's menu bar and then on "Attributes." Let’s assume that you want to see what aspects of Cuyahoga County have not been developed as urban areas and therefore would be available for further urbanization. One way to do this would be to block out those areas that could not be developed as urban zones and see what remains. There are four non-developable land-cover types: urban, water, wetland, and barren. The developable land-cover types are the remaining three: wooded, agriculture/grass, and shrub/scrub. Hold down the control key and click the rows corresponding to these three types to highlight them and move to the "opacity" column. Change the opacity of each of these three rows to 0. As you can see, the four land-cover types that can be developed retain their color; the other three show the underlying panchromatic image.

Develop a scenario of your own to show some sort of development in the County. You can use the one outlined in the previous paragraph, or you can develop your own. Save your revised land-cover map on

Figure 2: More detailed view of Map Composition
your X: drive by clicking File -> Save Top Layer As -> and giving it a name. This latter step is important. Your map composition must reference the image shown on your X: drive rather than the image on your Q: drive if it is to do what you want it to do!

Now return to the Map Composition window and prepare to draw the map frame. Map frames are unusual objects. They are placed on the map composition like other objects, but they behave much as viewers. They can contain any type of image that a viewer can. When you place an image in a map frame, you will see it. However, the image is not copied to the map frame; it is referenced there. When you save the map composition, you are also saving a pointer to the image rather than the image itself. You choose the image you wish to include in the map frame by clicking on the viewer containing the image you wish to use. There are three ways to select the select the dimensions of a map frame, and the options you will use will depend on the image area you wish to include in your final map composition.

The map area is the area in the viewer displayed in the map frame in the map composition. It corresponds to the dimensions of the area on the ground in map units.

The frame area is the area used by the map frame in the map composition. It is the area on the page occupied by the imagine in question. It is defined in page units.

The scale is the ratio of the distance in the map frame to the distance represented on the ground. You can, for example, define an area showing a scale of 1:24,000.

In order to use Map Composer, you will need to make sure that you have both a viewer and a map composition viewer open. The viewer will contain the image you wish to print, and the map composition viewer will contain the layout for your composition. Click on the Create Map Frame icon on the Annotation tool palette to draw the boundary of the map frame. The Create Map Frame icon looks like a square with tick marks to its inside. Near the top of your map composition, shift-drag the cursor downward and diagonally to draw a map frame. Don't worry about where it is or what size it is; you will change these later. If you want to be super compulsive and draw a perfect square, press the shift key while you are drawing your map frame.

When you release the mouse, the Map Frame Data Source window will open, allowing you to choose a data source from a viewer or from imported data, or to cancel or to obtain help. Click on "Viewer." A new window opens, giving you instructions in how to choose a viewer with data. Put the cursor over the viewer you wish to use. The cursor should change to a check mark. Click anywhere in the image on the viewer.

A very important and sometimes confusing window, the Map Frame window, now opens. This window allows you to determine the size and position of your map composition, as well as its location on the page. Of the three ways to select the dimensions of your map composition discussed above, you can maintain any one; the others can be changed and will be calculated in the process. You can also rotate the image. You can choose to use the entire image or to use a part of it. You will need to experiment with these options in order to understand them. The key to this window is to choose the appropriate "change" option. As indicated earlier, you have 3 choices:

1. Change Map and Frame Area (Maintain Scale). The "scale" window is grayed out, and you can change the map's width and height (in map units) and the frame width and height (in paper units). You will need to fill these in, either by filling in the numbers or by moving the appropriate boxes with your mouse.

2. Change Scale and Frame Area (Maintain Map Area). The Map Area Width and Height fields are grayed out, and you can adjust the scale and the frame width and height, again, either by filling in numbers or by moving the appropriate boxes with your mouse.

3. Change Scale and Map Area (Maintain Frame Area). The Frame Width and Height fields are grayed out, and you can adjust the scale and the map area width and height, again, either by filling in numbers or by moving the appropriate boxes with your mouse.

4. Alternatively, if you wish to use the entire image, you can click on the "Use Entire Source" button.

When the Map Frame window opens, a cursor box also opens up over the image in the viewer. This shows the portion of the image that will appear in the map frame in the Map Composition. You should experiment with the buttons and see how they change the options available to you and how these options
affect the cursor box in the viewer. For purposes of this composition, choose "Change Map and Frame Area (Maintain Scale)." Double-click the value in Frame Width to select it and type 5.5 as the value. Do the same for Frame Height and type 5.5 as the value. Press the return key after inserting each value. What this does is to set the map frame to the dimensions you want.

