# Creating Buffers and Waste Exclusion Areas

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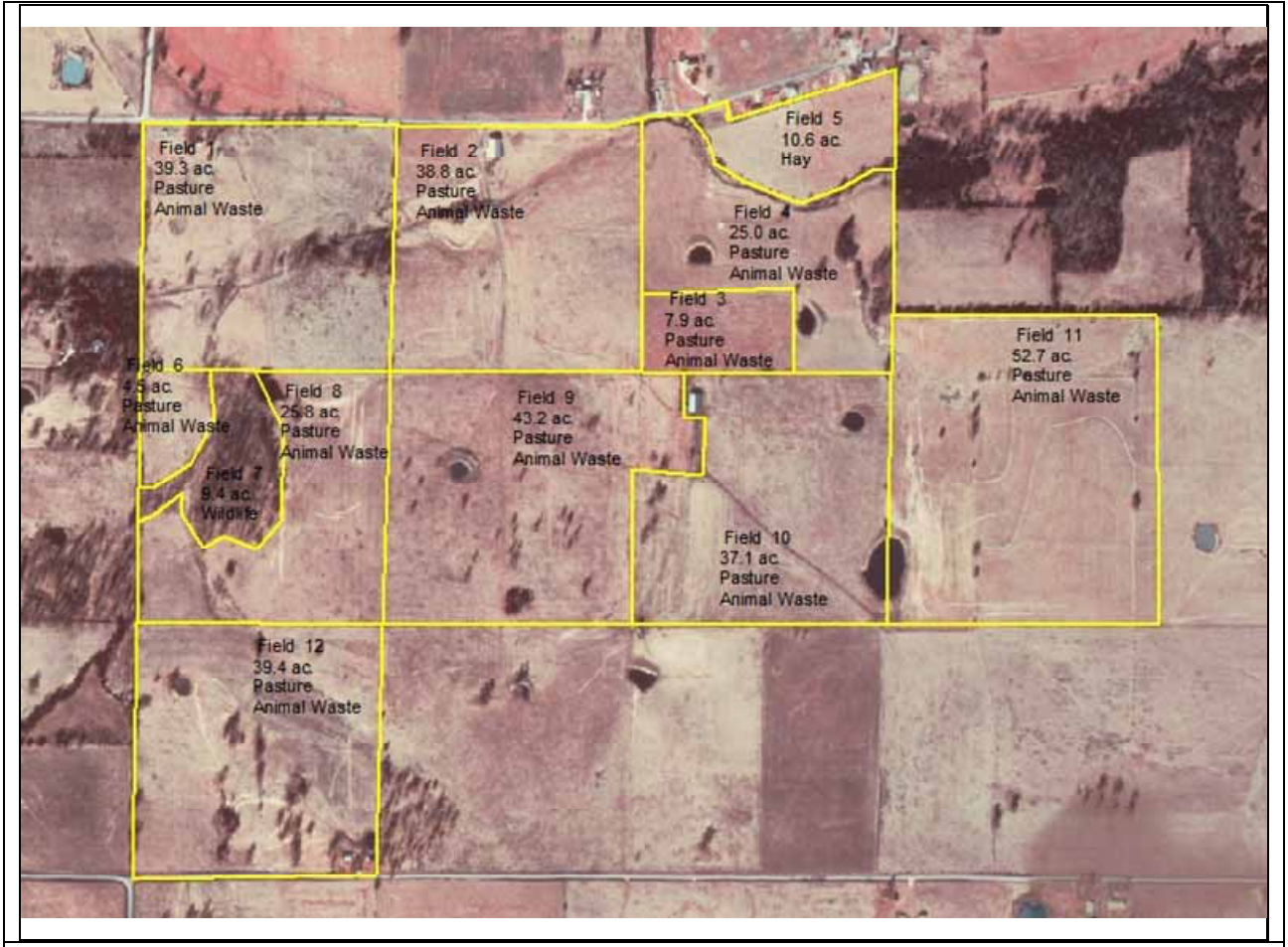
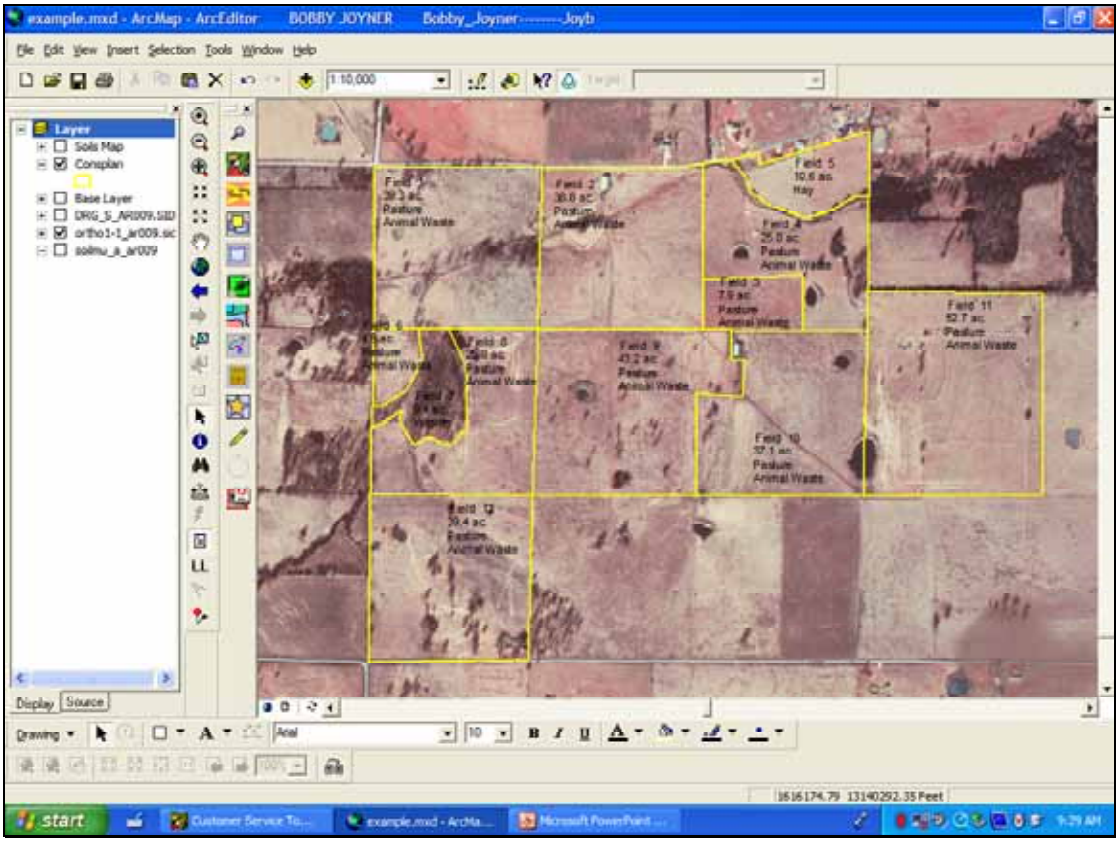
Generally, most buffers are created for areas where animal waste is applied. While most of these areas are either filter strip buffers or setback buffers, some areas are actually exclusion areas such as steep slope areas or areas where soil or bedrock conditions are such that animal waste should not be applied. The following instructions were developed to show how to create these buffers and exclusion areas in Customer Service Toolkit.
While these instructions are targeted toward animal waste applications, some of the procedures demonstrated here will also work for other types of buffers such as Riparian Forest Buffers and those developed for CRP.

These instructions will introduce some users to new ArcMap tasks such as copying and pasting from one layer to another, merging features within a layer, selecting by attributes and clipping one layer with another.

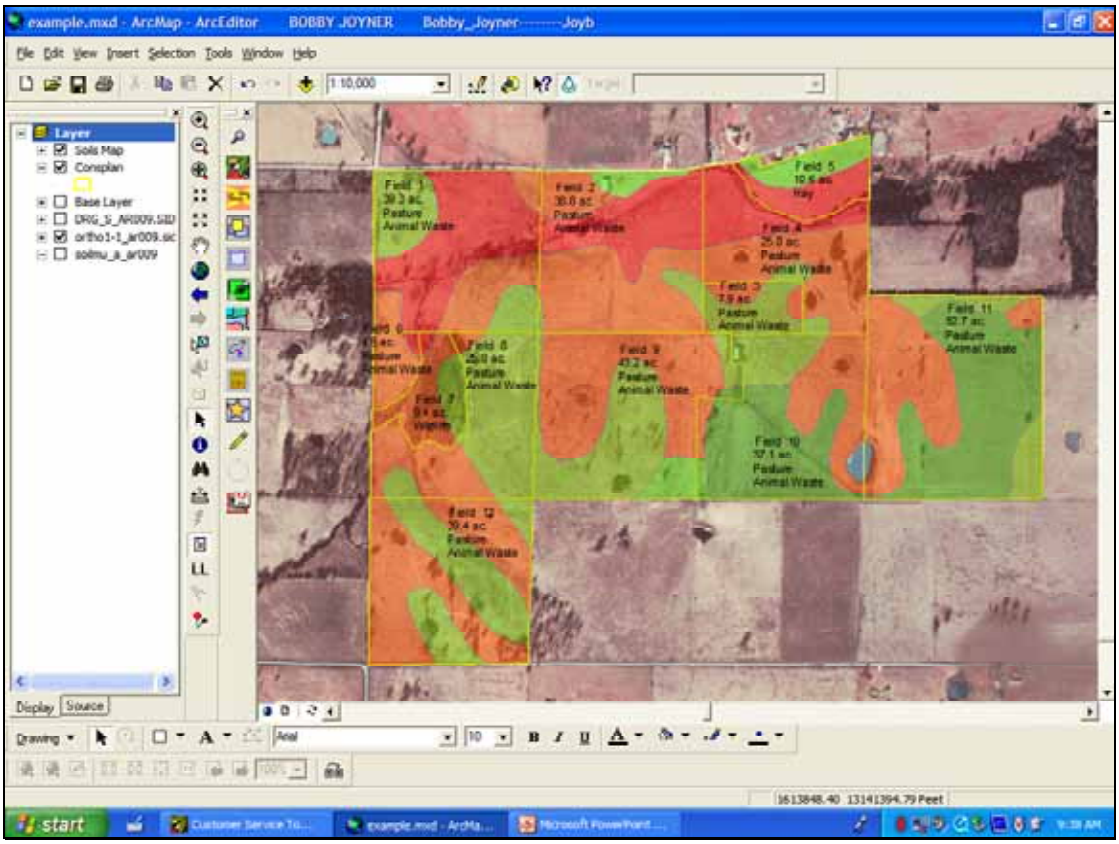



In these instructions we will use the following scenario:
The producer applies animal wastes to the farm from outside sources. He has requested a conservation plan and CNMP. The operating unit consists of one tract with 12 fields, most of those fields receive animal waste applications as shown in the field labels with the exception of field 5 which is used for Hay production and field 7 which is a wooded area used for wildlife habitat.
The producer has agreed to the following:
He will not apply animal waste:
within 100 feet of the property boundaries,
within 100 feet of streams,
within 100 feet of the upslope side of ponds or other water bodies,
within 200 feet of wells or other sensitive areas.
Or on soils with frequent flooding or slopes of more than 15%.

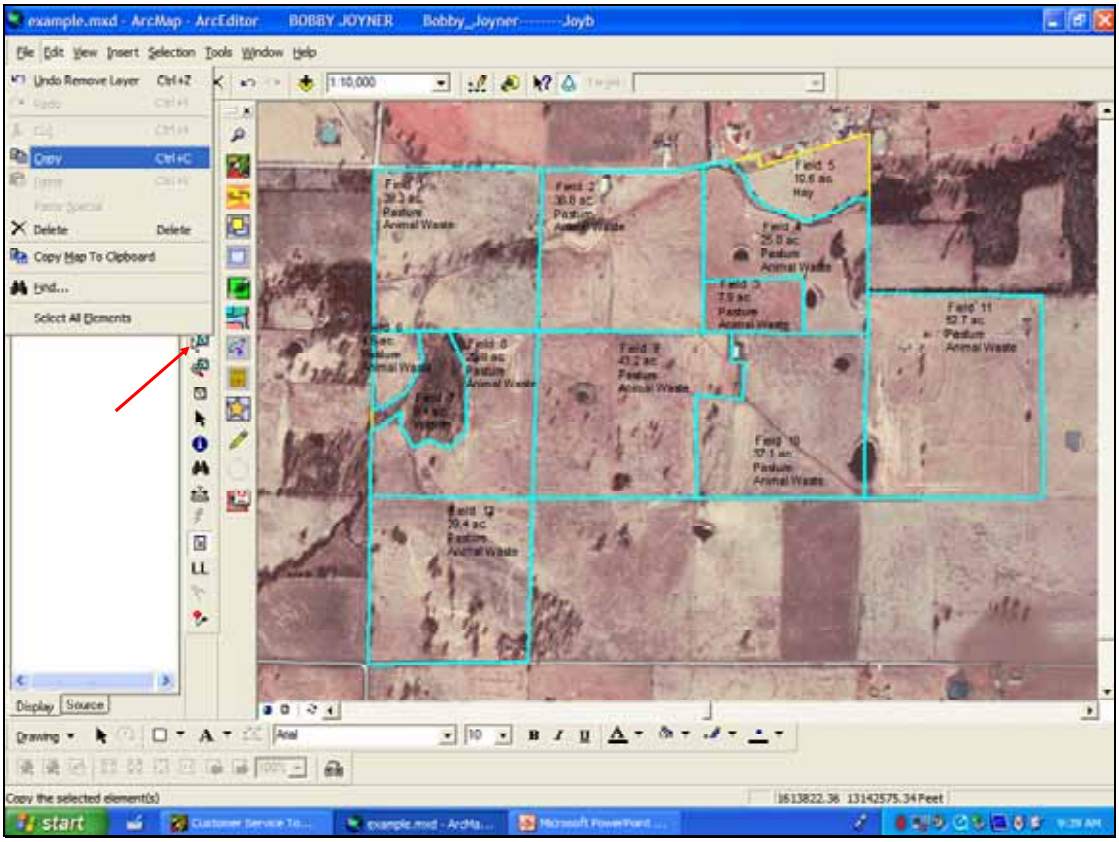
He has requested a map that would show all the areas where animal waste should not be applied.



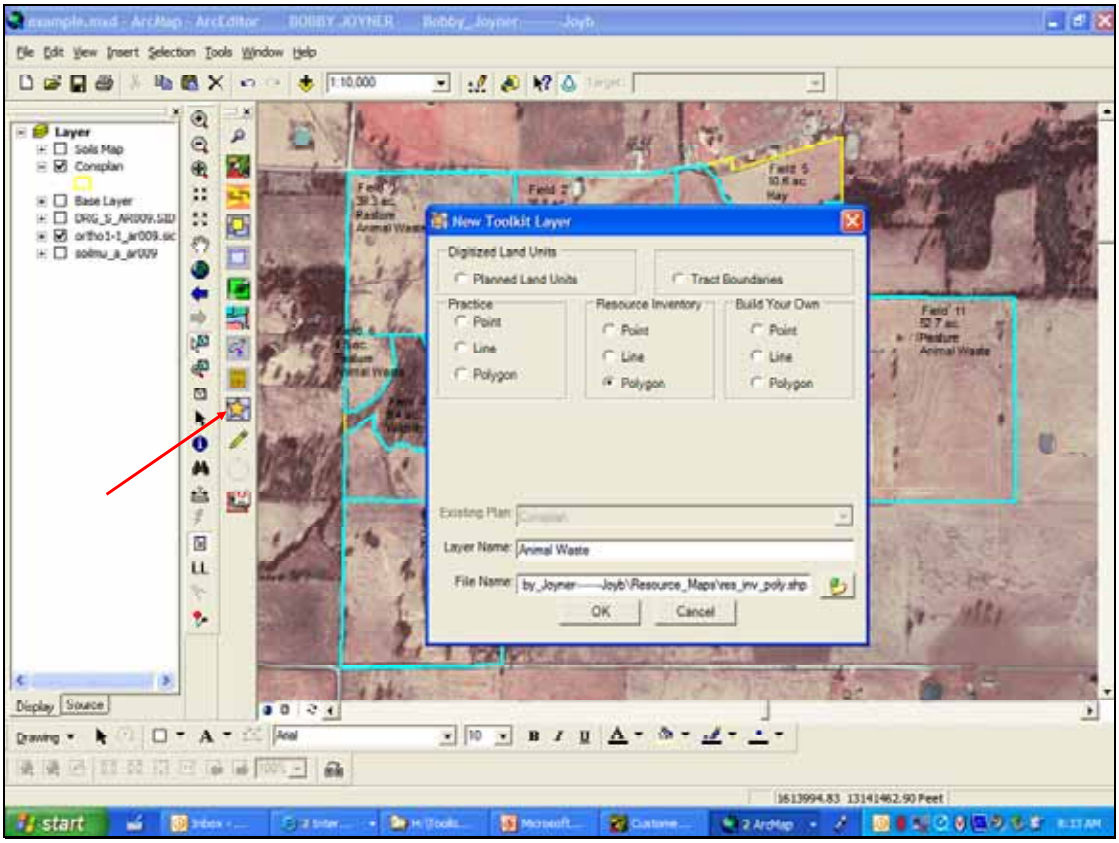

The Plan map has been developed and all land units have been digitized, attributed and labeled. A soil map for the farm has also been created. Information from these layers will be used to create the buffers and exclusion areas. Notice that the orthophotography and topographic image are also present in the table of contents. Some of this information may be useful later when determining areas that should be excluded from animal waste applications.



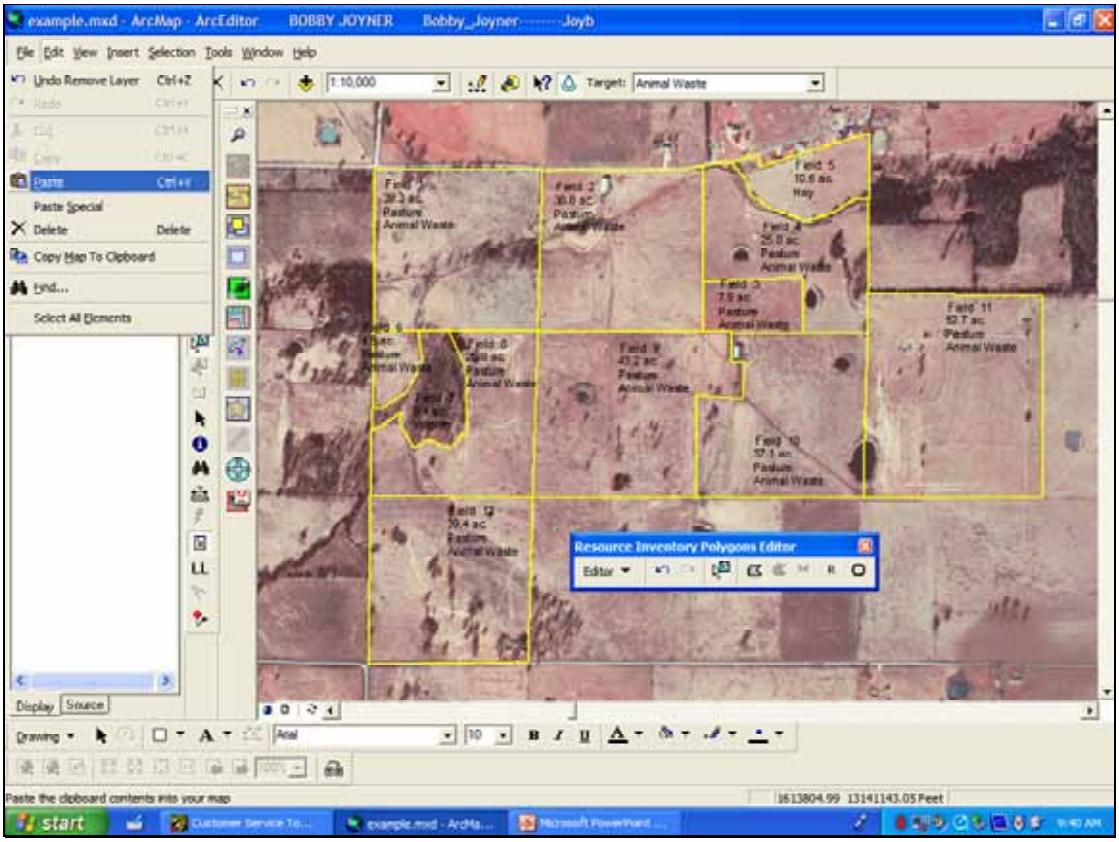

The soils map has been set to semi-transparent and symbolized to show frequently flooded areas in red. Areas that have slopes of 8 to 20% are shown in orange, some of these areas may exceed 15% slopes. Other soils that have no significant limitations are shown in green. Some of this information will be used later in developing the exclusion areas.



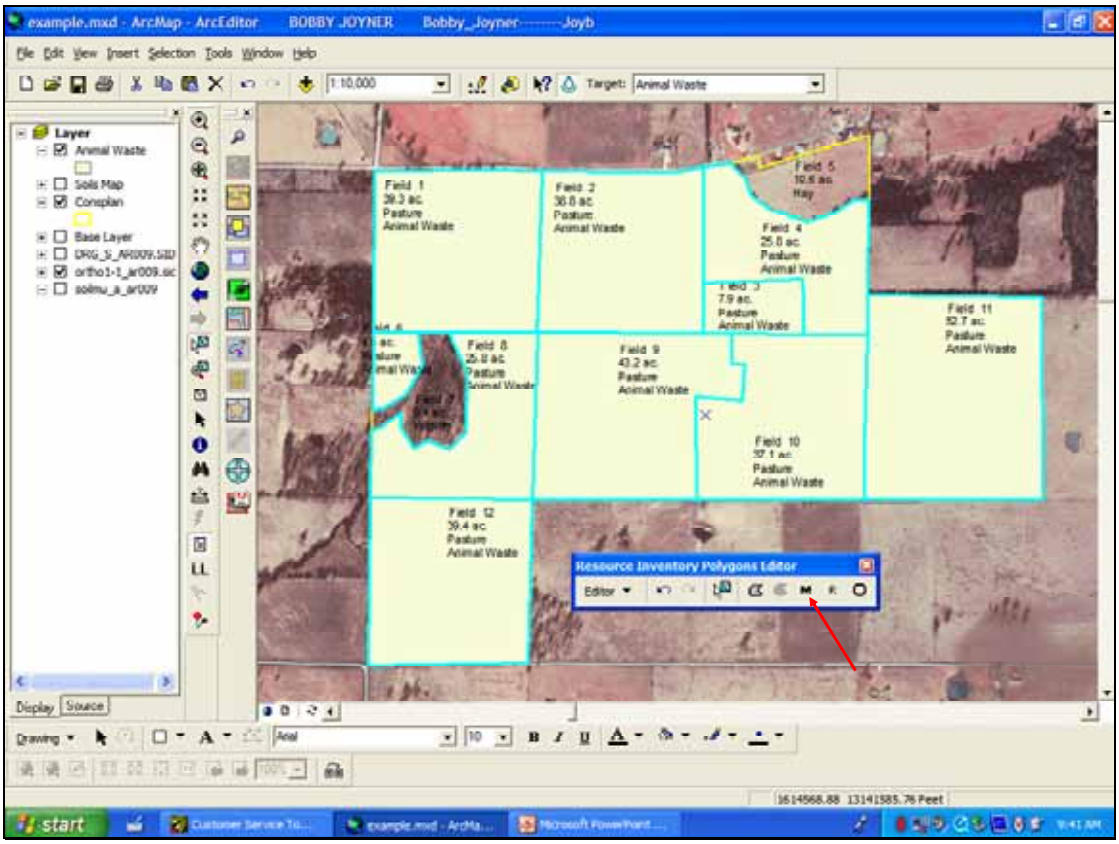

The first step in creating the buffers is to create some layers that will either be used to create buffers or to trim buffers. Since no buffers are needed on areas that do not receive animal waste applications, the first layer to create is an animal waste layer. Use the select features tool, click on the first field and shift click on other fields to select only the fields where animal waste will be applied. Notice fields 5 and 7 are not selected. Click Edit on the main menu and click Copy (Ctrl+C or the copy button could also be used).



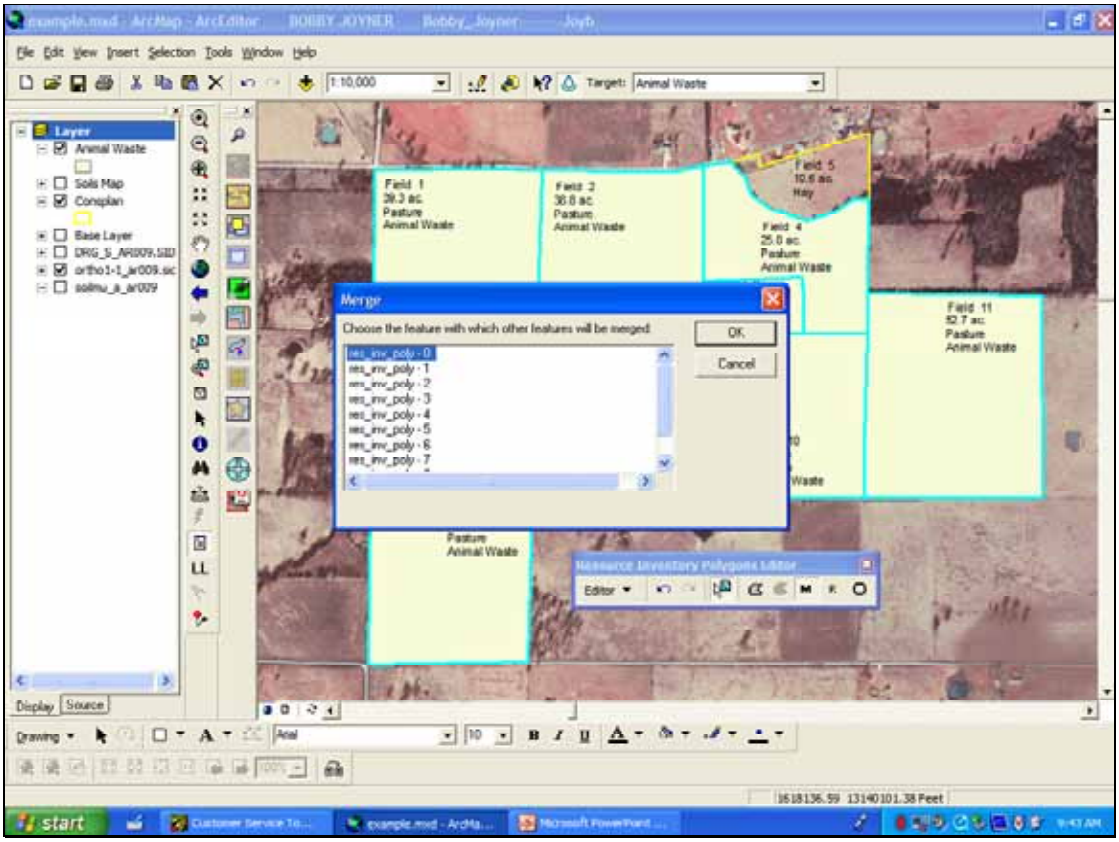

Use the New Toolkit Layer button to create a new Toolkit Layer. Choose the Resource Inventory Polygon, change the Layer Name to Animal Waste and use the default File Name. Click OK.



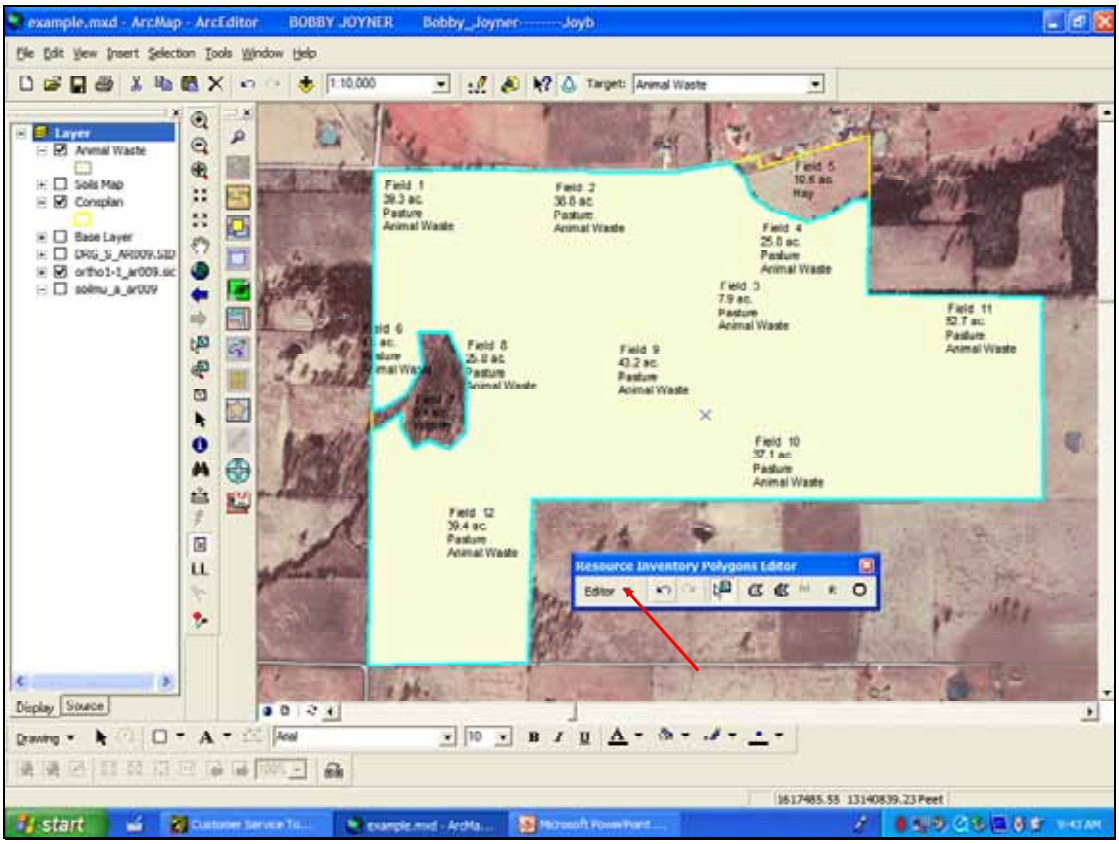

The Resource Inventory Polygons Editor Toolbar appears. Click Edit on the main menu, then click Paste. This action will copy the selected land units from the planned land units layer into the Resource Inventory Polygons layer. (note: Ctrl+v or the paste icon could also be used)



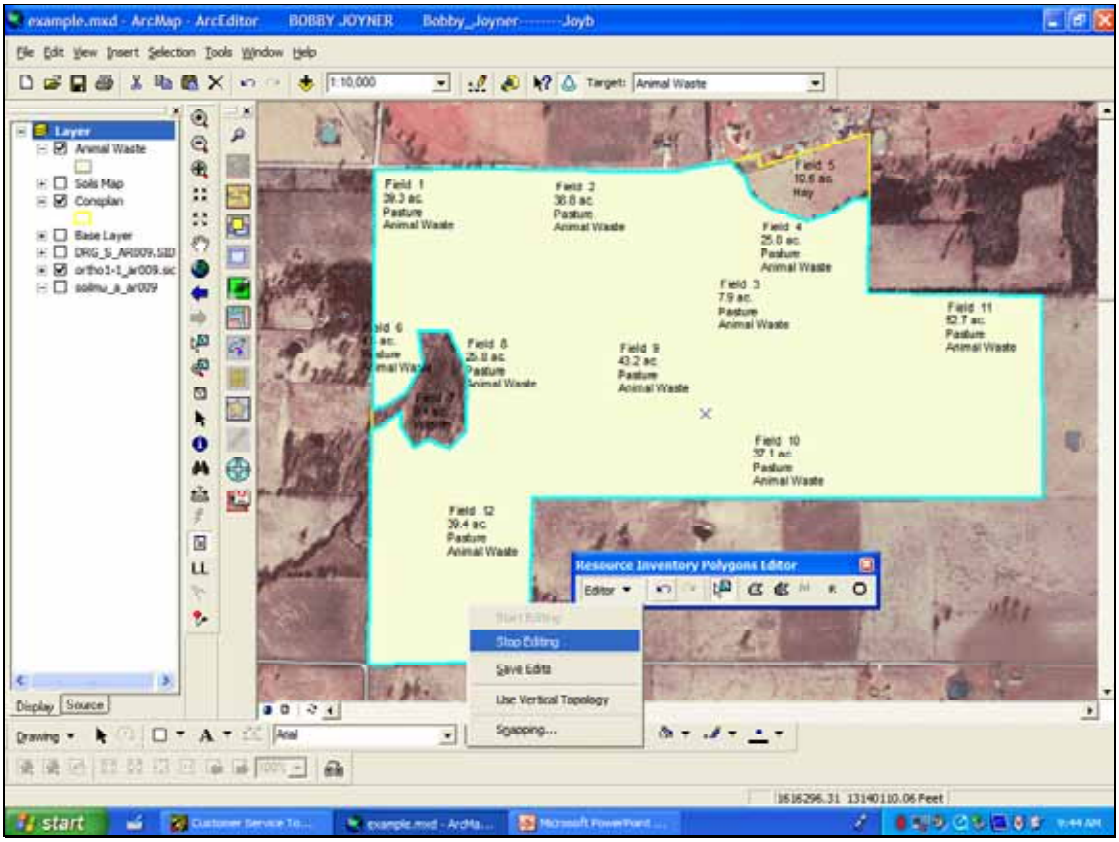

The land unit polygons are copied into the animal waste layer as individual polygons. Only one polygon is needed, and since all the polygons are still selected (highlighted in blue) click the M button on the Resource Inventory Polygons Editor Toolbar to merge all the polygons into one.



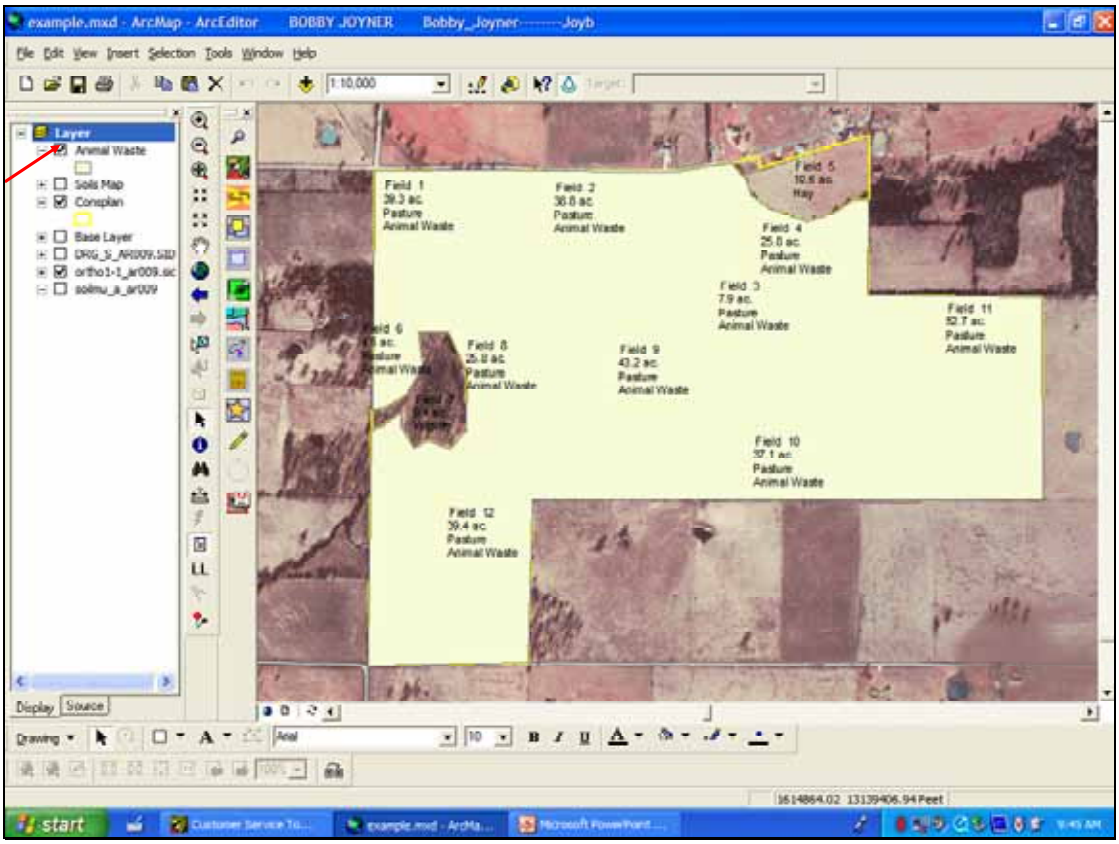

A merge window appears to determine which land unit's attribute data should be assigned to the new polygon. Since this data is not important for this layer, select any one of them and click OK.



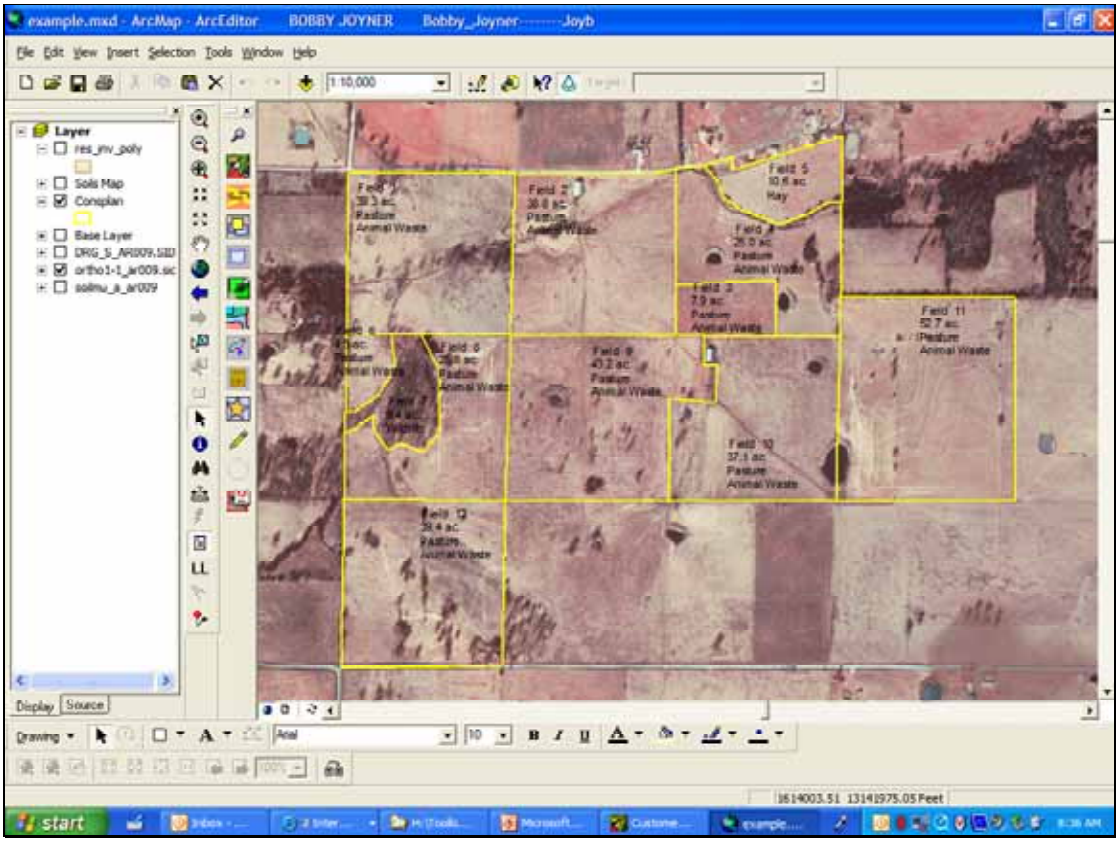

The polygons are merged. Click the Editor dropdown button on the Resource Inventory Polygons Editor Toolbar.



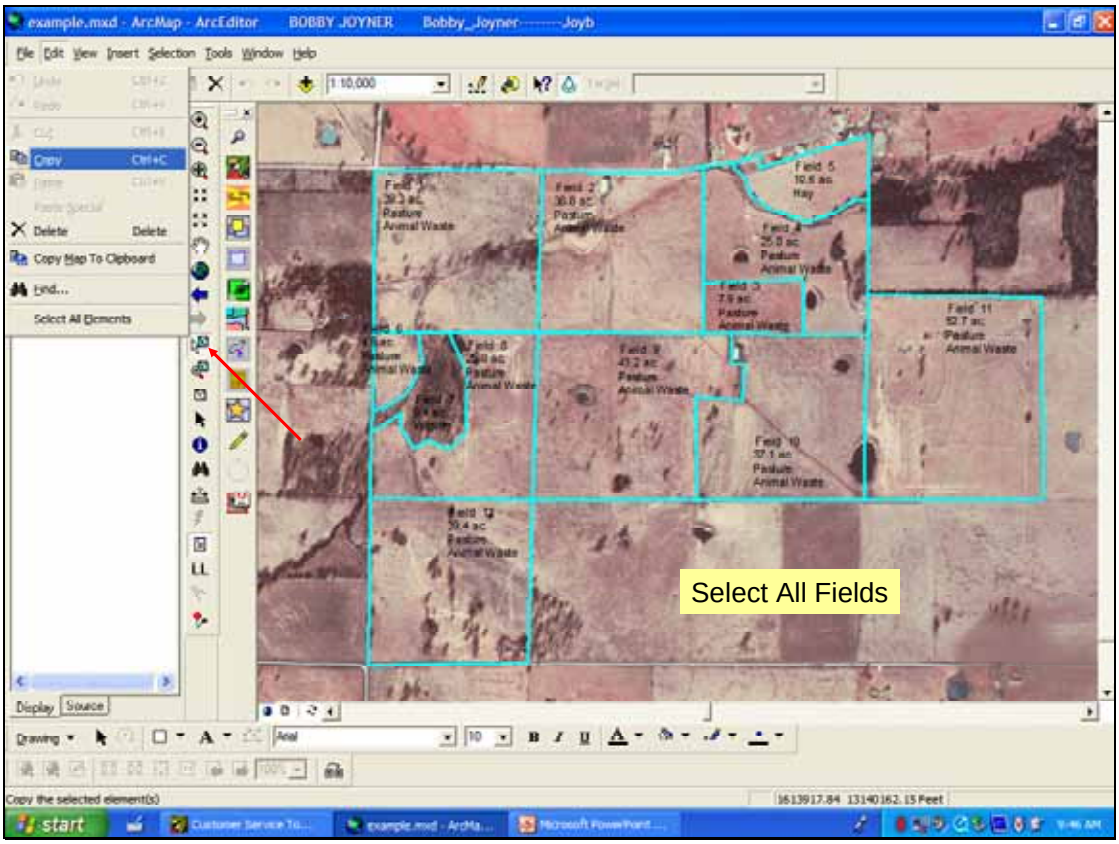

Click Stop Editing. Click Yes when prompted to save edits.



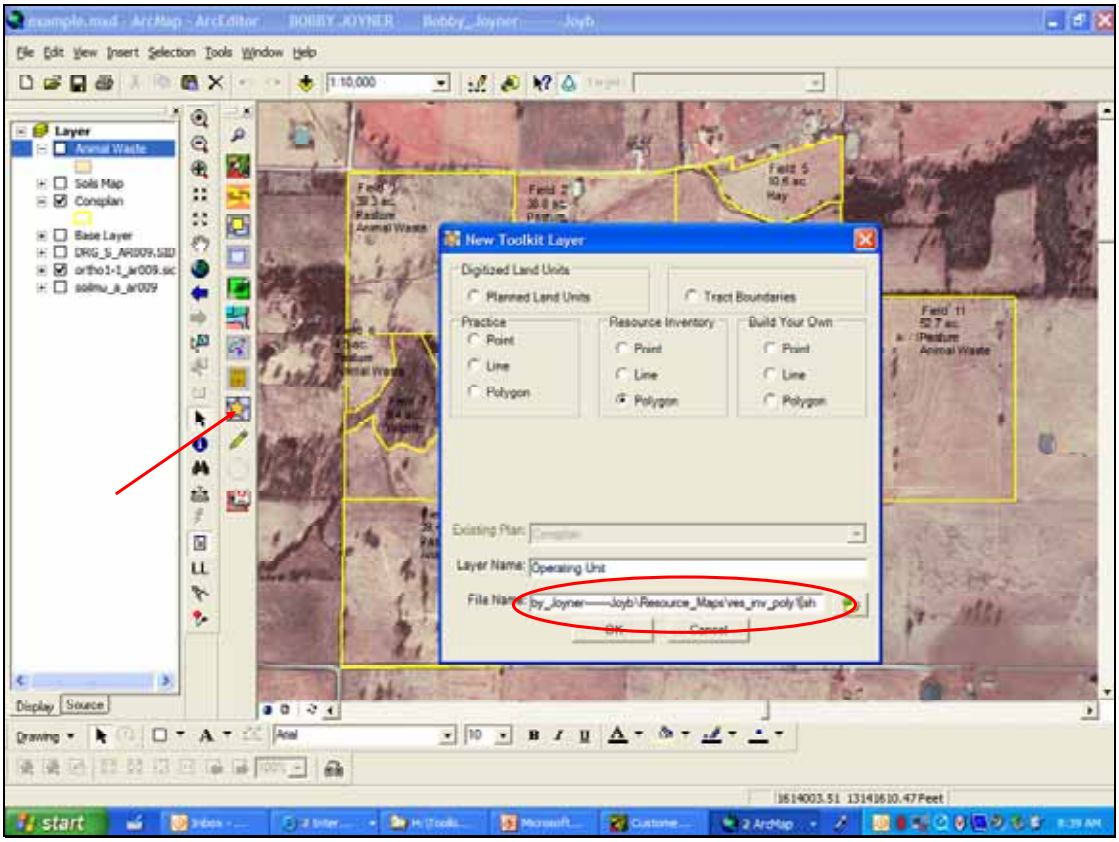

The new animal waste layer appears on the map and the table of contents. Uncheck the display box in the table of contents to “turn off” the layer.



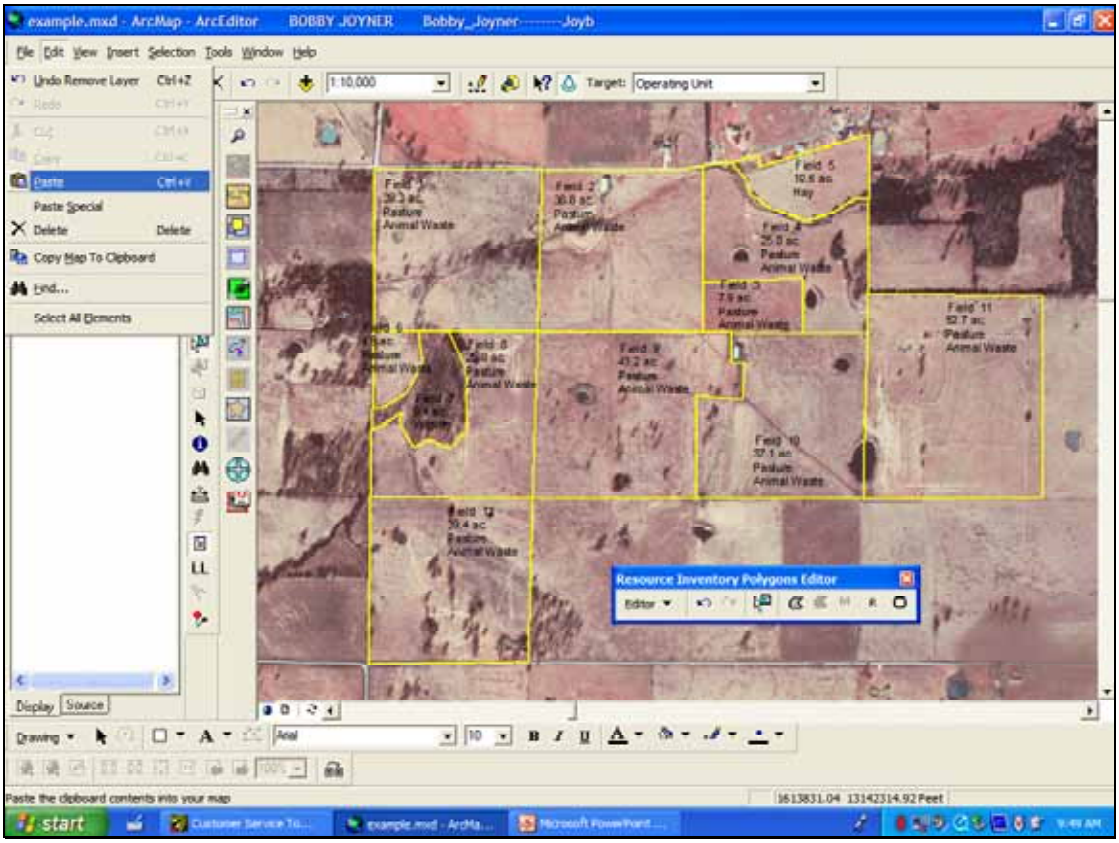
Repeat the process to create a Operating Unit or Farm layer. The New Toolkit Layer button could also be used to create a tract layer. However if there is more than one tract, the polygons will still have to be merged. It is probably just as easy to create the layer by cutting and pasting. The goal is to get one polygon from all the land units where the outside boundary of the polygon is the farm boundary.