Now choose "Change Scale and Map Area (Maintain Frame Area)." Remember that you have set the frame as you want it, so you will not want to change it again. Now set your frame coordinates. You should experiment with different values for these. For example, you can set the upper left corner of your map frame by moving to the Upper Left Frame Coordinates portion of the window, and changing the X value to 1.0 and the Y value to 9.0. Press the return key after inserting each value. You can also enter a scale, such as by double-clicking on the value in Scale 1: to select it, and typing 50000 in the window. Again, press the return key after entering your value. You can also set the width of your composition by entering 6.0 in the frame width field. Try several things to see what happens. When you enter any value in the Map Frame window, you should check the results on the Map Composition viewer (to see how the size and location of the map frame responds to your entry) and on the viewer (to see the portion of the image that will be included in the final product). Get used to using these three windows together to build a final map. Note that you can choose the portion of the image in the viewer to be included in your map composition. To do this, move your cursor to the cursor box in the viewer. Drag the cursor box to the area you want to display in your composition.

When you have chosen all of the variables determining how your image will be printed, and you are satisfied with your choice, click OK in the Map Frame dialog to reference that portion of the image to the map composition. The image area you chose is now displayed in the map frame in the Map Composer window. Note that when you click OK for this action, the map frame is set, and it is not a trivial task to change it. Therefore, you should spend as much time as you need in making your choices. From this point on, we will assume that you are really satisfied with your image and intend to proceed to complete it. You can, if you want to, edit the map frame or delete the map frame, but it is not easy. Instructions on doing these operations will be given later in this handout. All of the other aspects of your map depend on the map frame rather than the image in the viewer, so it is important that the map frame be exactly what you want. You can now close the viewer.

You will now add a neatline (a rectangular border around the map frame) and tick marks. Click on the Grid/Tick icon on the Annotation Tool palette. This will enable you to place grid ticks. Now click on the map frame on which you wish to place the neatline and tick marks. The Set Grid/Tick Info dialog opens. Be sure that Neatline is checked, and leave the Margin at its default value of 0, so that the neatline fits to the edge of the map frame. In the Horizontal Axis options, drag across the Length Outside: field to select it. Enter a tick length of 0.06 and press return. This means that the tick marks will extend 0.06" outside of the map frame. Drag across the Spacing: field to select it. Enter the value 5000 and press the return key. This will place the tick lines with a spacing of 5000 feet. You may wish to change other fields as well. When you have determined the dimensions of the horizontal ticks, you can click the "Copy to Vertical" button if you wish to use the same settings on the vertical axis. Alternatively, you can click on the Vertical Axis tab and enter other values. Whether you Copy to Vertical or not, you should click on the Vertical Axis tab and verify that the vertical axis values are set as you wish them. Click on "Apply" on the Set Grid/Tick Info dialog to set the neatline and tickmarks on the map. If you are satisfied, click Close. Otherwise, make whatever adjustments you wish to make and click "Redo" to apply them. Experiment with some of the other settings possible on this dialog. For example, you might vary the Map Units or see how your map would appear if it had a full grid rather than tick marks.

You will now change some of the details of your map. Select the group of ticks, tick labels, and the neatline by clicking on any of the number labels outside of the map frame. A selection group appears around the entire group. From the Map Composer viewer menu bar, select Annotation-Styles. The Styles dialog opens. Hold on the popup list next to Line Style: and select Other. The Line Style Chooser dialog opens. Enter 1.00 as the Width: to change the width of lines in points. Click Apply and then Close in the Line Style Chooser dialog. The group redraws with the new line width. Now hold on the popup list next to Text Style: and select Other. Pick a new font, and change the Size to 9.0. Click Apply. If your change improves the image, click on Close in the Text Style Chooser dialog. Otherwise change the settings.
Click Apply and Close. Deselect the annotation group on which you are working by clicking anywhere in the map composition window outside of the selection box. Then click Close in the Styles dialog.

Again, there may be instances when you would like to edit one or more individual elements in a complex object, like the one you have created here. Since grids and ticks are groups of elements, they can be ungrouped and the elements edited individually or coped, cut, pasted, etc. Instructions on how to do this will appear later in this handout. At this point, we will proceed to the scale bar.