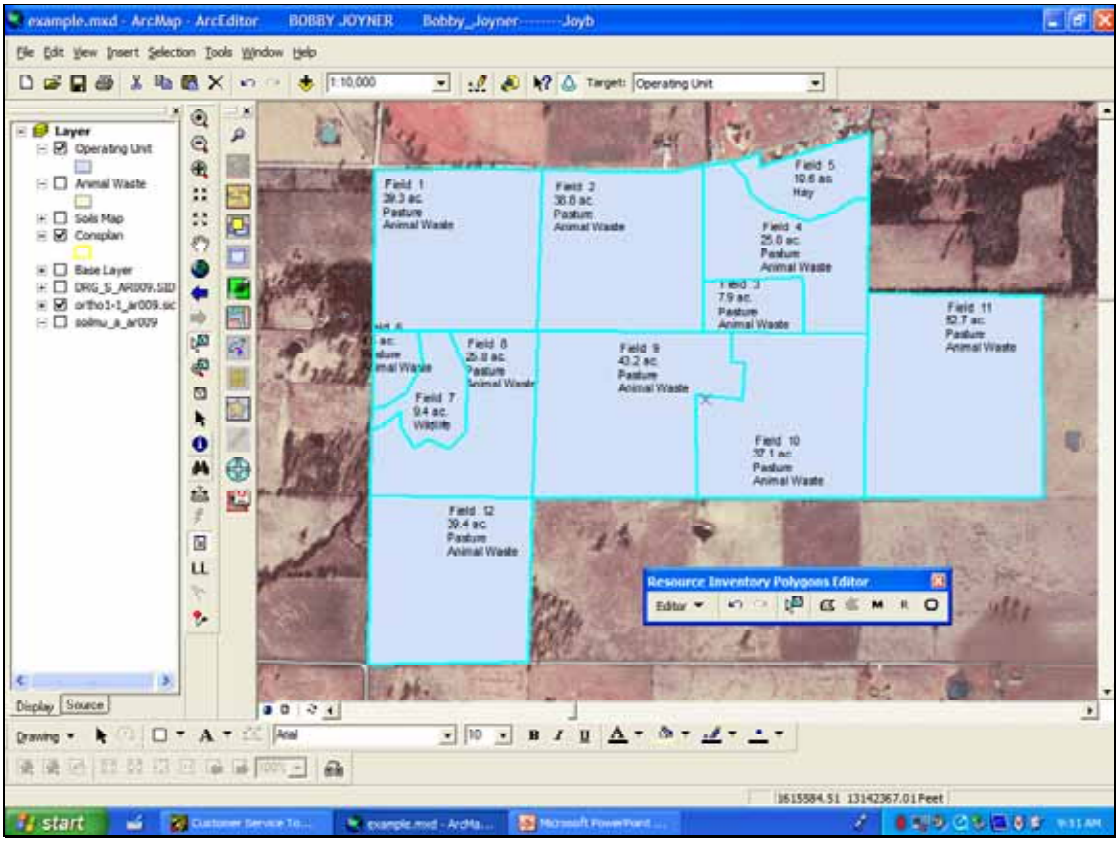

From the planned land units layer, using the select features tool, select all land units. Click Edit on the main menu and click Copy.



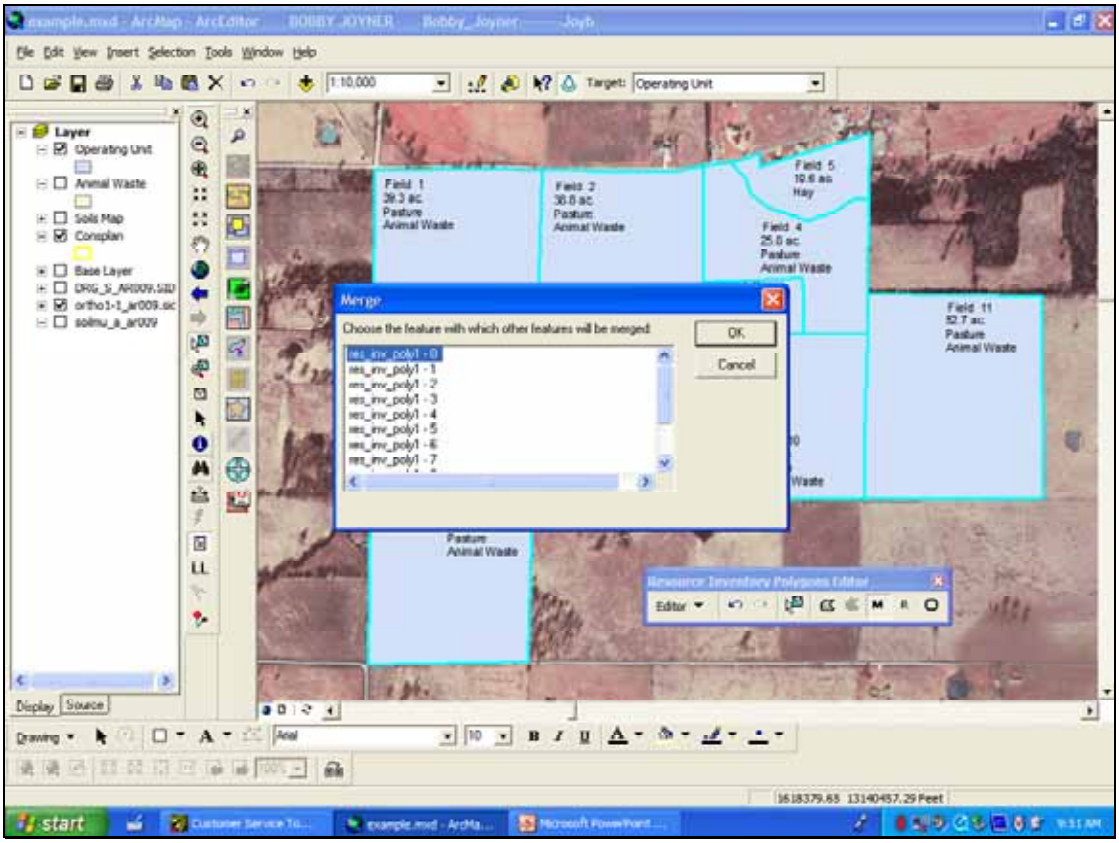

Use the New Toolkit Layer button to create a new Toolkit layer. Choose the Resource Inventory Polygon, change the Layer Name to Operating Unit. Be careful here! Since a Resource Inventory Polygon layer has been used before, change the filename to res_inv_poly1 by inserting the number 1 after poly and before the .shp. If the filename is not changed the animal waste layer will be overwritten and lost. Click OK.



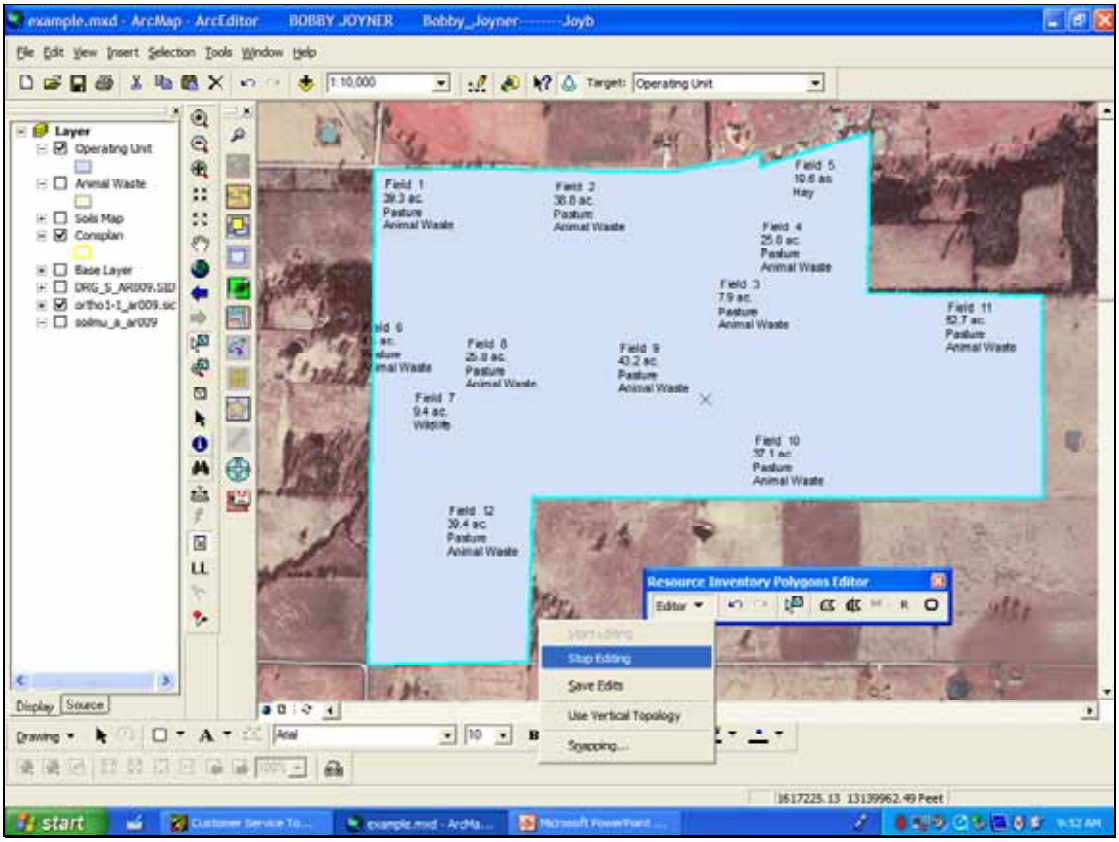

The Resource Inventory Polygons Editor Toolbar appears. Click Edit on the main menu, then click Paste. This action will copy the selected land units from the planned land units layer into the Resource Inventory Polygons layer.



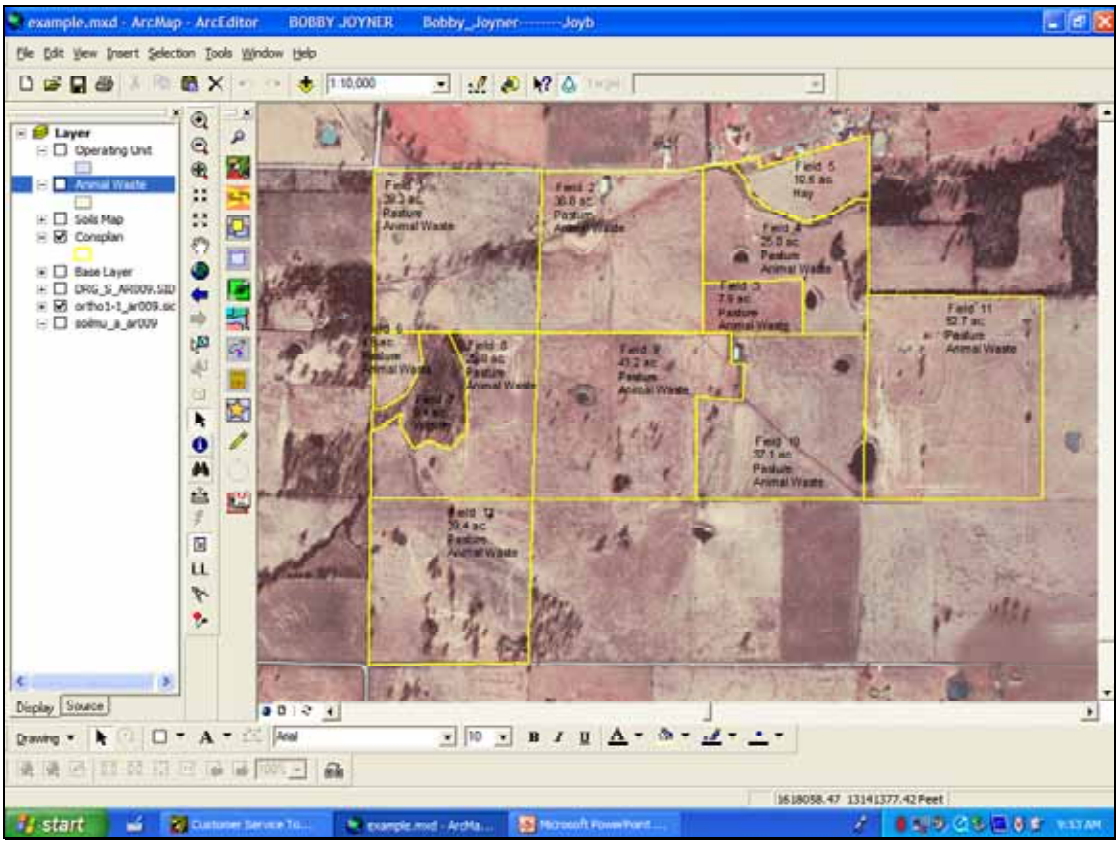

The land unit polygons are copied into the operating unit layer as individual polygons. Only one polygon is needed, and since all the polygons are still selected (highlighted in blue) click the M button on the Resource Inventory Polygons Editor Toolbar to merge all the polygons into one.



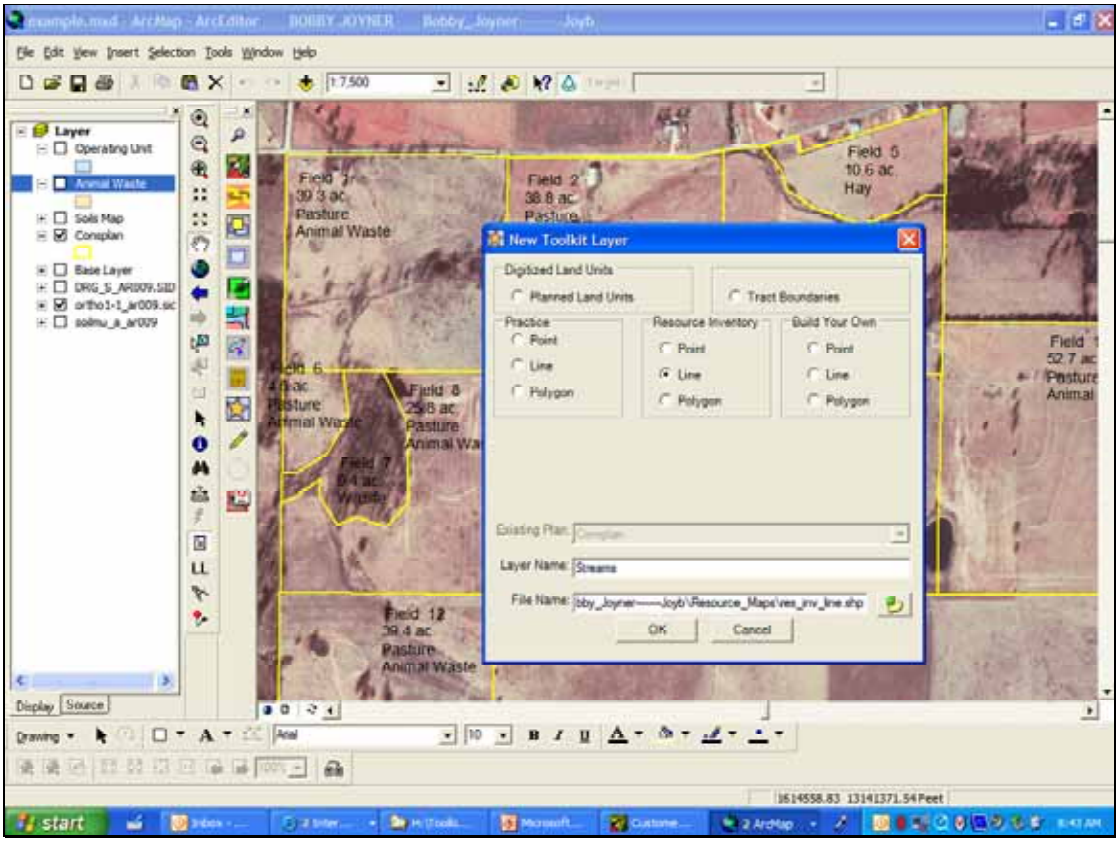

A merge window appears to determine which land unit's attribute data should be assigned to the new polygon. Since this data is not important for this layer, select any one of them and click OK.



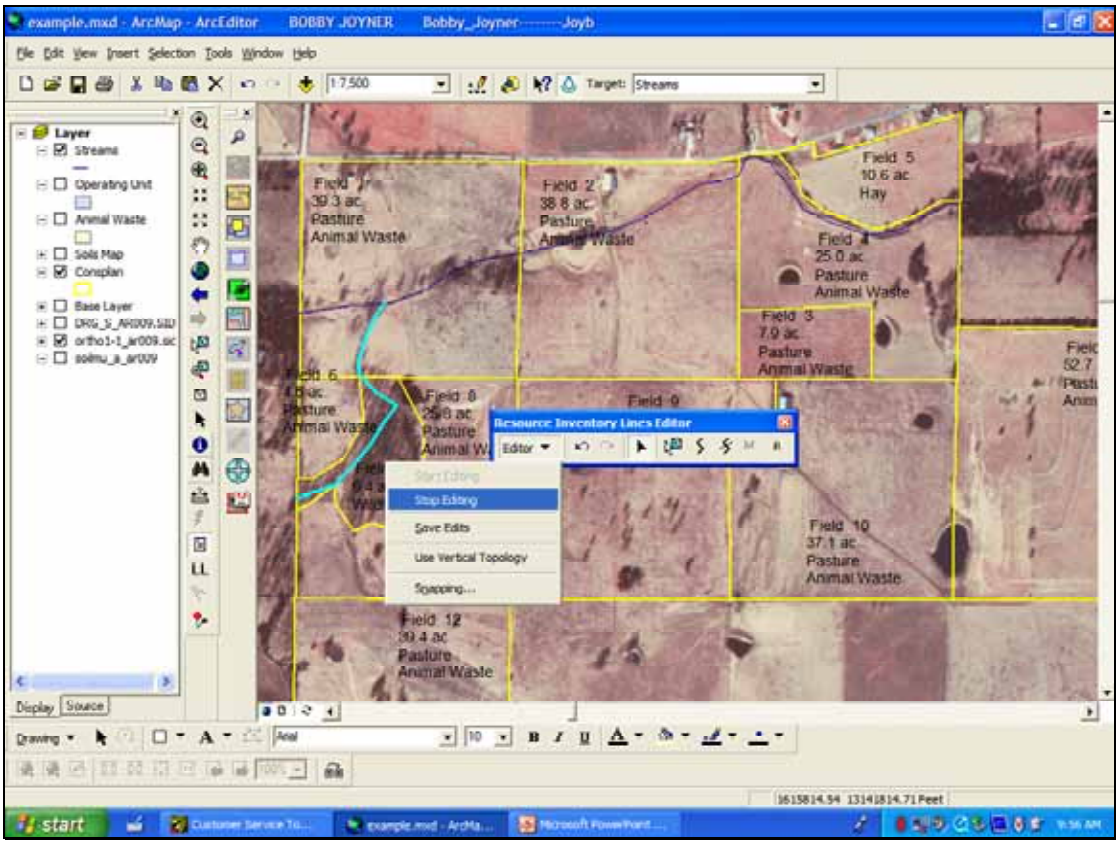

The polygons are merged. Click the Editor dropdown button on the Resource Inventory Polygons Editor Toolbar. Click Stop Editing. Click Yes when prompted to save edits.



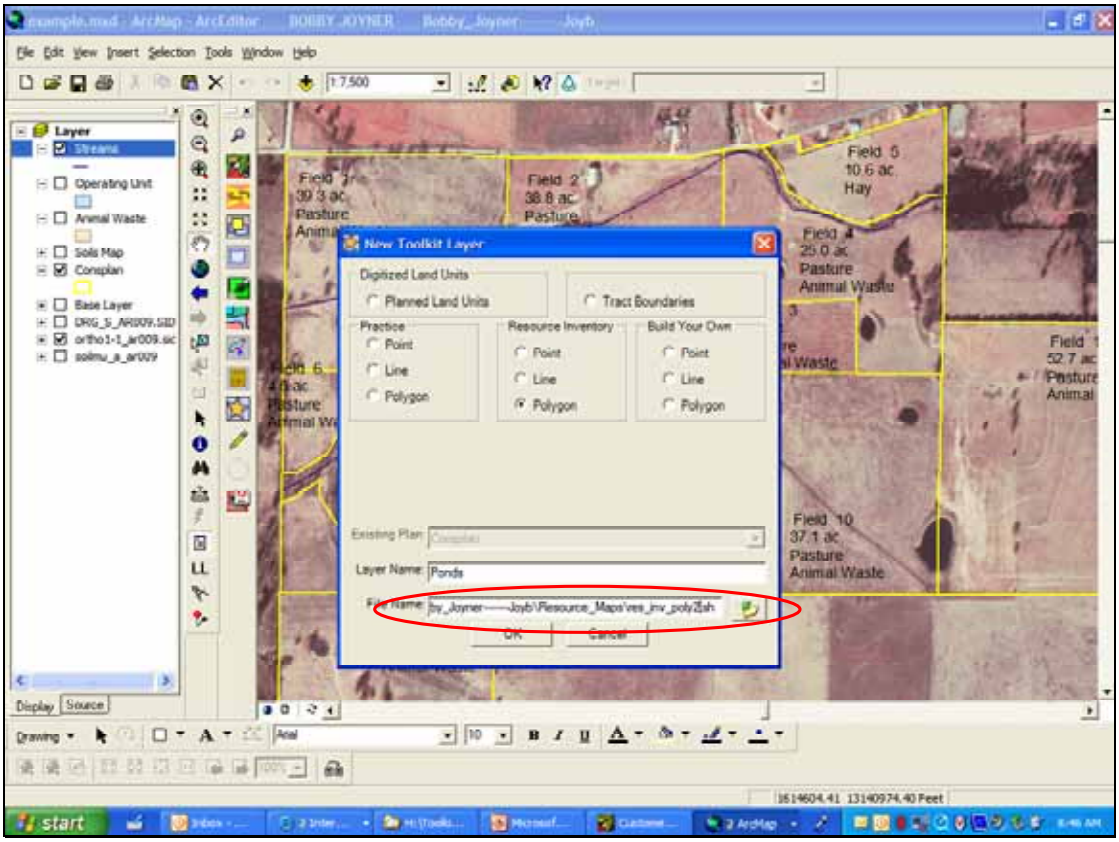

The new operating unit layer appears on the map and the table of contents. Uncheck the display box in the table of contents to “turn off” the layer.
This layer will be used later to create the setback buffers. The next step will be to create other layers to buffer, streams, ponds, and sensitive areas.



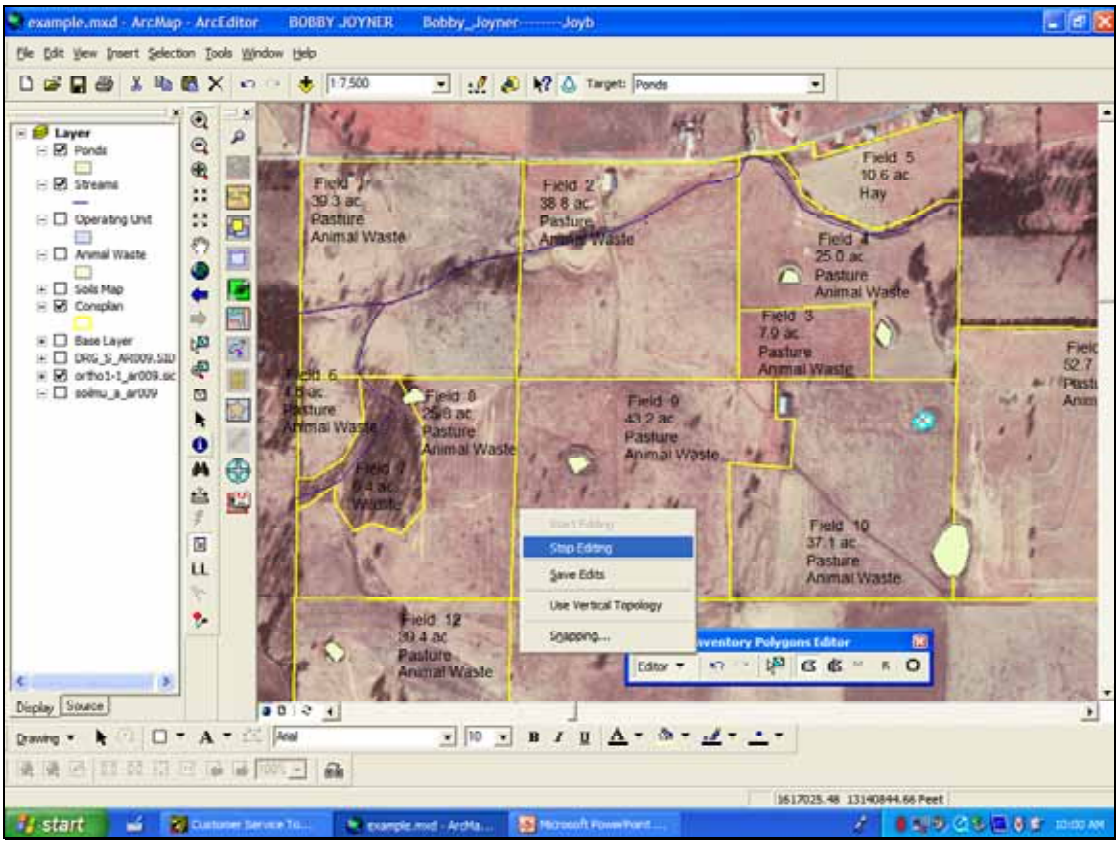

The first layer to create will be the streams layer. Use the New Toolkit Layer button to create a new Toolkit Layer. Choose the Resource Inventory Line, change the Layer Name to Streams and use the default File Name. Click OK.



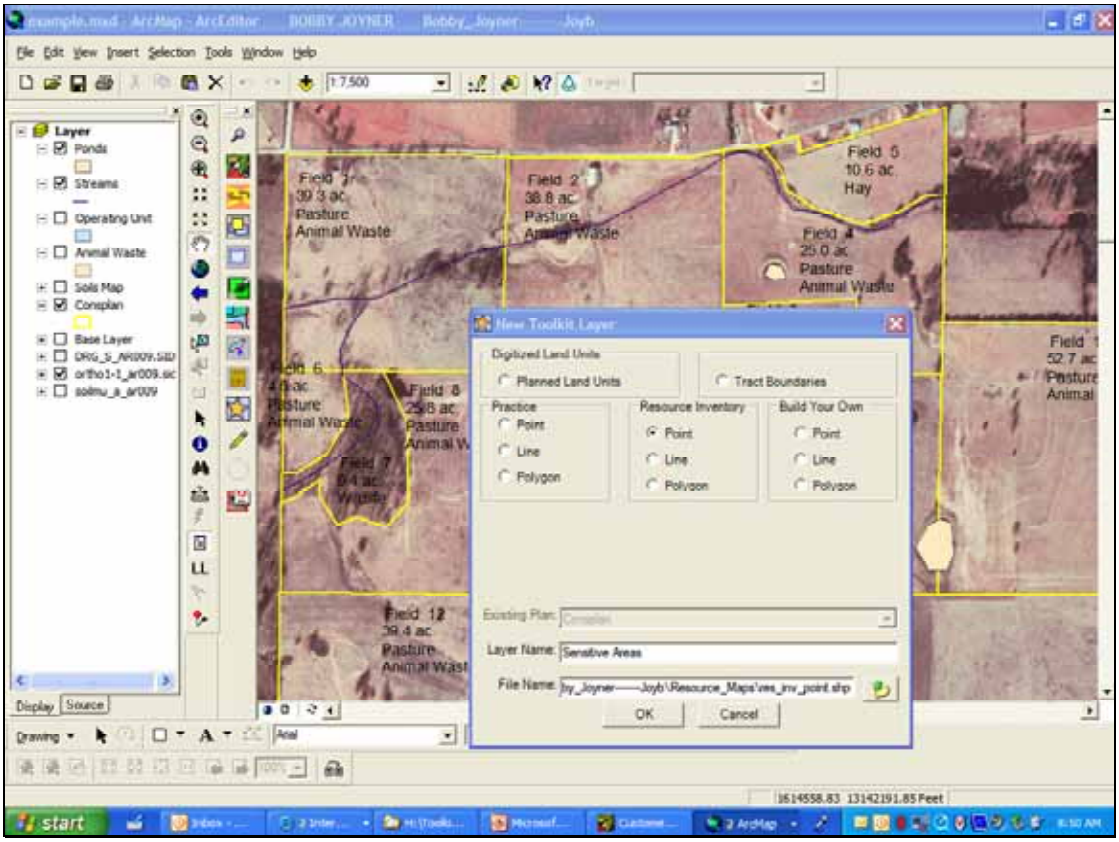

Use the line tool on the Resource Inventory Lines Editor toolbar and digitize the streams. When all streams have been digitized, click the Editor dropdown button on the toolbar. Click Stop Editing. Click Yes when prompted to save edits.



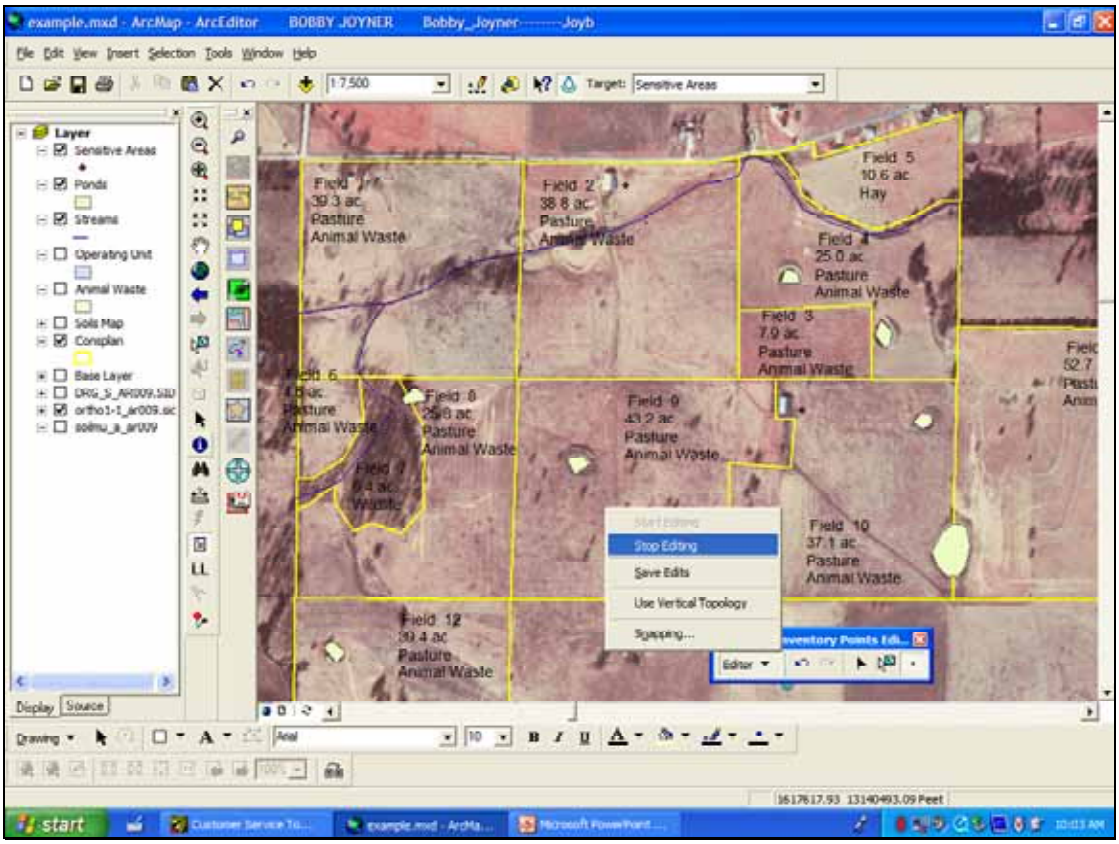

The next layer to create will be the ponds layer. Use the New Toolkit Layer button to create a new Toolkit Layer. Choose the Resource Inventory polygon, change the Layer Name to Ponds. Be careful here! Since a Resource Inventory Polygon layer has been used before, change the filename to res_inv_poly2 by inserting the number 2 after poly and before the .shp. If the filename is not changed the animal waste layer will be overwritten and lost. Click OK.



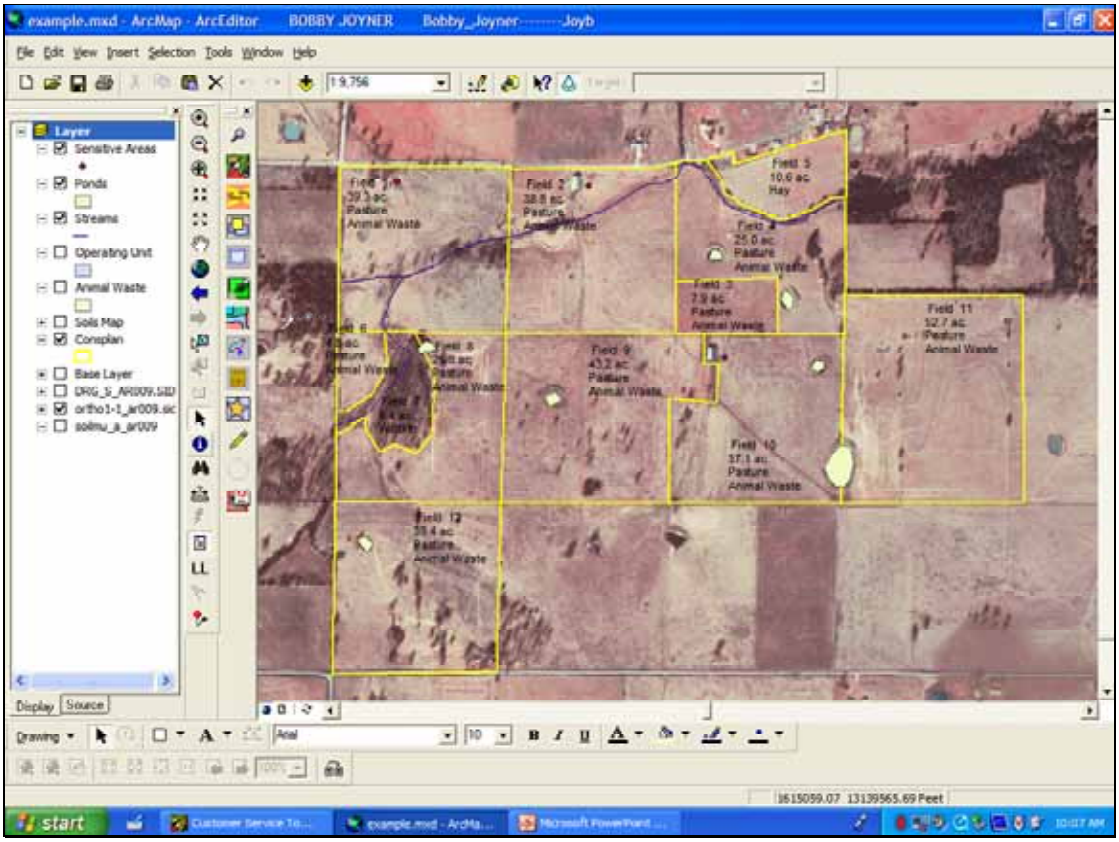

Use the polygon tool on the Resource Inventory Polygon Editor toolbar and digitize all the ponds. When all ponds have been digitized, click the Editor dropdown button on the toolbar. Click Stop Editing. Click Yes when prompted to save edits.



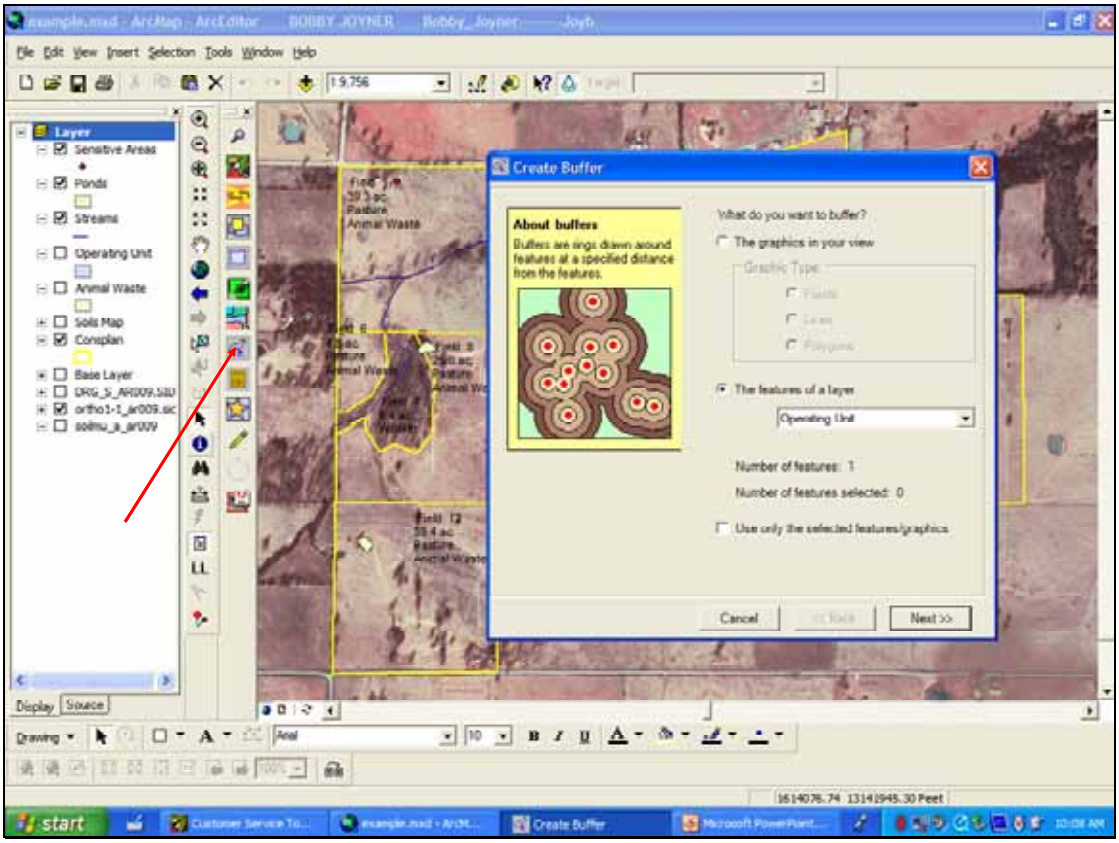

The final layer to create will be the sensitive area layer. Use the New Toolkit Layer button to create a new Toolkit Layer. Choose the Resource Inventory Point, change the Layer Name to Sensitive Areas and use the default File Name. Click OK.
Note: Some sensitive areas should be digitized as points (wells, small rock outcrops, etc.), however larger areas such as large sink holes may need to be digitized as polygons. If the sensitive areas are large include them in the polygon layer with the ponds.



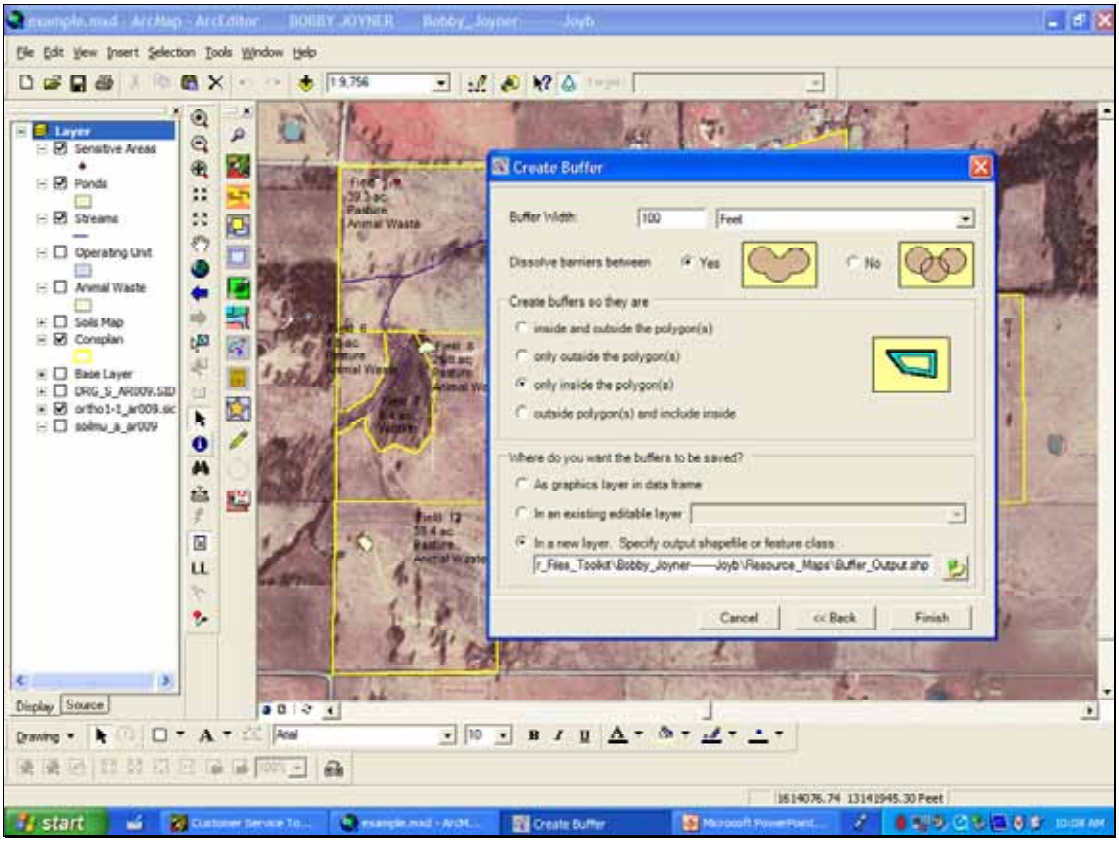

Use the point tool on the Resource Inventory Point Editor toolbar and digitize all the sensitive areas (in this case , wells). When all wells have been digitized, click the Editor dropdown button on the toolbar. Click Stop Editing. Click Yes when prompted to save edits.



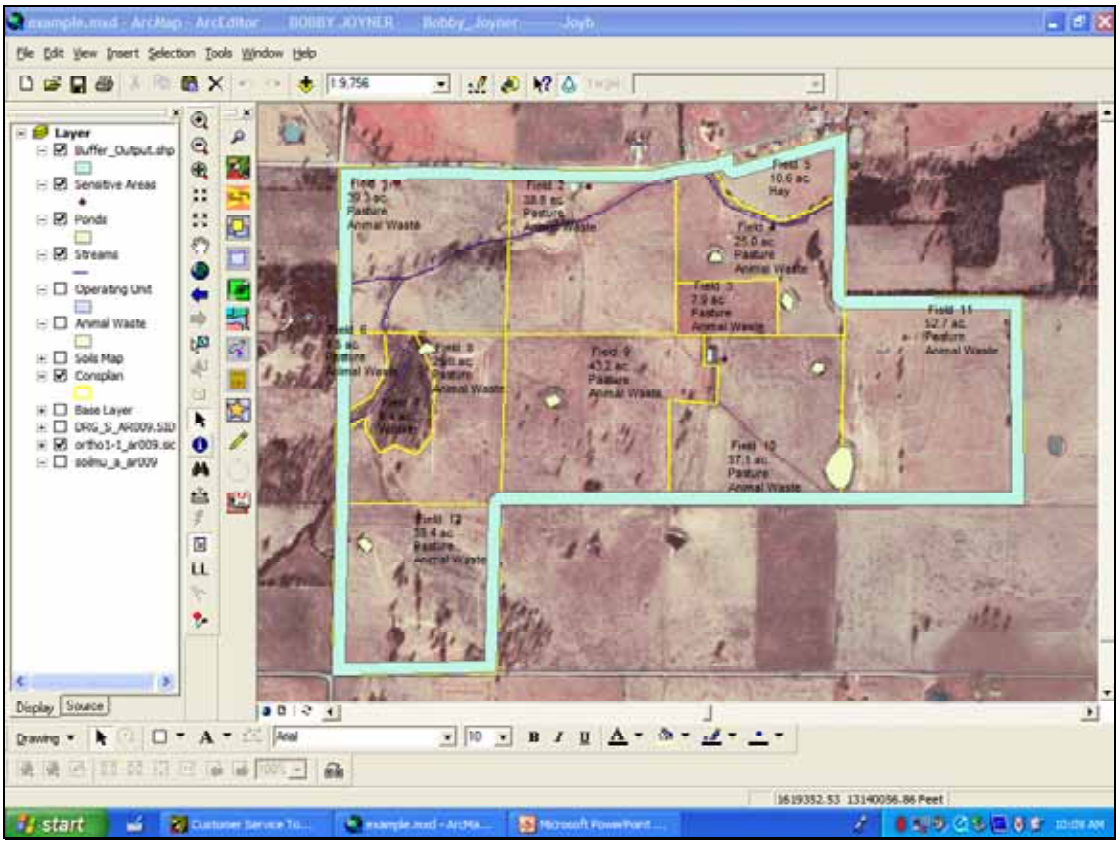
Now all the layers that need to be buffered have been created. The next step will be to create buffers.



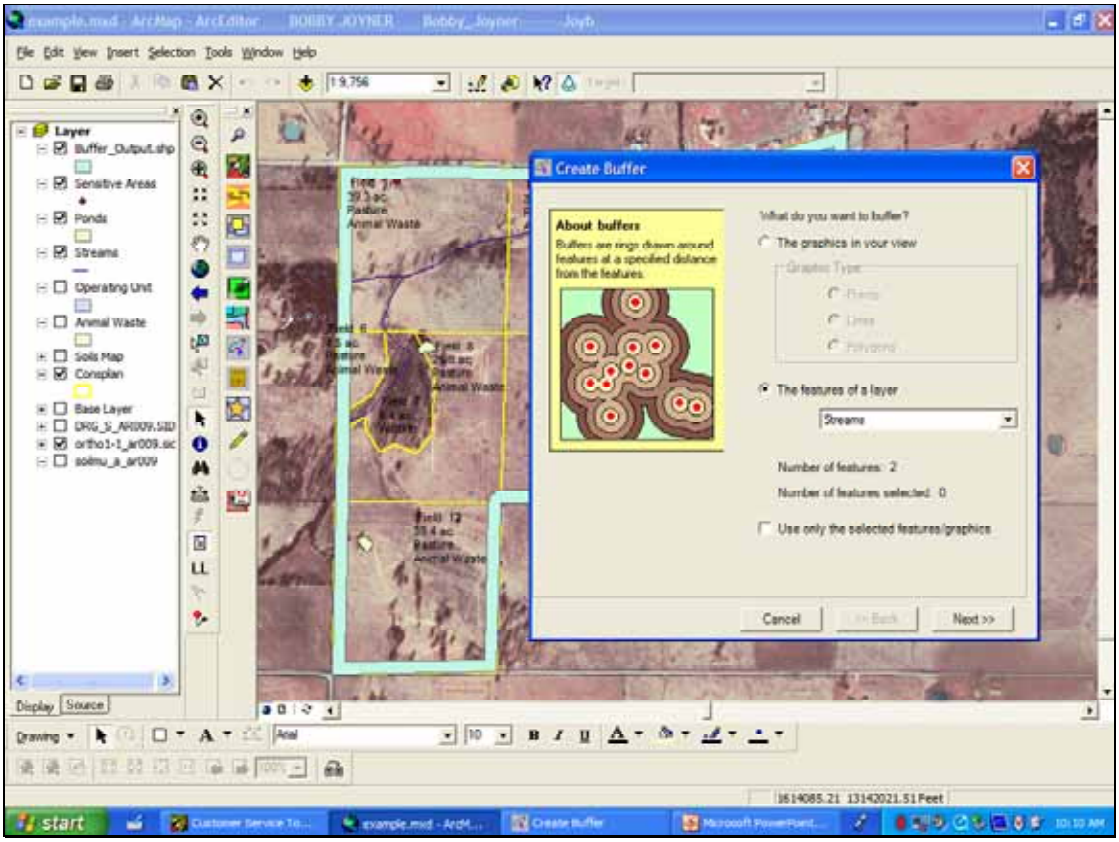

Use the Toolkit Buffer Tool to create a setback buffer. For the features of a layer choose the Operating Unit layer. Uncheck the box to Use only the selected features/graphics, click Next.