You can create as many scale bars as you wish for any georeferenced map. In this case, we will create two. To place scale bars, select the Scale Bar tool from the Annotation tool palette. Move the cursor into the Map Composer viewer, and the cursor changes to the scale bar positioning cursor. Drag the mouse to draw a box under the right corner of the map frame in the Map Composer viewer, outlining the length and location of the scale bars. You will be able to change these later, if you choose. Releasing the mouse button activates the Scale Bar Instructions dialog. You will be instructed to click on the Map Frame you wish to use for the scale bar. Since only one is open, you have only one choice. You could, however, have several Map Frames open, and you can choose any open Map Frame.

When you identify the Map Frame you wish to use, the Scale Bar Properties dialog opens. You have several possibilities for Scale Bars. Experiment with several of them, to see what happens. When you are done, you should have checked “Zero” in the Alignment area, to indicate that you wish the scale bars centered on each other, you should have checked “Kilometers” and “Miles” in the Units area, you should indicate “Scale” as the title, and you should enter 2.0 inches as your maximum length. Click on “Apply.” If you are satisfied with their appearance, Close the Scale Bar Properties dialog. Otherwise click on “Redo” to change the information.

Once the scale bars are placed on your map, you can move either of them by clicking on the bar and dragging it to a new position. When you have moved your scale bar, click outside of the selection box to deselect the scale bars.

Now you need to create a legend. This is a very important part of many maps, especially the sorts of thematic maps that characterize environmental, scientific, and natural-resource applications of GIS. Legends are created in the Map Composer as groups of elements generated automatically to your specifications. The map you currently have in the Map Frame is a thematic map. You can create a legend for any thematic map – but not for a continuous map. To begin to create a legend, click on the Legend icon in the Annotation tool palette, and move the cursor into the Map Composer window. The cursor changes into the Legend Positioning cursor. Click in the Map Composer viewer under the left side of the Map Frame to indicate the position of the upper left corner of the legend. The Legend Instructions dialog now opens, asking you to click in the Map Frame corresponding to the image from which you plan to derive the legend. The Legend Properties dialog opens. This dialog contains 4 tabs (Basic, Title, Columns, Color Patches). The Basic tab is displayed. Do you need all of the rows in the legend? You can limit the rows to be included in the legend, if you want to, by highlighting those you want in yellow. The easiest way to do this is to hold the control key down and left-click those you wish. The highlighted rows will be the only ones included in the legend.

Click the Title tab. Enter the word “Legend” in the Title column, and make sure that it is Left-Justified. Click “Apply” in the Legend Properties dialog. The legend is drawn in the Map Composer viewer. As before, choose to Close the dialog or Redo it, depending on whether or not you are satisfied with its appearance. You can reposition the legend, if you choose, by clicking on any of the color patches or text strings to select it. Drag the box using the mouse. When you are finished, deselect the legend by clicking outside of the legend box.

Now you should add a title to your map. Click on the Text icon in the Annotation tool palette. Move your cursor to the top of the map in the Map Composer viewer. The cursor becomes an l-beam, indicating that you are about to place text. Click where you want to place the text. This will become the bottom left corner of the text string. The Annotation Text dialog opens. Enter “Environmental Sensitivity Analysis” in the Enter Text String: field, and click OK to place the text. To change the text style, click on the text string
to select it. Select Annotation-Styles from the Map Composer menu bar. The styles dialog opens. Hold on the popup list next to Text Style: in the Styles dialog, and select Other. In the Text Style Chooser dialog, change the Size: to 20 points. Now click on the Custom tab of the Text Style Chooser dialog. Choose a different font. Click on "Apply." If you are satisfied, Close the Text Style Chooser dialog. If not, Redo it. You should experiment with various positions, fonts, sizes, and other aspects of your title.

To position the title, double-click on it. The Text Properties dialog opens, enabling you to edit, position, and align the text. You first want to make sure the text is centered. To do this, drag across the X: value to select it. You know that your viewer is 7.5 inches wide. Therefore, enter "7.5/2" in the X" window, and press return. This returns a value of 3.75. Now change the Y: value to 9.5, and press return. Now look at the Alignment area. You want the title centered. That is, you want the center of your title to be located at the 3.75" location you specified in the X: position. So you should click on the Center radio button for the Horizontal: setting. You want the bottom of your title to be at the 9.5 position. So you should click on the Bottom radio button for the Vertical: setting. Click on Apply. If you are satisfied, Close the dialog.