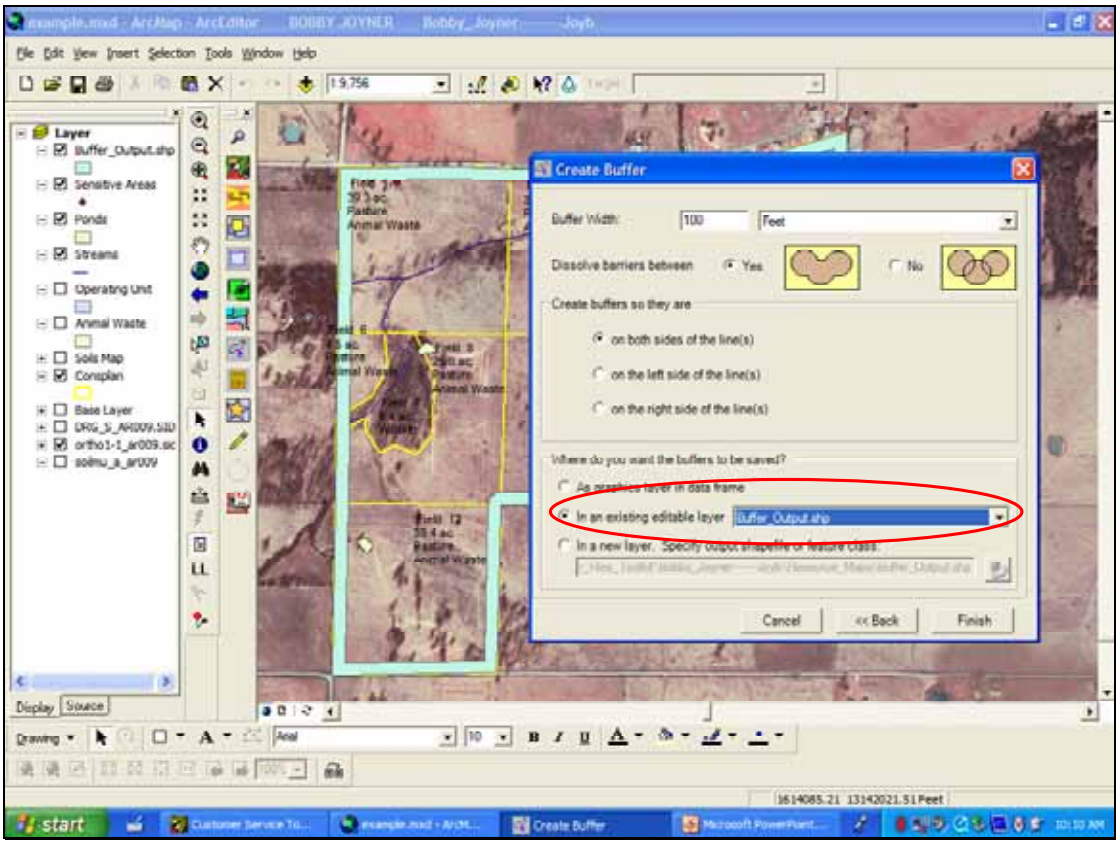

Set the Buffer Width to 100 feet. Click the radio button to Create buffers so they are *only inside the polygon(s).* Under Where do you want the buffers to be saved Click *In a new layer* and use the default filename. Click Finish.



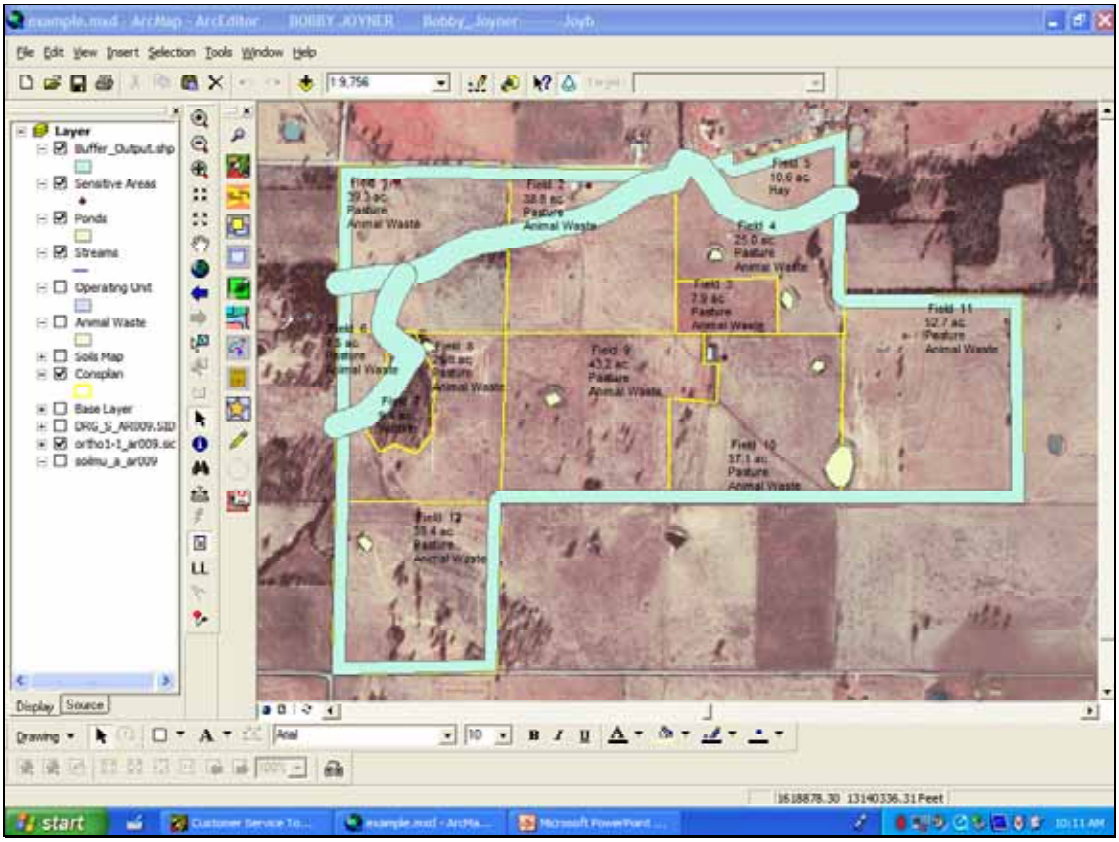
The new buffer is created 100 foot wide inside the outside boundary of the operating unit. Notice that some areas show as a buffer even though animal waste is not applied to that area. These areas will be clipped later.



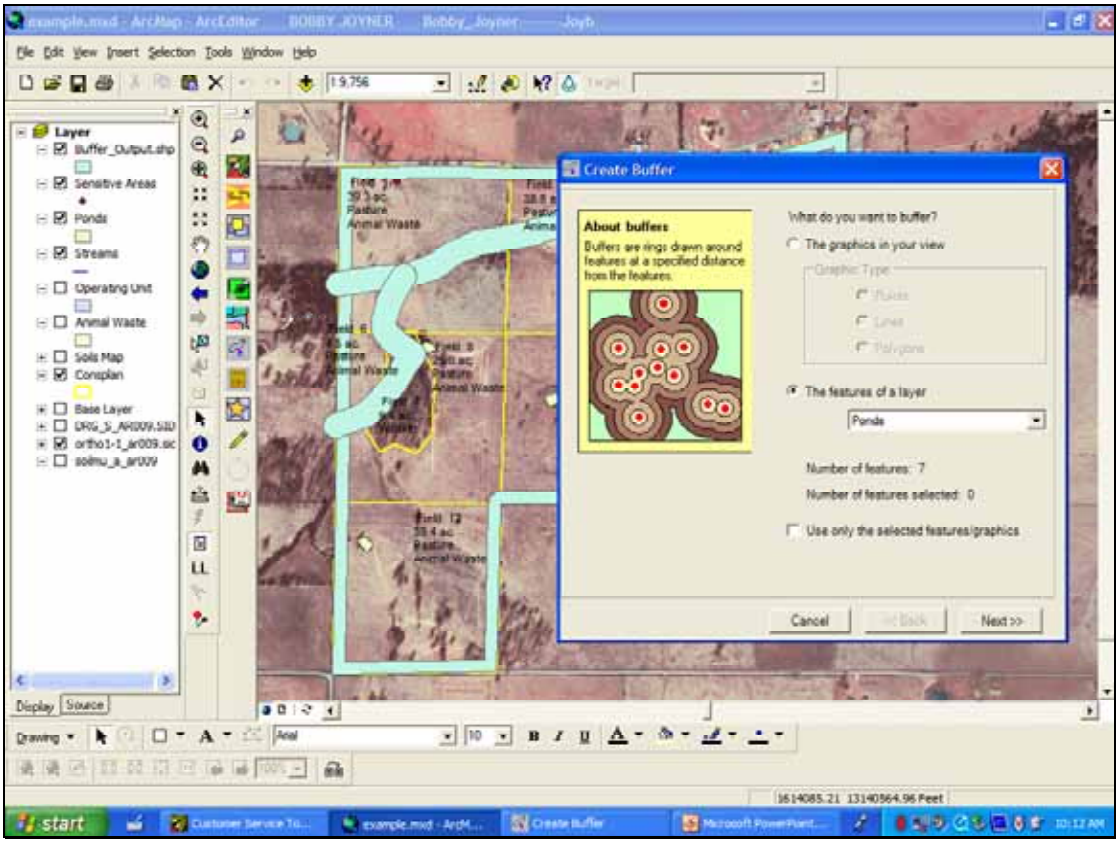

The next step will be to create the stream buffer. Use the Toolkit Buffer Tool to create a buffer. For the features of a layer choose the Stream layer. Uncheck the box to Use only the selected features/graphics, click Next.



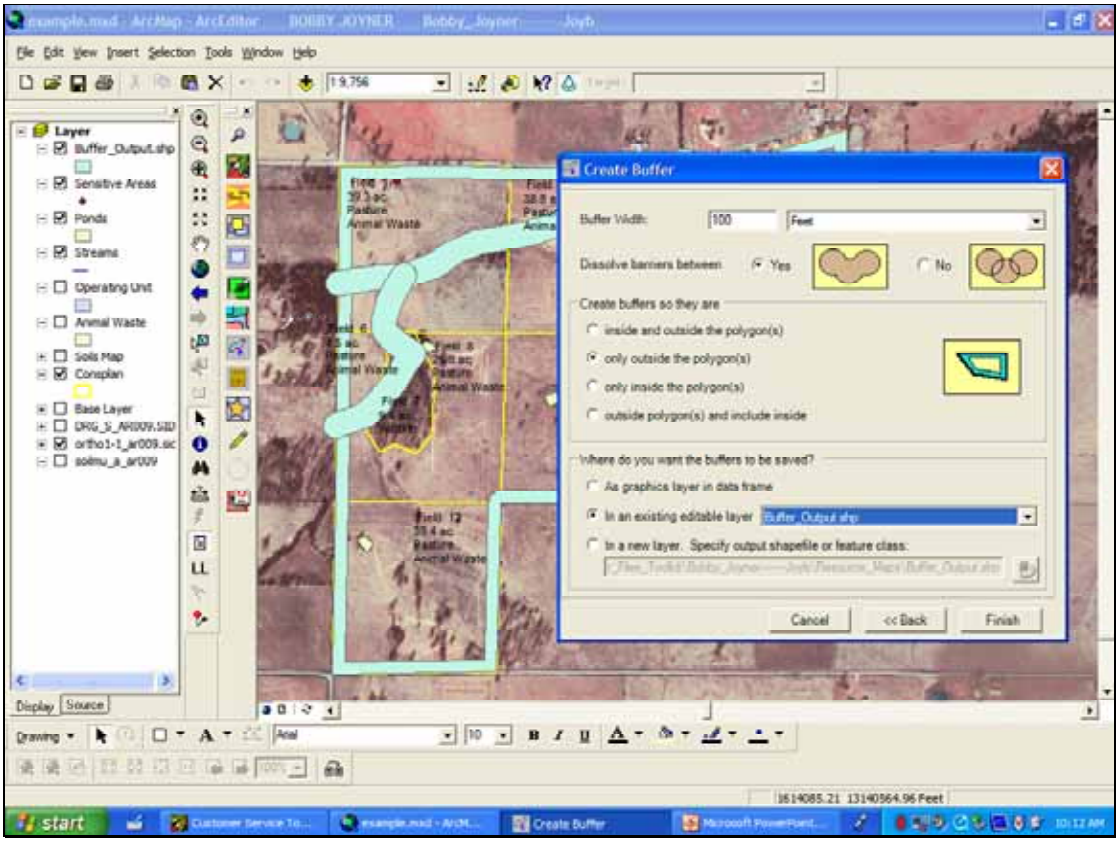

Set the Buffer Width to 100 feet. Click the radio button to Create buffers so they are *on both sides of the line.* The new buffer should be added to the previous buffer layer, so under Where do you want the buffers to be saved Click *In an existing editable layer* and choose Buffer_Output.shp. Click Finish.



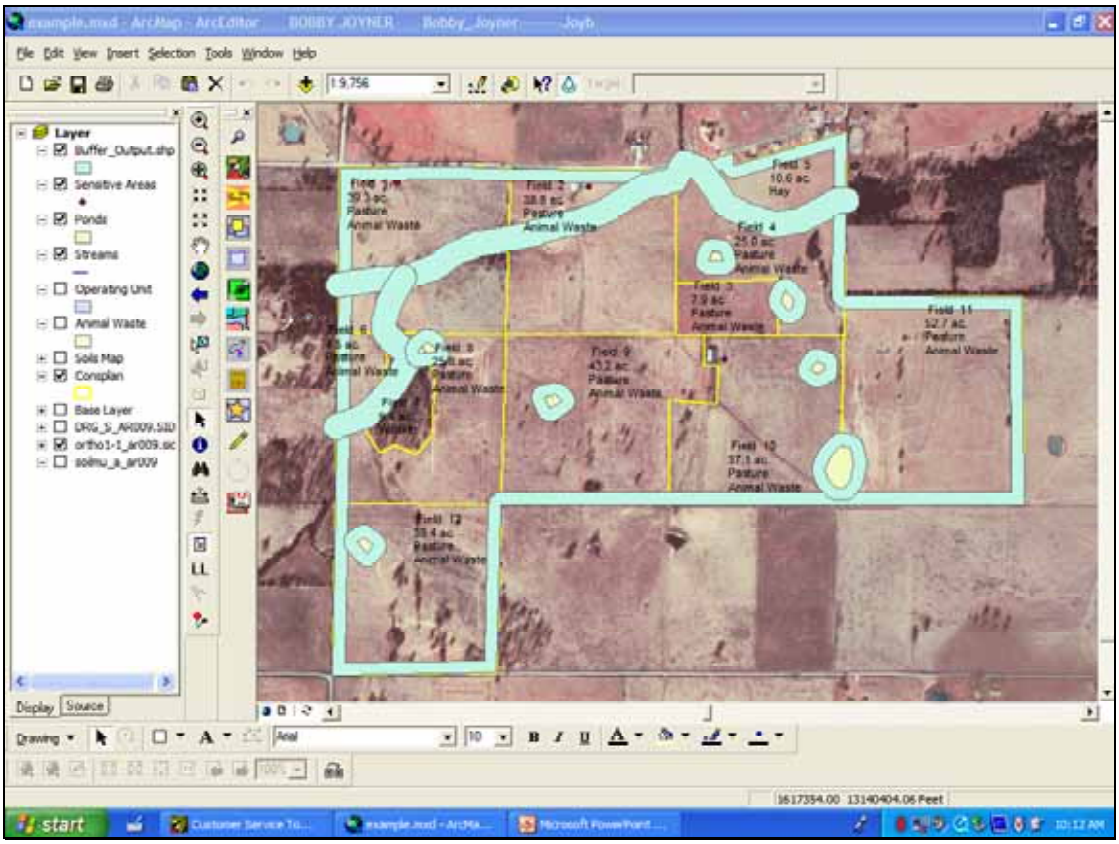
The stream buffers are added to the setback buffers. Notice that some areas extend outside the property boundaries. Do not worry! These areas will be clipped later!



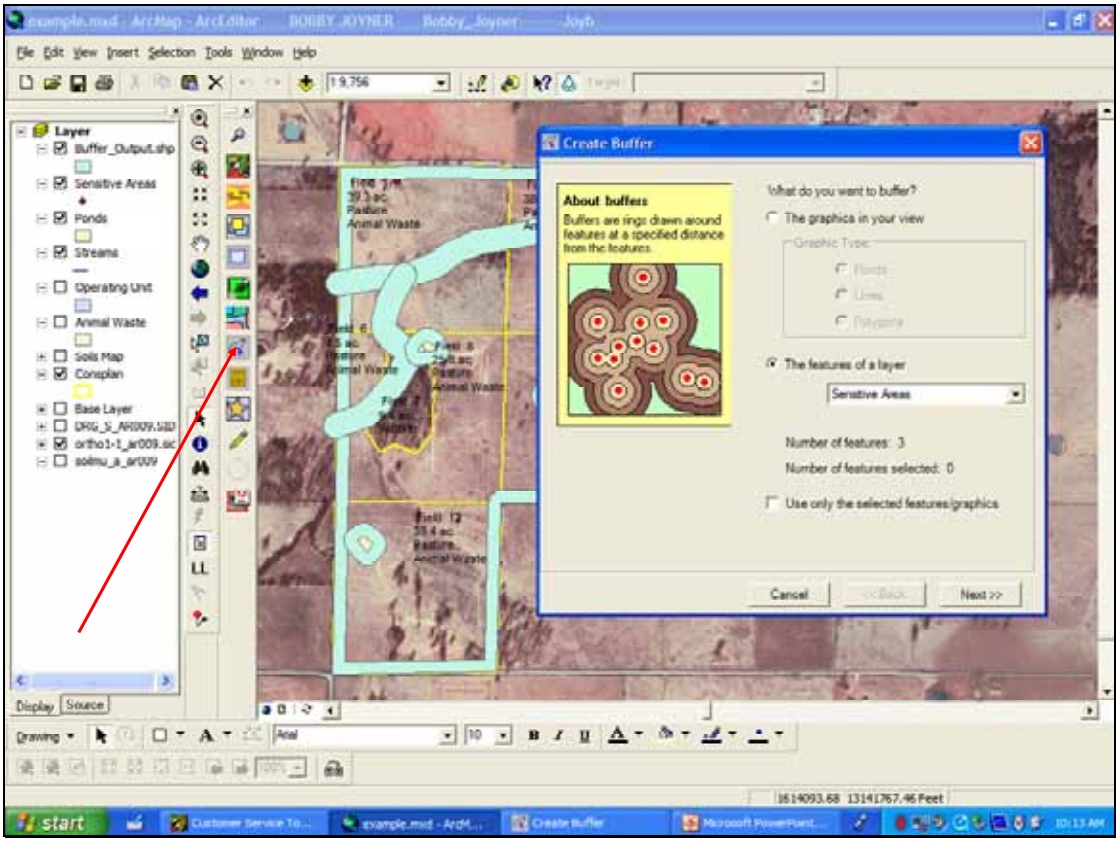

The next step will be to create the pond buffers. Use the Toolkit Buffer Tool to create a buffer. For the features of a layer choose the Ponds layer. Uncheck the box to Use only the selected features/graphics, click Next.



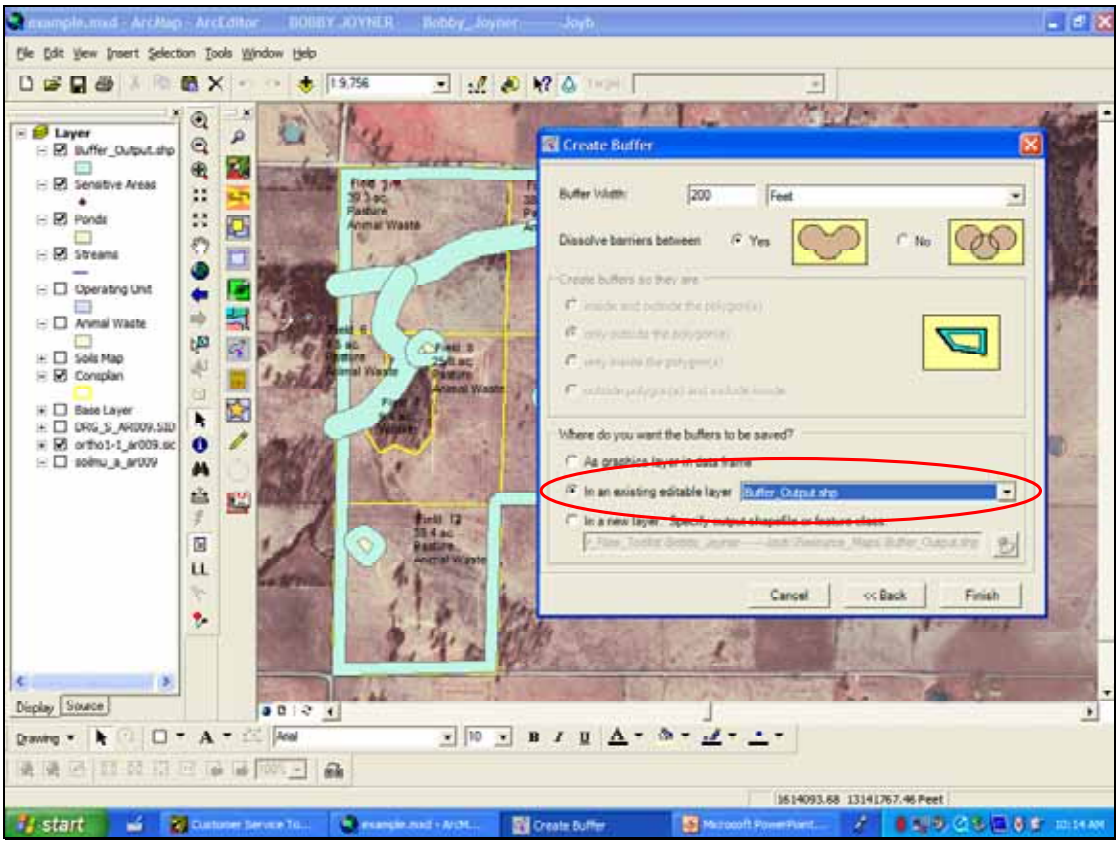

Set the Buffer Width to 100 feet. Click the radio button to Create buffers so they are *only outside the polygon(s).* The new buffer should be added to the previous buffer layer, so under Where do you want the buffers to be saved Click *In an existing editable layer* and choose Buffer_Output.shp. Click Finish.