The next step will be to place a North arrow. This is one of many symbols you can place on a Map Composition. If the Styles dialog isn’t open, open it by clicking on Annotation-Styles from the Map Composition menu bar. Hold on the popup list next to Symbol Style: and select Other. In the Symbol Chooser dialog, click on the popup list next to Menu, and select North Arrows. Select a north arrow that turns you on from the list. Change the Size: 36 points is a good place to start (1 point equals 1/72 inch, so 36 points is ¼ inch. Click on Apply and then Close in the Symbol Chooser dialog. Note that the North Arrow is now the default symbol for the Symbol Style in the Styles dialog. Select the Symbol tool from the Annotation tool palette. Click beneath the map image in the Map Composer viewer, between the legend and the scale bars. This places the north arrow on your composition. As with other elements in the Map Composition, you can move it by double-clicking on it and dragging it to a new position.

Finally, add some descriptive text. If the Styles dialog isn’t open, open it by selecting Annotation-Styles from the Map Composer menu bar. Hold on the Text Style: popup and select Other. In the Text Style Chooser, change the text Size to 10 points. Click on the Custom tab at the top of the Text Style Chooser dialog. Check to be sure that Fill Style: is set to a solid black. Click on “Apply” to change the defaults. Close both the Text Style Chooser dialog and the Styles dialog. Click on the Text icon in the Annotation tool palette to use the text option to write your descriptive text. The Annotation Text dialog opens. Move your pointer into the Enter Text String: section of the Annotation Text dialog, and type. Use the return key to left-align each line. Enter an appropriate text which describes what you are showing in this image. Don’t forget to add your name to this field! When you have entered this, click OK in the Annotation Text dialog to place the text.

Save your Map Composition by clicking the Save icon on the Map Composer tool bar or by selecting File-Save-Map Composition from the Map Composer menu bar. This will save your Map Composition as a file with the ".MAP" extension, indicating that it is a Map Composition.

Now print your map composition. If you have closed your Map Composition viewer, you can open it by clicking on the Composer icon on the main Imagine control panel. If your Map Composition viewer is already open, you don’t need to open another. Select “Print Map Composition” from the Map Composer menu or File-Print from the Map Composition viewer menu bar. Click on the name of the Map Composition you’ve just saved under Filename: (*.map), and click on OK. The Print Map Composition dialog opens. Click on the Print Destination popup to select the printer you wish to use. If your Map Composition is a black-and-white image, you should choose the HP LaserJet III. If it is color, you should choose the HP DeskJet 890C. When you choose a printer, it will take a couple of seconds for Imagine to connect to the printer driver. When it does, you will be able to click on OK.

Dealing with Loose Ends

Editing and Deleting the Map Frame. There may be times, after you have placed a Map Frame, that you wish to edit it or delete it. The Map Composer is a very powerful tool, but it is also idiosyncratic, and you have to be know how to edit the Map Frame correctly if you are to edit it at all. You cannot, for
example, change the image you are using. If you want to use a different image in a particular Map Composition, you need either to delete the Map Frame and redraw it or to edit the *.map file. If there is a question, you are best advised to start over.

To edit a Map Frame, click on the Select Map Frame icon on the Annotation tool palette. Click in the Map Frame you wish to select. Click on Annotation-Element Properties in the Map Composer viewer, or double-click in the map frame. A new viewer opens, containing the image you are currently using. The area currently in the Map Frame is shown by a white cursor box. Change the information in the Map Frame dialog and/or move the cursor box in the viewer. When you are satisfied with the modified image in the Map Frame, click on OK in the Map Frame dialog, and close the file in the viewer.

To delete a Map Frame, choose View-Arrange Layers from the Map Composition viewer menu bar. Move your pointer to the box entitled MapFrame_CuyahogaPAN.img (or similar name, depending on how you saved the image). Right-click this box and select Delete Layer. After the box disappears, click on Apply and then Close in the Arrange Layers dialog. Note that you cannot “undelete” a Map Frame which you have deleted. Once you have done this, you will need to redraw the Map Frame. You do this in exactly the same way you created the Map Frame in the first place.