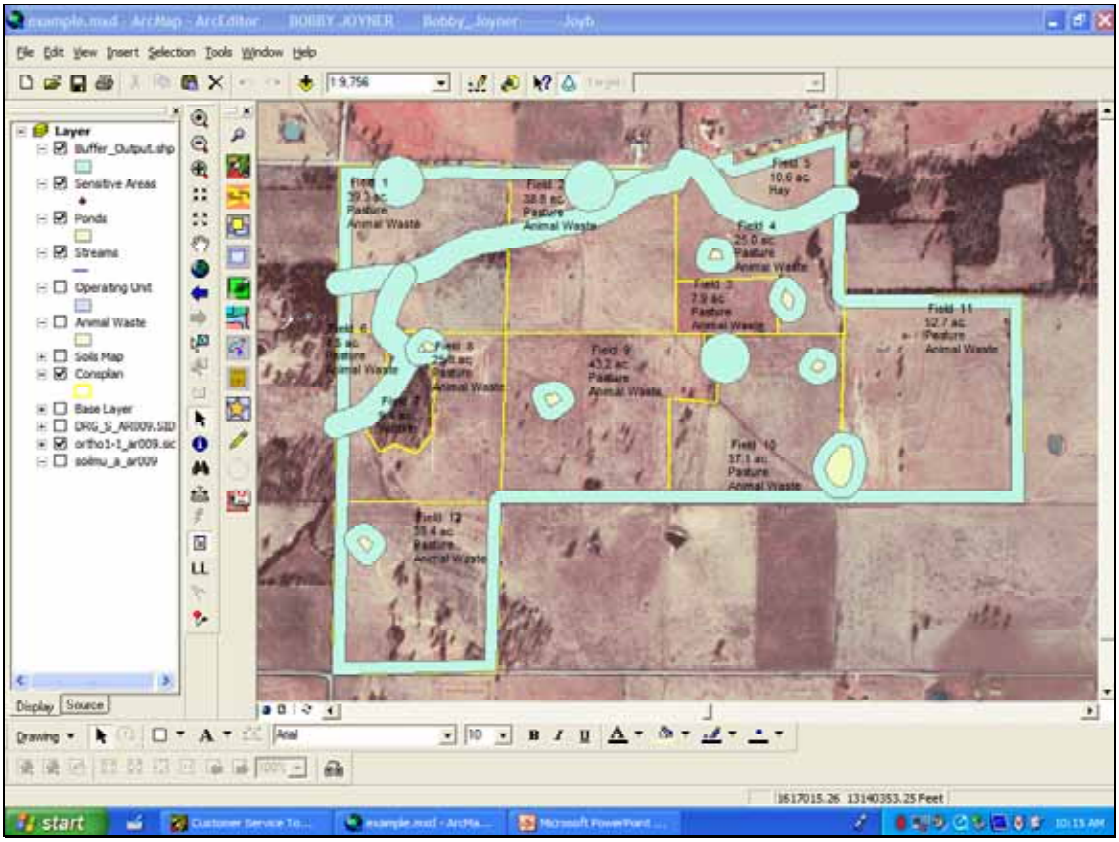
The pond buffers are added to the setback and stream buffers. Notice that the buffer areas completely surround the pond and include the downslope side. Do not worry! These areas will be trimmed later!



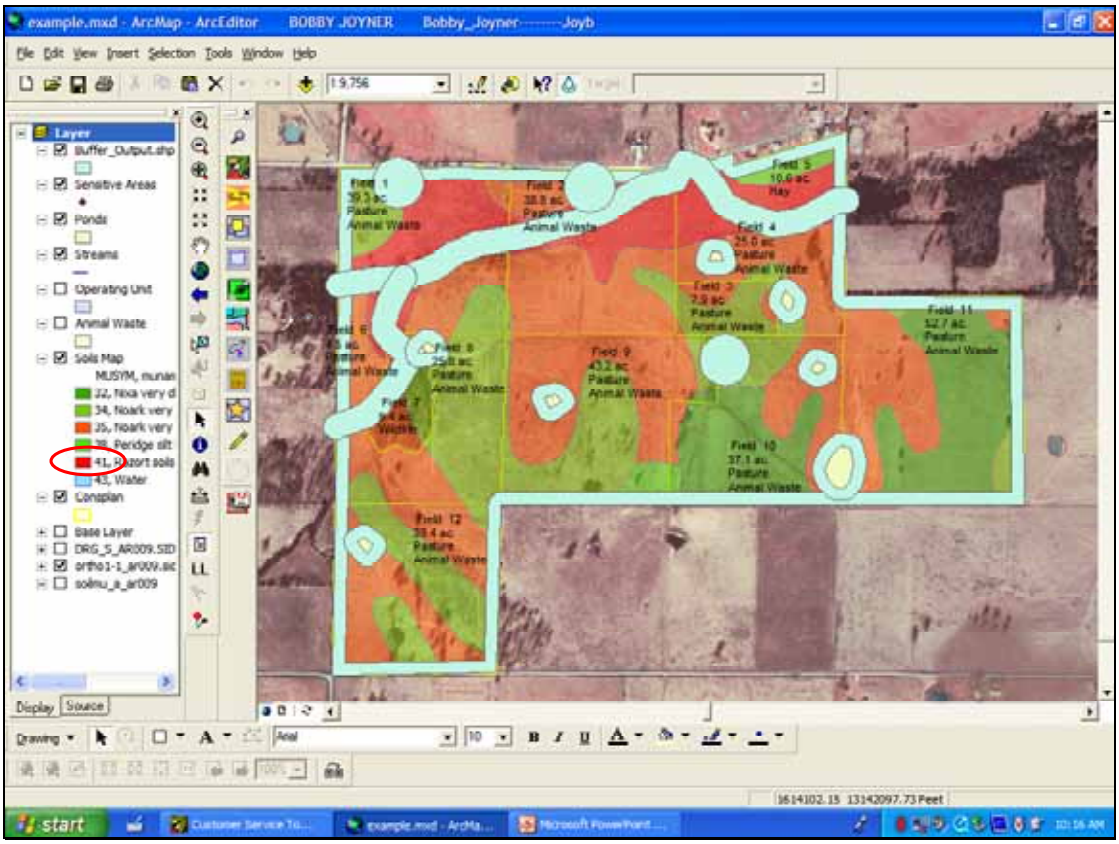

One more buffer! Use the Toolkit Buffer Tool to create the Sensitive area (wells) buffer. For the features of a layer choose the Sensitive Areas layer. Uncheck the box to Use only the selected features/graphics, click Next.



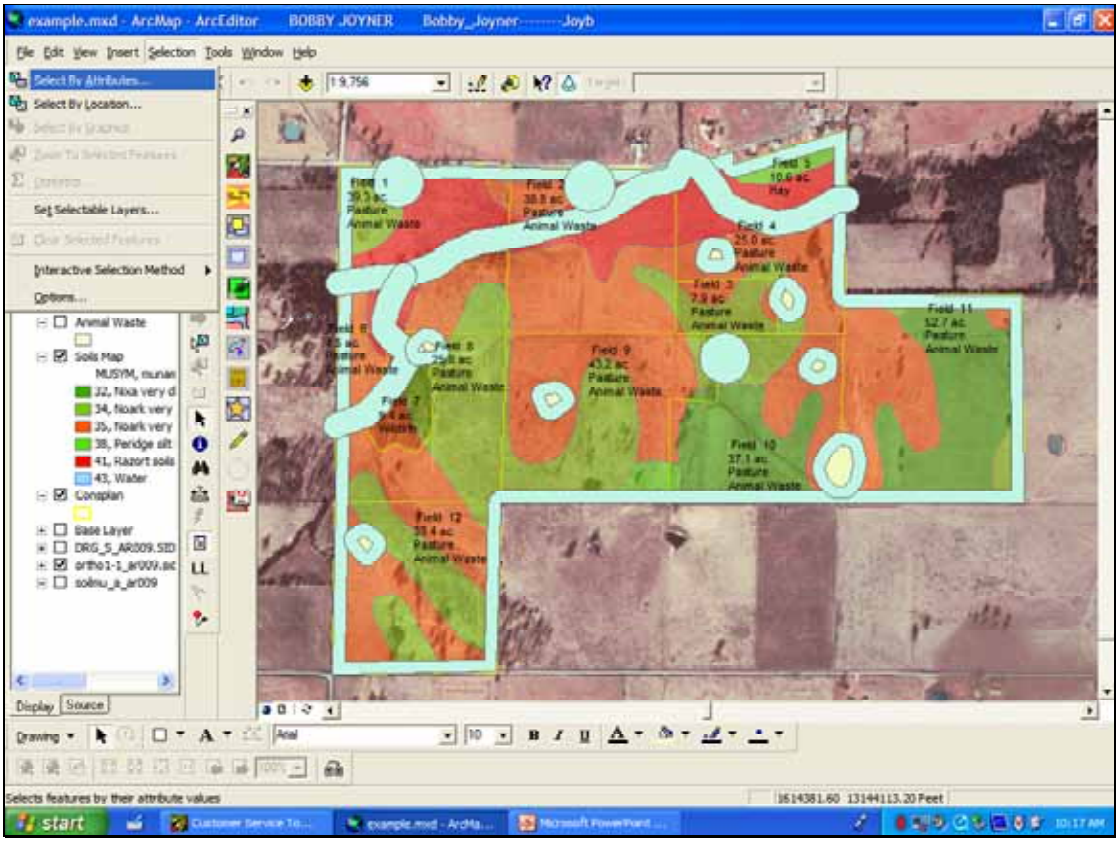

Set the Buffer Width to 200 feet. The new buffer should be added to the previous buffer layer, so under Where do you want the buffers to be saved Click *In an existing editable layer* and choose Buffer_Output.shp. Click Finish.



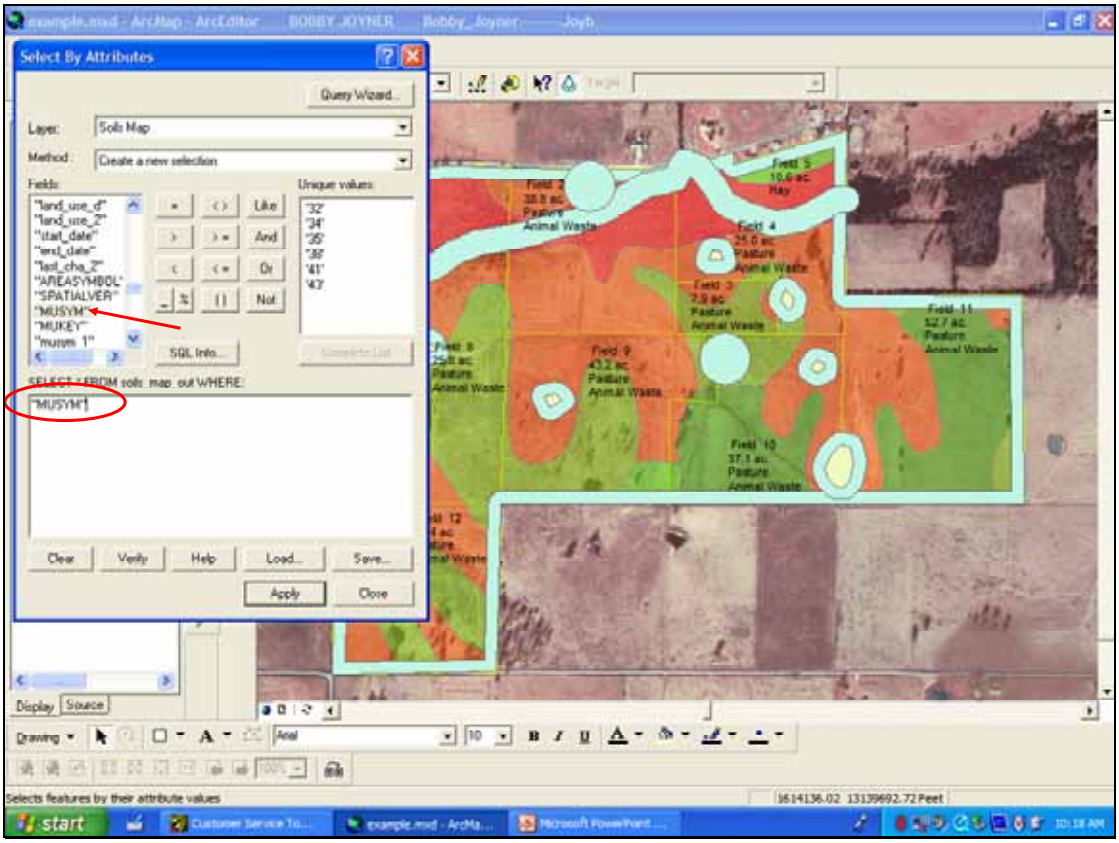
The sensitive area buffers are added to the setback, stream, and pond buffers. Notice that some areas extend outside the property boundaries. Do not worry! These areas will be clipped later!



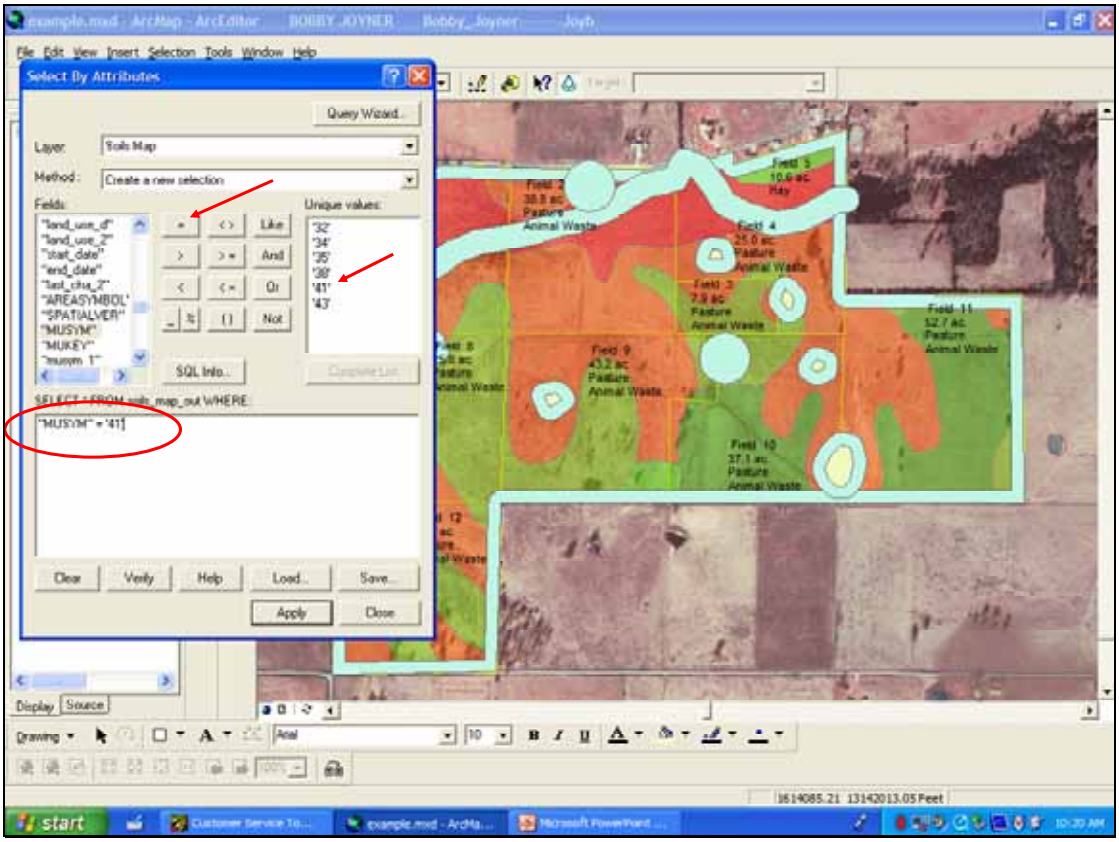
Now soils information will be used to determine other areas that should be excluded from the application of animal waste. Click the display box next to the Soils Map in the table of contents. In the legend, map unit 41 is a frequently flooded map unit. These areas should not be used for animal waste applications. There are several polygons that make up map unit 41. These areas can be selected based on an attribute (MUSYM 41).



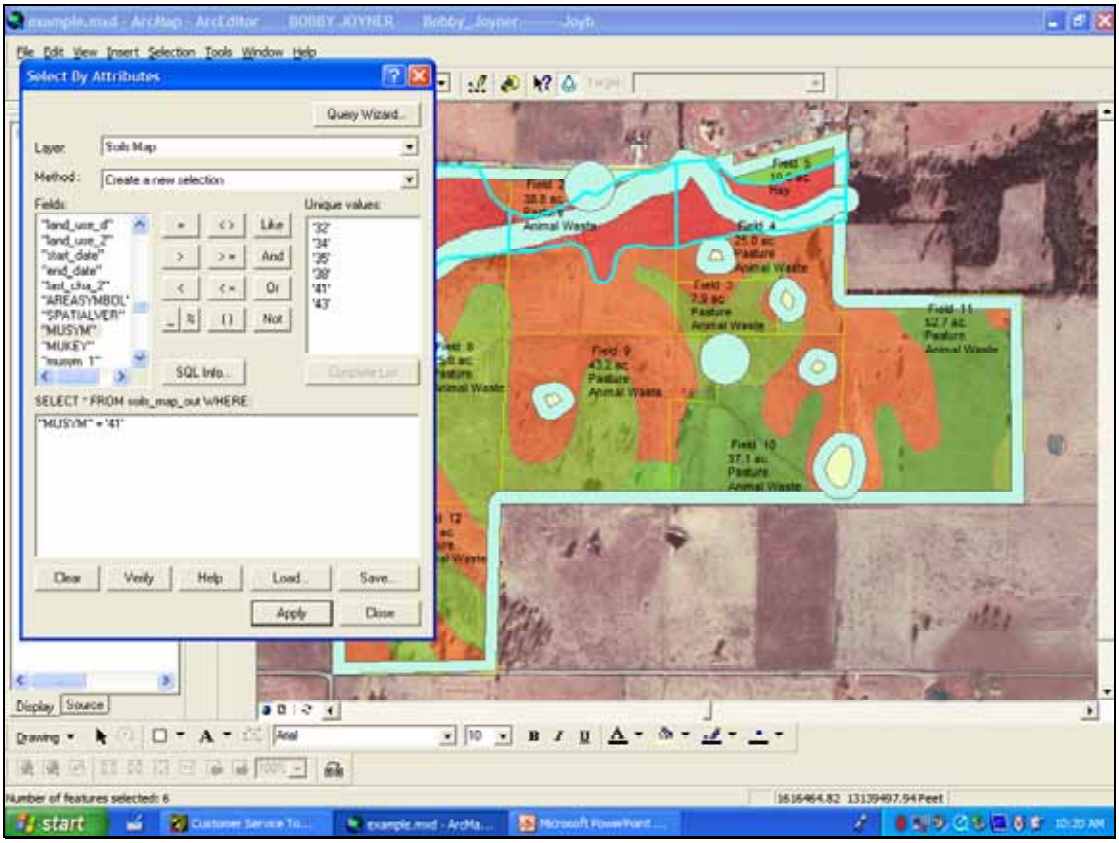

On the main menu click Selection, then click Select By Attribute.



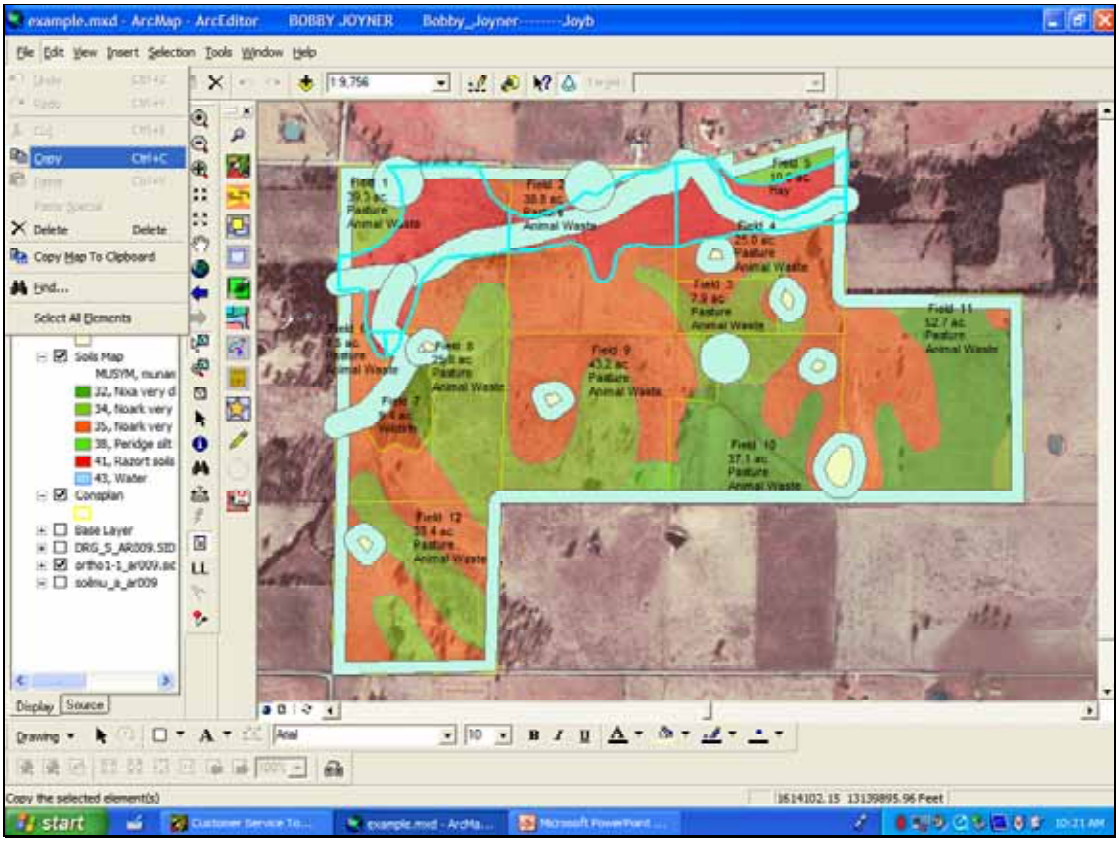

In the Layer selection field choose Soils Map. In the Fields pane, double click on the field “MUSYM”. The field will be added to the Query pane.



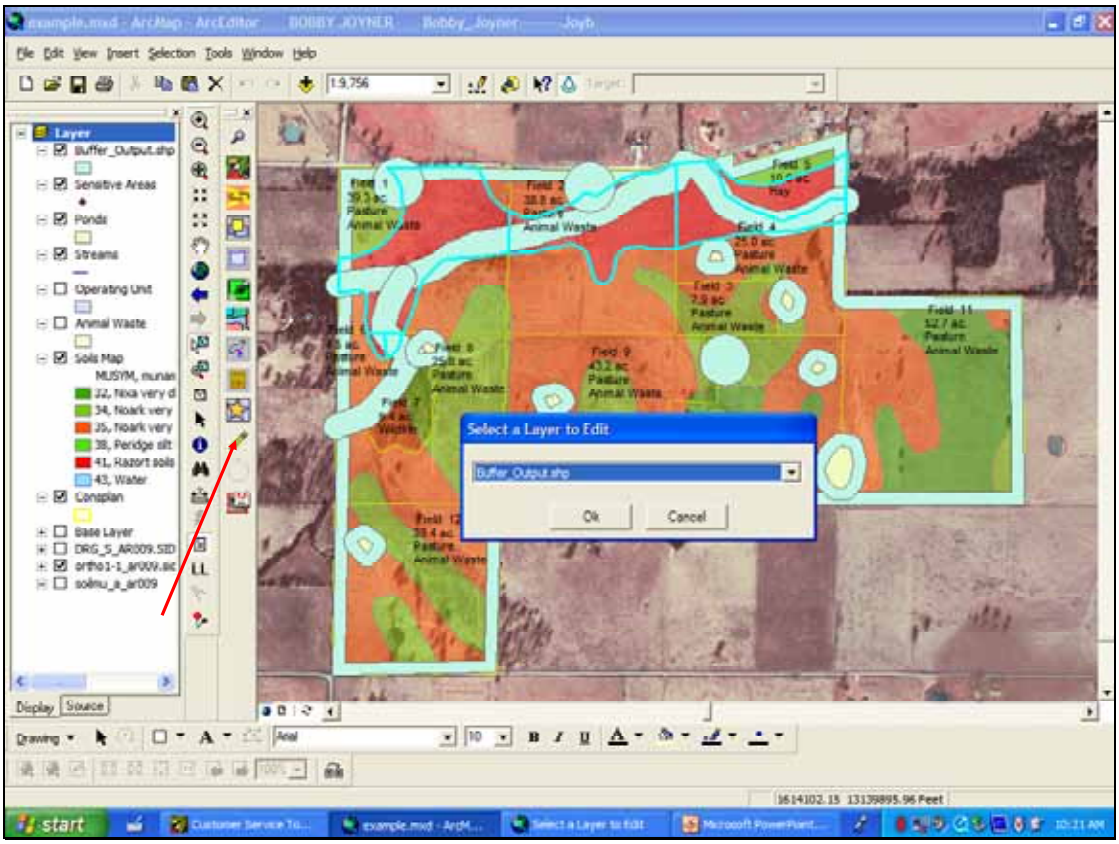

Click once on the equal (=) button and double click on 41 in the Unique values pane to add this information to the query pane. Note: if the value does not appear in the Unique values pane, click the Complete List button at the bottom of the Unique values pane. Click Apply.



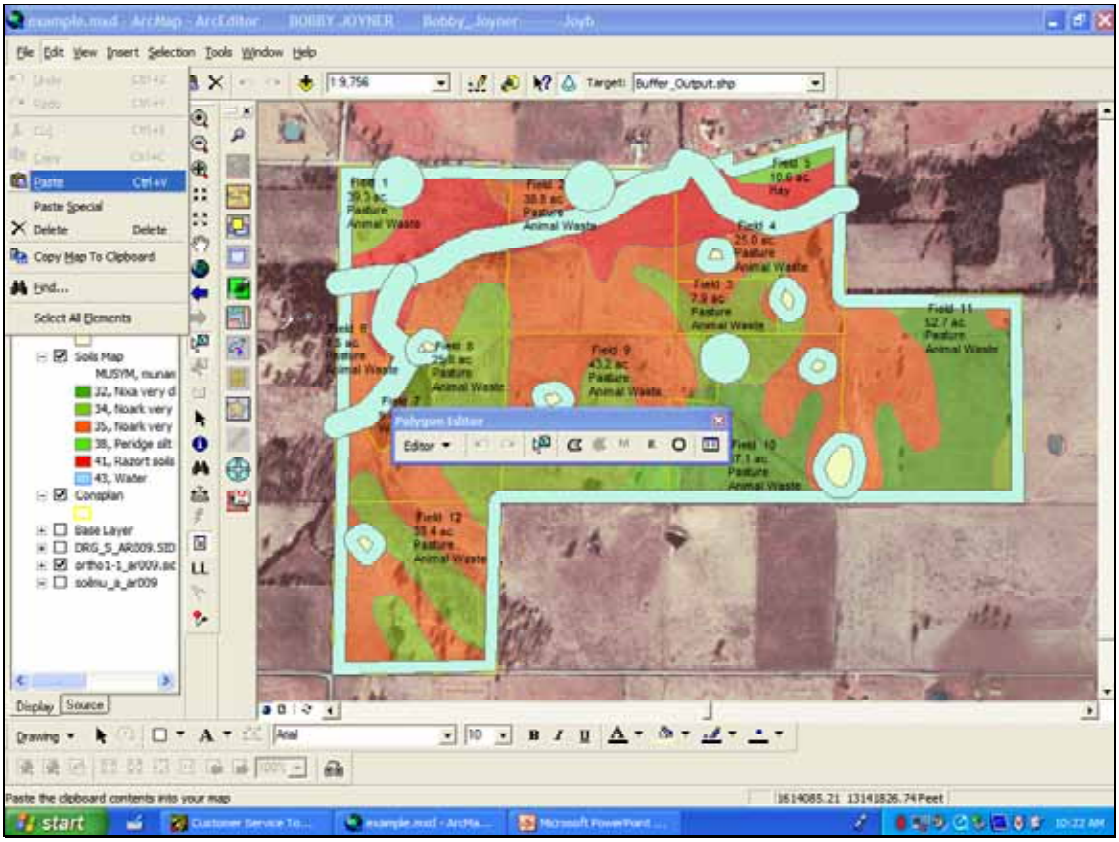

All Polygons with the Map Unit Symbol of 41 are selected on the map. Click Close to close the window.
Note: Queries can be constructed to include "OR" if you need to select more than one map unit.



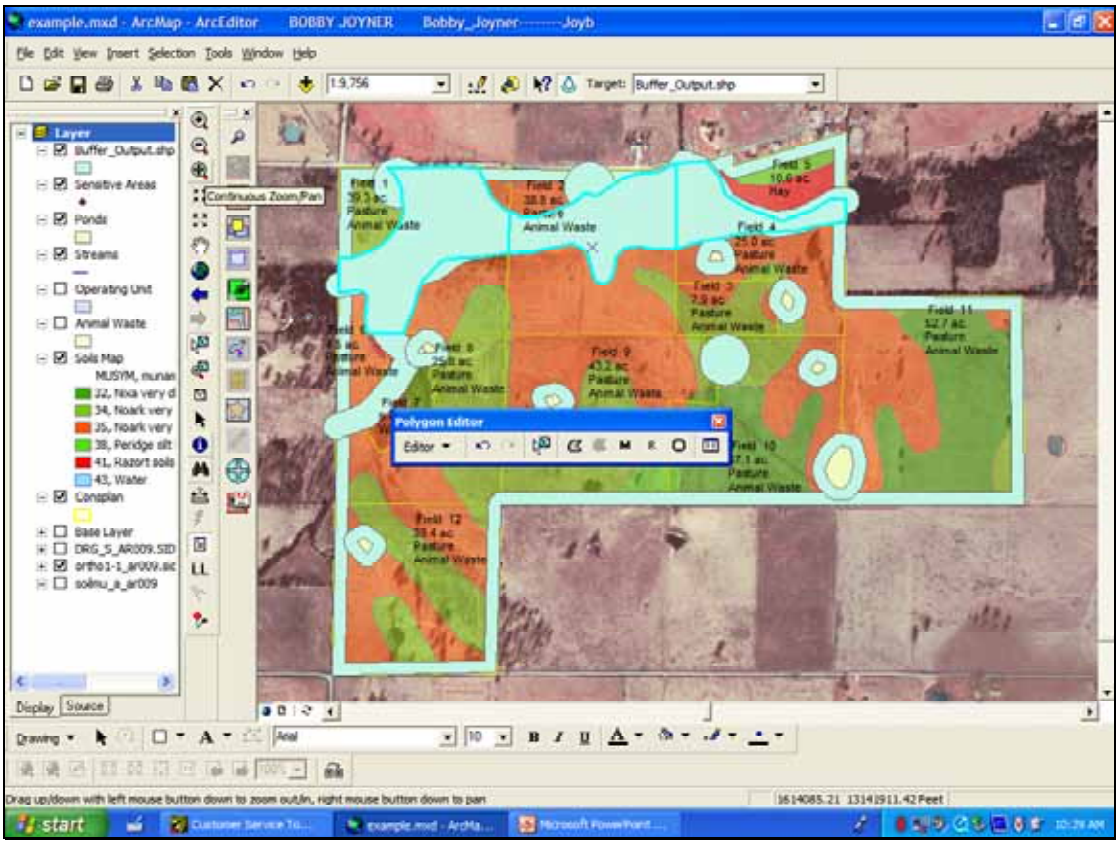

On the main menu click Edit, then Copy.



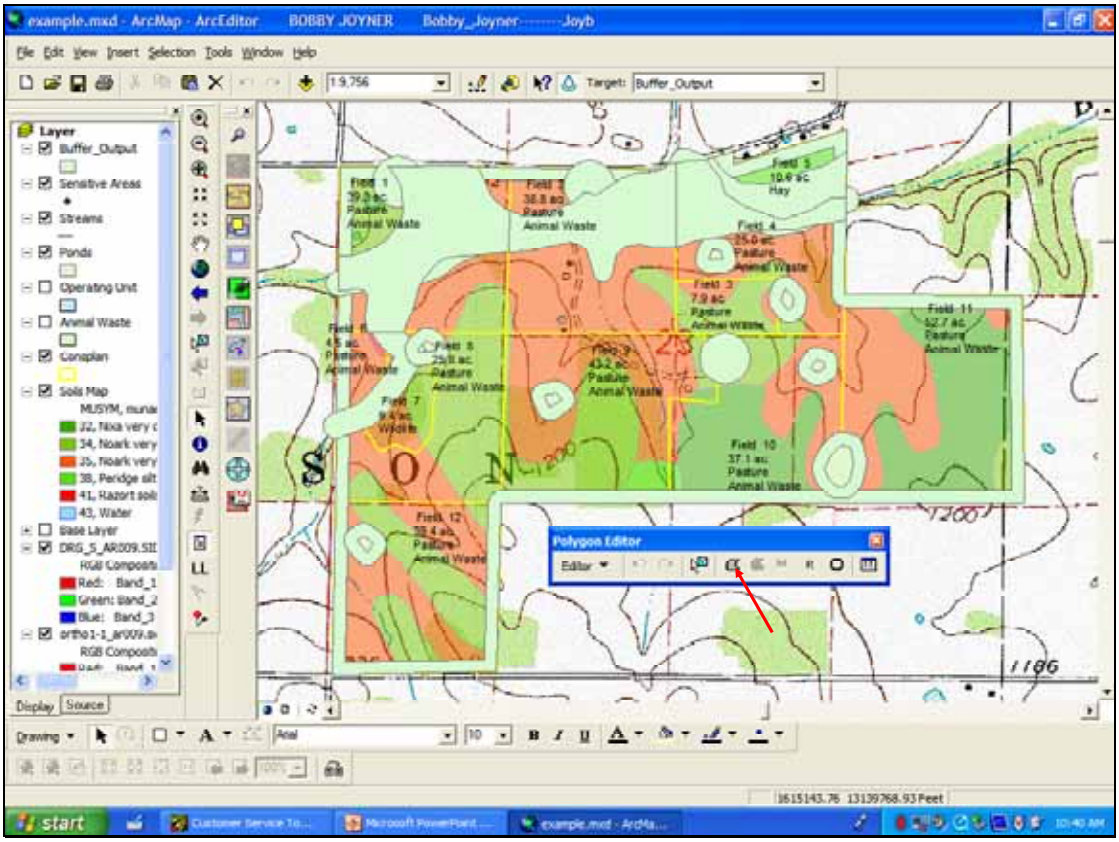

Use the Toolkit Digitizer tool and select the Buffer_Output.shp layer to edit the buffer layer.



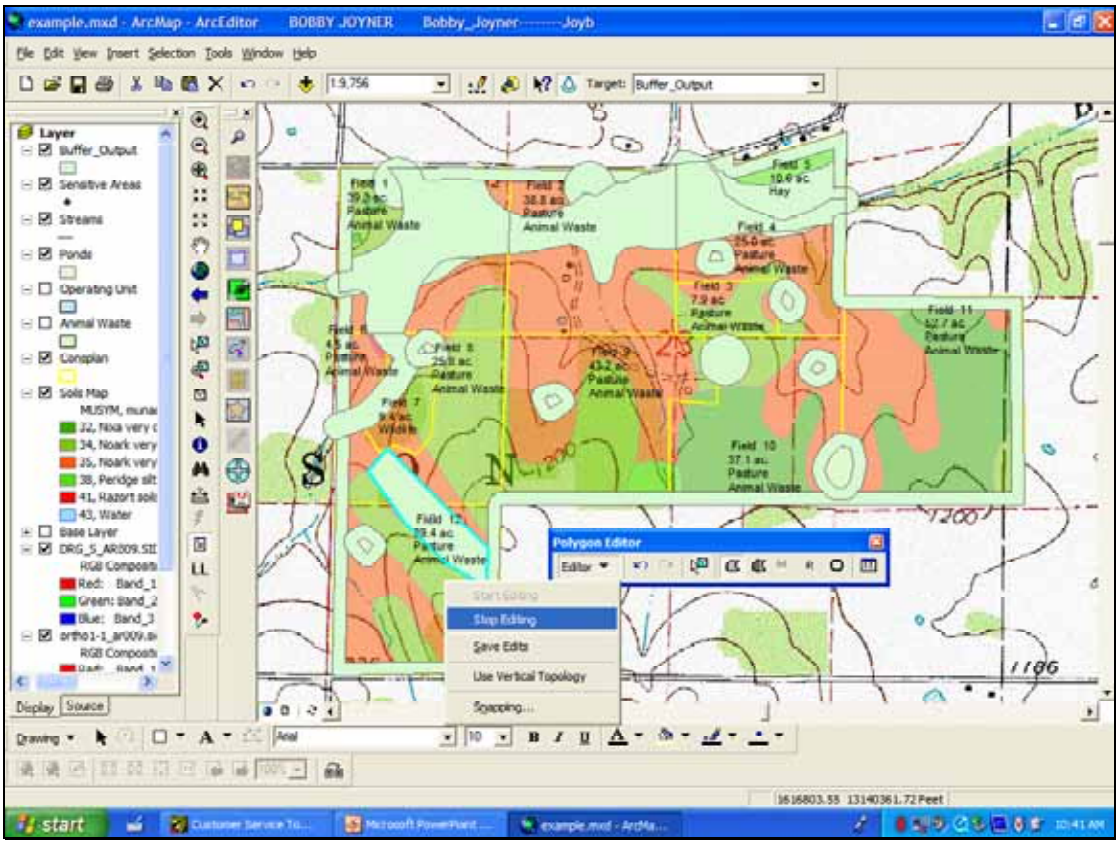

The Polygon Editor toolbar appears. On the main menu click Edit, then Paste.



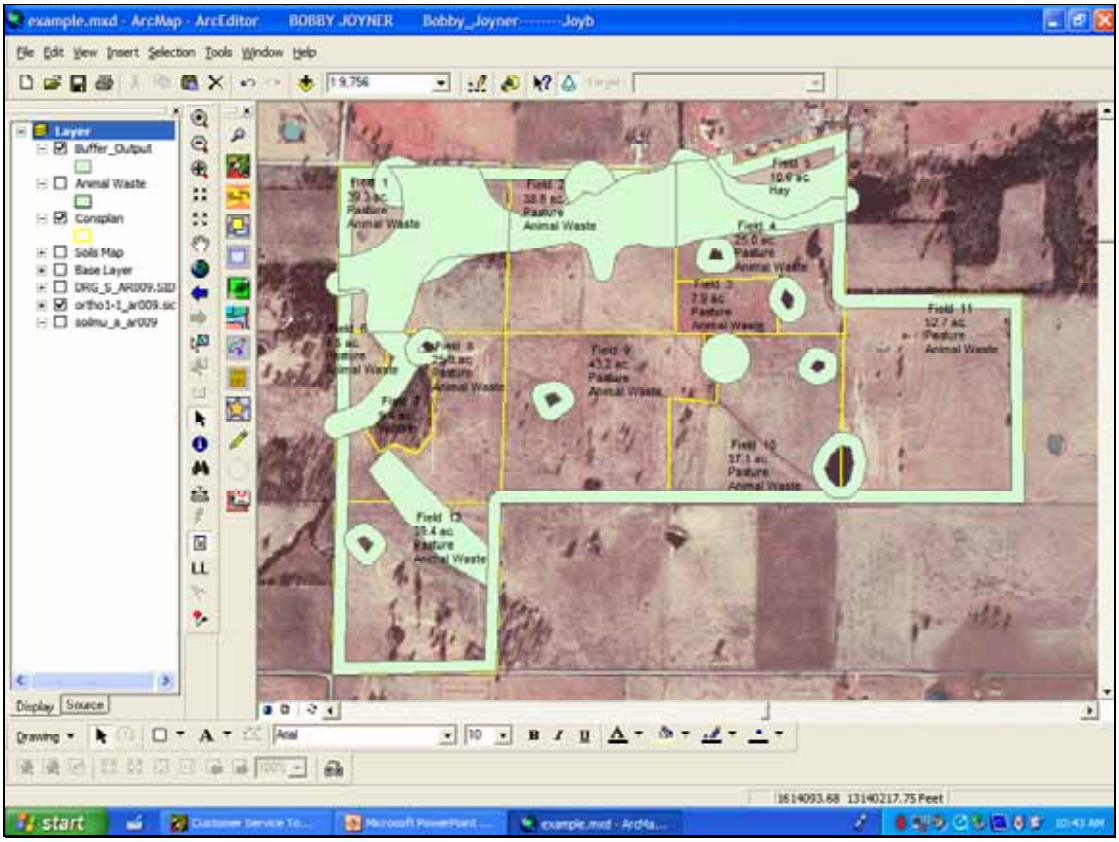

The soil map units are added to the layer. Click the box next to the DRG layer in the table of contents to display the Topographic image.



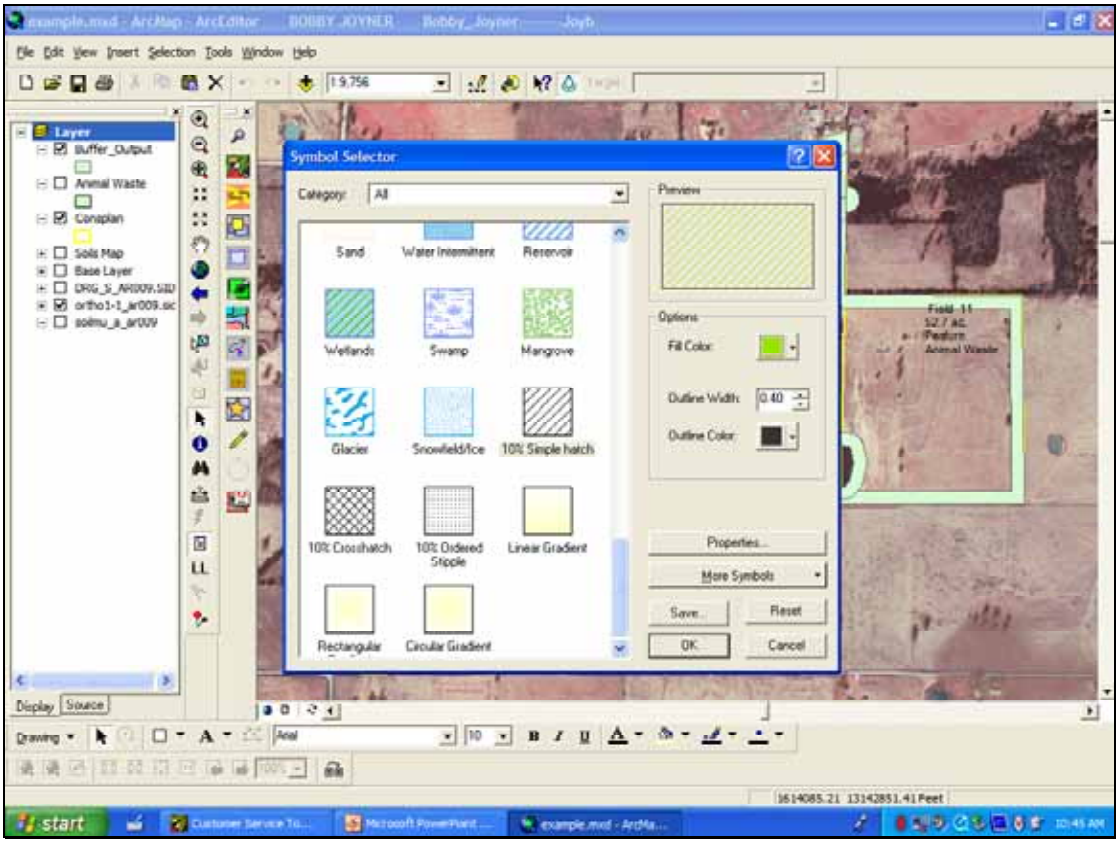

The soils symbolized in orange have 8 to 20% slopes. By observing the topographic map, some areas may be interpreted to have more than 15% slopes. Based on the closeness of topographic lines, the area between fields 7 and 12 appears to exceed 15%. Use the polygon tool on the Polygons Editor toolbar and digitize these areas into the buffer layer.



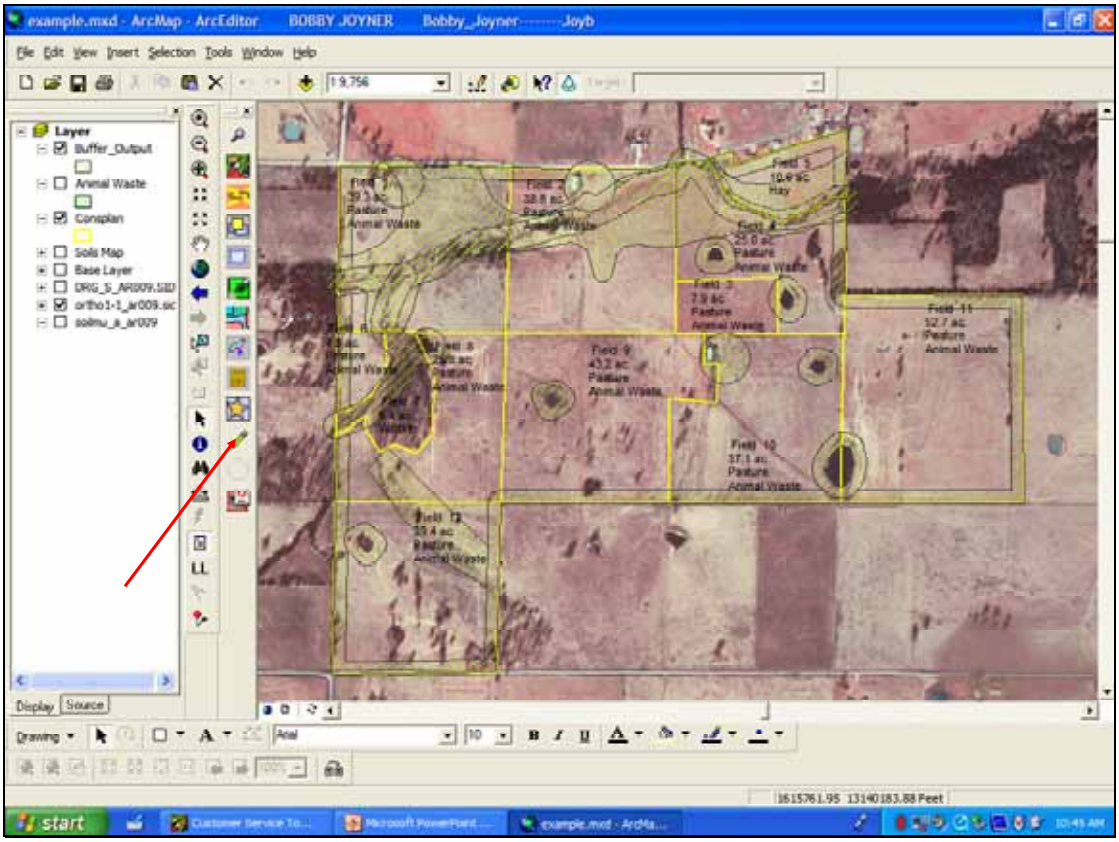

The area is added as a polygon. Stop editing momentarily by clicking the Editor dropdown button on the toolbar and clicking Stop Editing. Click Yes when prompted to save edits.