Editing *.MAP files. Files you create when you save a map or graphic using Map Composer have the *.MAP extension. This file contains all of the information required to construct your composition, such as size, position, and name of the image(s), annotations, symbols, etc. When you display or print a Map Composition using Composer, the software reads this *.map file and recreates the map you originally composed. Although you “place” an image in a Composition, you really are only referencing it. The name of the image you are using is listed in the *.map file. Therefore, when you enhance or change an image in any way, you change the image in the Map Composition because it is the same image. You need to edit a map file if you wish to move an image that has been used in a Map Composition to a new directory, or to make certain other changes. You can edit the annotations in a Map Composition using the annotation tools you used to place the annotations when you originally created the map.

To edit a *.map file which you have saved, click on Composer in the main Imagine Control Panel. Choose Edit Composition Paths. The Map Path Editor opens. Open a file by clicking on the Open icon or choosing File-Open. The Compositions dialog opens. Choose the map file you wish to edit, and click on OK. The information for the selected map file displays in the Map Path editor. The type of Layer: and Layer Information displays for the image. Click on Composition under Frame:. Under Layer Information, type the new file name or directory name in the Name text entry field. Click “Apply” in the Map Path editor. The changes you have made are applied to the map composition. If you don't want the changes you’ve just made, click the Reset button. If you are satisfied, save the file by clicking File-Save from the Map Path Editor menu bar.

Ungrouping Elements in Annotation Groups. The Annotation tools in the Map Composer module are very powerful, and they are capable of considerable editing. Some of these tools are relatively simple: things like North Arrows, Explanatory Text, etc. are simple features in which the Annotation element is a single entity that can be edited using the Annotation tools. Others, such as neatlines, grids, and tick marks are more complex. To edit the simple elements, simply enter the Annotation tools, and change the materials controlled by the tool in question.

For more complex elements, consider the neatline/tick mark/grid elements. To edit these, you may have to ungroup them. First, select the group you wish to deal with. Then click on Annotation-Ungroup in the Map Composer menu bar to ungroup the selected elements. This draws selection boxes around each component making up the group. If the component you wish to work on is selected by this action, fine. Otherwise, click on a particular group to select it and then click on Annotation-Ungroup to ungroup it further. You may need to use Annotation-Ungroup several times in order to achieve the desired separation. Deselect everything by clicking outside any of the selection boxes. Then click on any element you wish to edit. A selection box will form around it. You can now edit, cut, paste, copy, etc.

When you are done, you will probably want to regroup the elements into a group. Click on the first
element you wish to regroup, then shift-click on all of the other elements you want included in the group until all are selected. Then select Annotation-Group from the Map Composer menu bar.

**Other Map Compositions to Create**

Beginning with this unit, you will use Map Composer to print all maps for your portfolio. *All maps printed for your portfolio should be brought to class at the time of the recitation.* All maps should include the following elements:

1. Your name in a text annotation field
2. A title, which should include the Unit number in which the map was generated
3. A brief explanation of what the map shows in a text annotation field
4. A legend, *if a legend is appropriate for the map in question*

The map created above is the only map solely from Unit 3 that will be included in the portfolio. However, you will now create Map Compositions for the following maps from Unit 2 and print them, with the following specifications.

1. The LNSOILS.IMG file.
2. The VUE file you created in Unit 2 showing the area in Madison Sandy Loam soil with a slope of 15-25%, from the LNSOILS.IMG file superimposed over the LANIER.IMG image.
3. The image showing forested areas in the Germantown, MD area suitable for development as housing projects, superimposed over the GERMNTN.IMG image.

In all three cases, your images should be as large as feasible. That is, don’t limit yourself to a Map Frame size of 5.5 x 5.5 inches. If you can fit everything in with an image of 8 x 8, do it. You should be able to make images this size for two of the three images. *Also, you should use the entire image.* In figuring out how to do this, keep in mind that you will need to specify the size of the image and the position of its upper left-hand corner. You should also use the Use Entire Source button.

**Questions to Consider**

1. In planning a Map Composition, what do you think is the easiest way to maximize the size of the printed image while insuring that you get all of the other pieces of information you need to get on your Map Composition?
2. Why are legends limited to Thematic maps? That is, why can’t you print a legend for a continuous image?

**Portfolio**

Four Map Compositions are required for the portfolio from Unit 3:

1. The map of Cuyahoga County which you prepared for this unit
2. The map of LNSOILS.IMG
3. The map of the Madison Sandy Loam with slope of 15-25%, superimposed over LANIER.IMG
4. The image showing forested areas suitable for housing development, superimposed over GERMNTN.IMG.