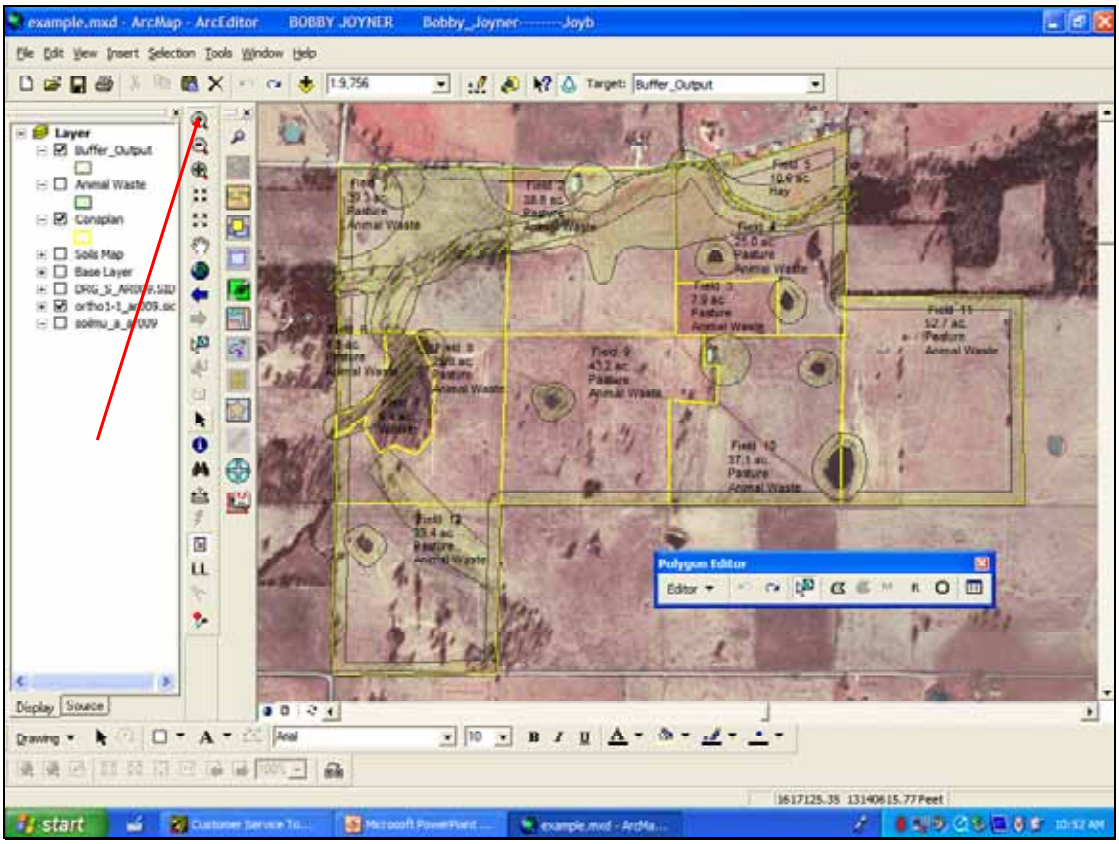
At this point stop and clean up the project. The Operating Unit, Streams, Ponds, and Sensitive Areas Layers are no longer needed and can be deleted from the table of contents by Right clicking on the layer name, and clicking Remove. Undisplay the Topographic and Soils Map layers. There should be one buffer layer with many overlapping polygons (to be cleaned up later!) and the Animal Waste layer.
To make the buffer layer easier to edit, change the symbol by double clicking the symbol in the table of contents.



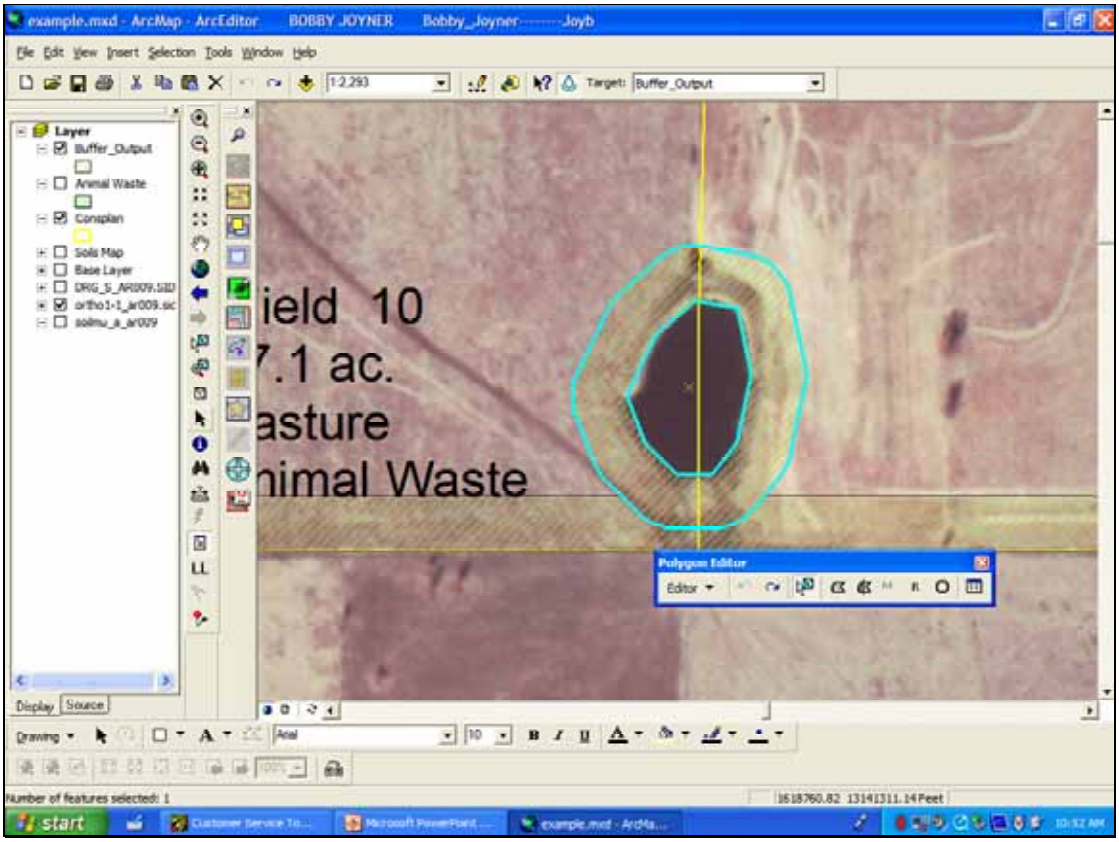

Scroll down and choose a 10% single hatch and change the color, click OK to apply the changes.



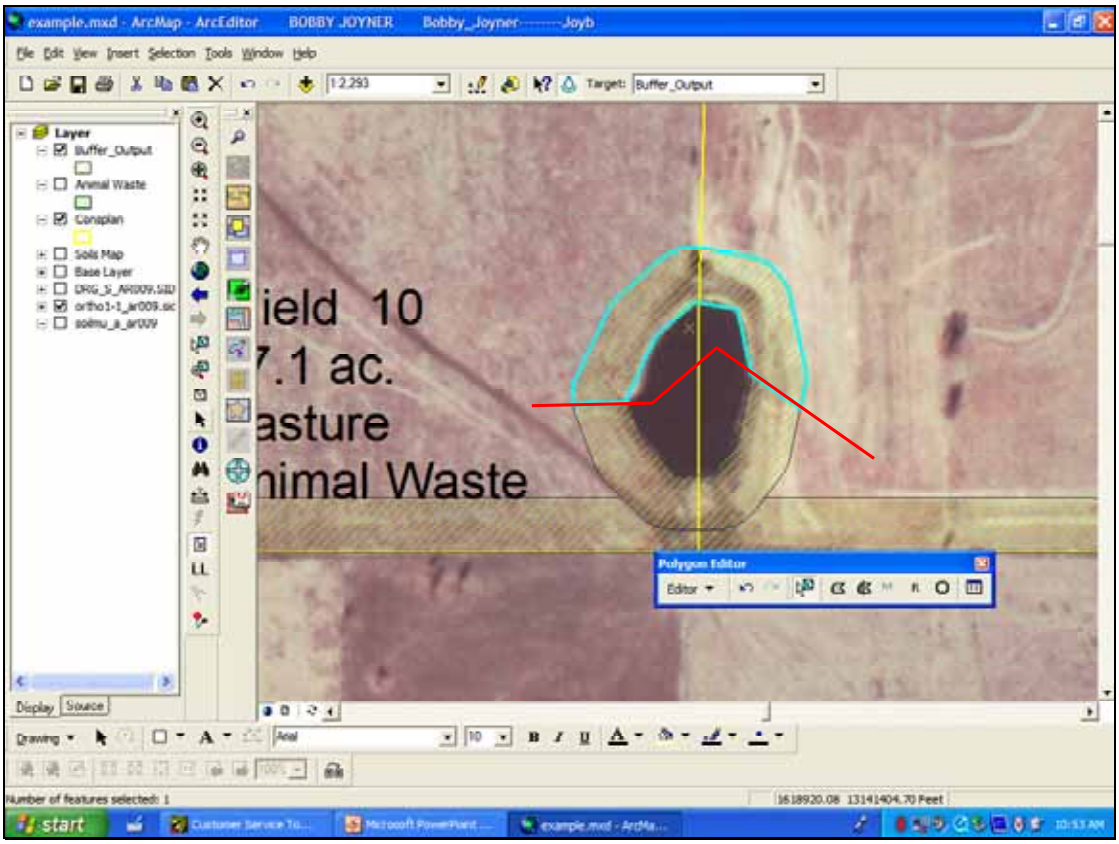

Now the Orthophotography can be seen through the buffer layer. Click the Toolkit digitizer tool and choose the Buffer_Output layer.



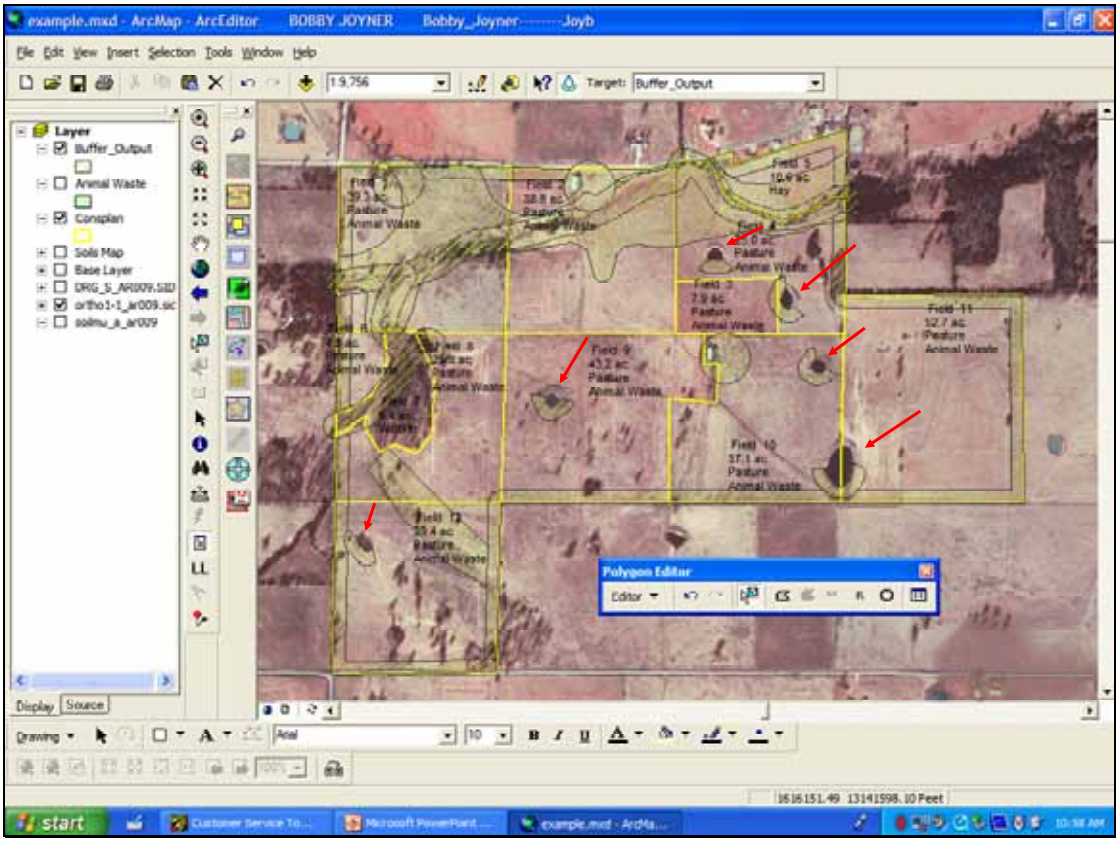

Trim the buffers around the ponds to remove the part of the filter strip downslope of the pond. Use the Zoom tool to zoom in on a pond.



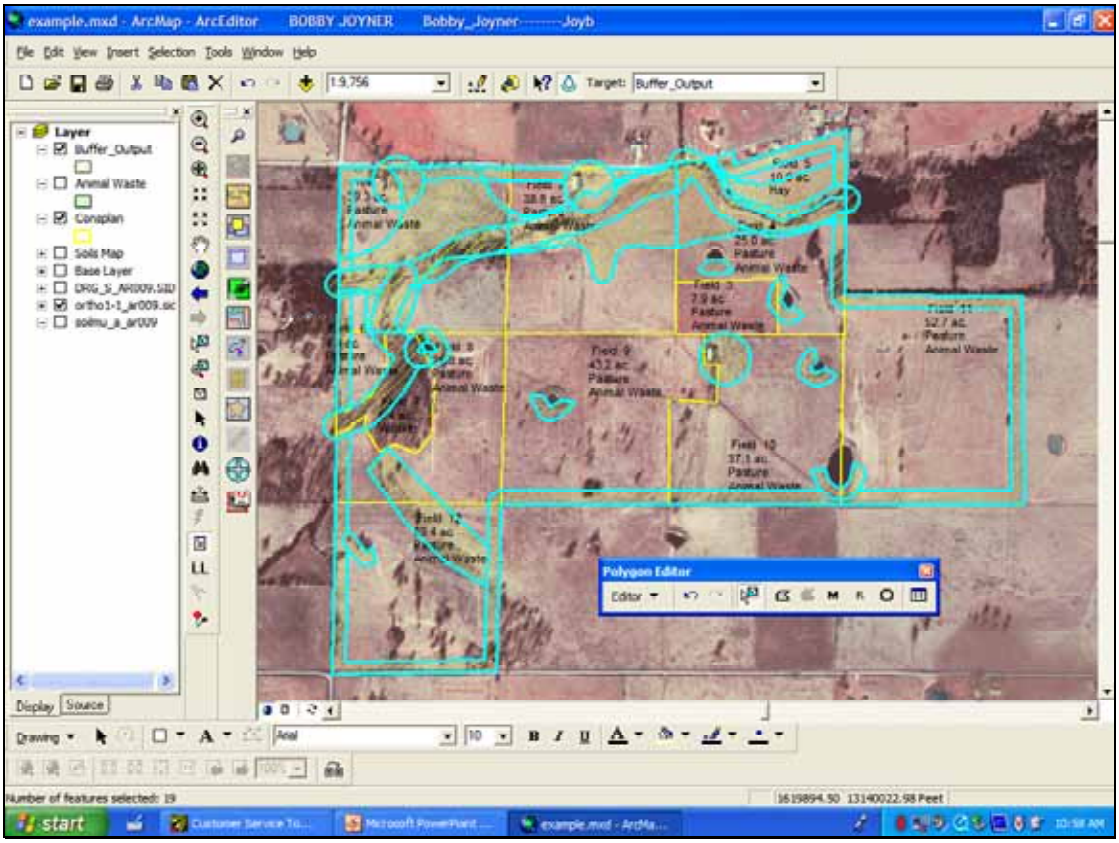

Use the select features tool on the Polygons Editor toolbar. Click on the buffer around the pond to select it.



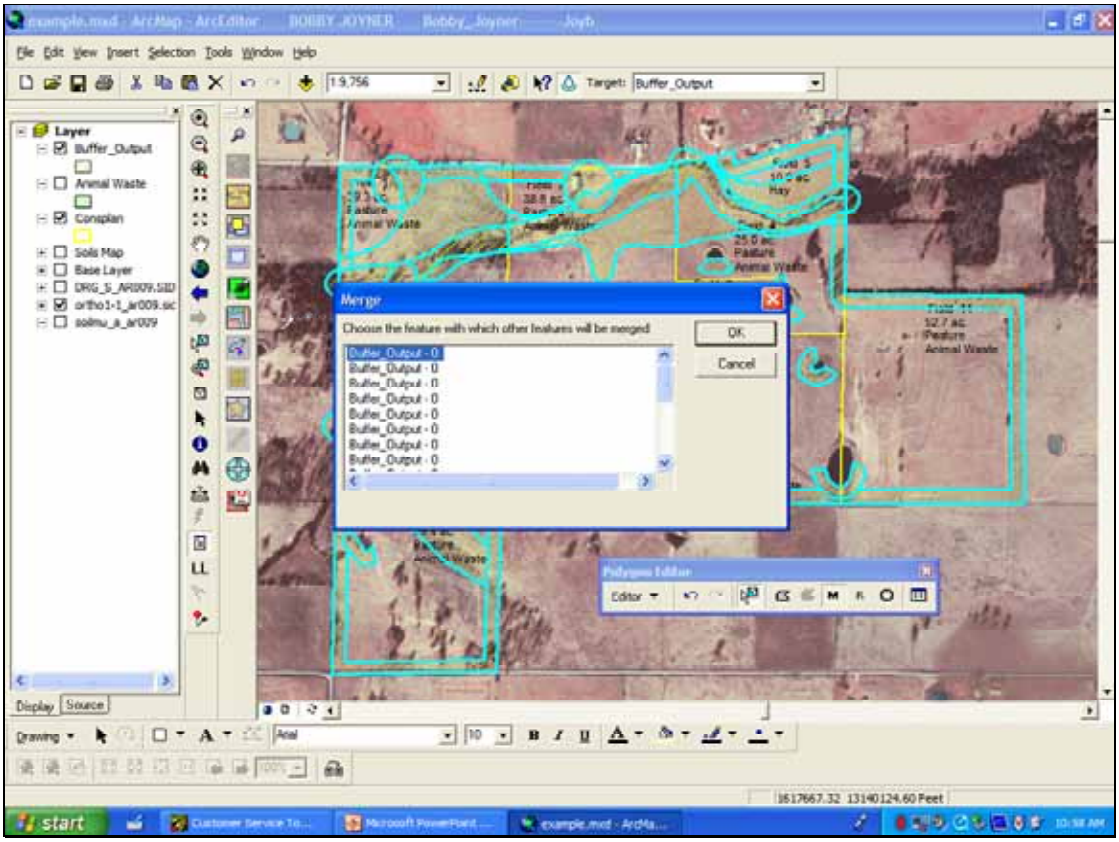

Use the split tool to split the buffer, then use the select tool to select the part to be deleted, and press the delete key on the keyboard.



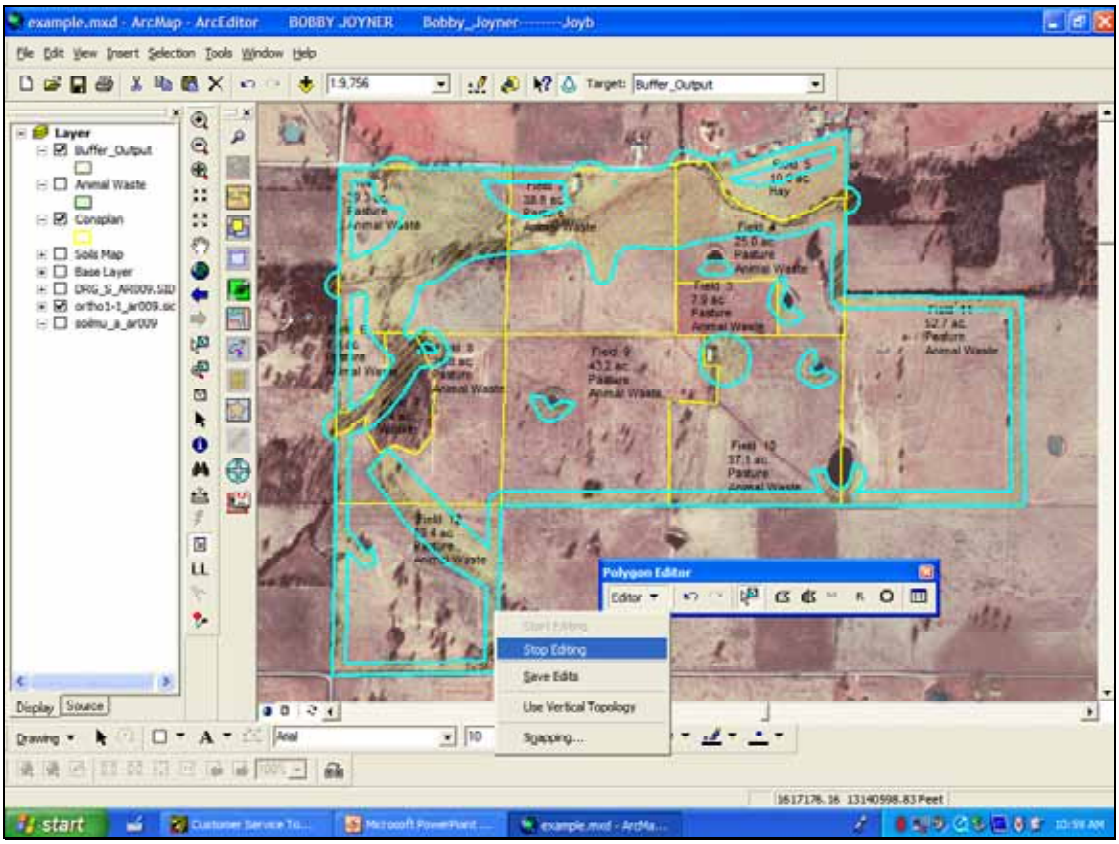

Continue the process to trim the buffers around all ponds.



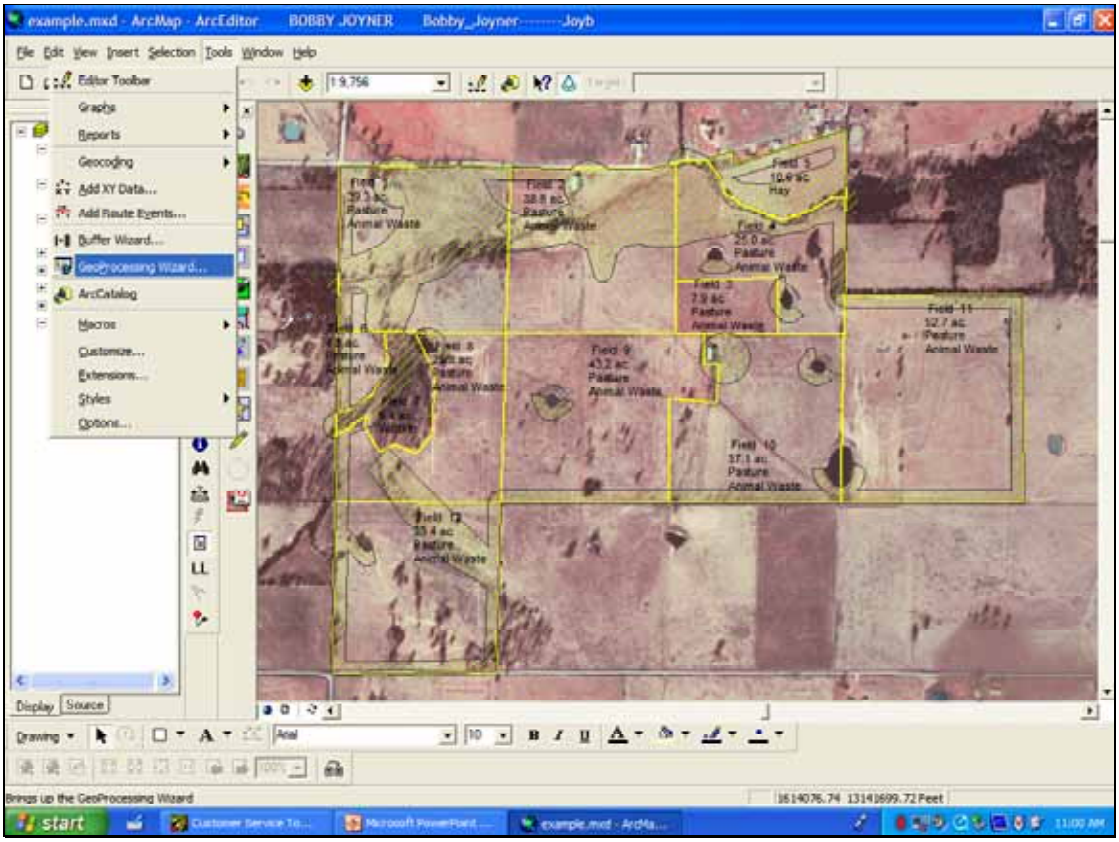

Use the select features tool on the Polygons Editor toolbar and select all polygons in the layer. Then click the M tool to merge all polygons into one.



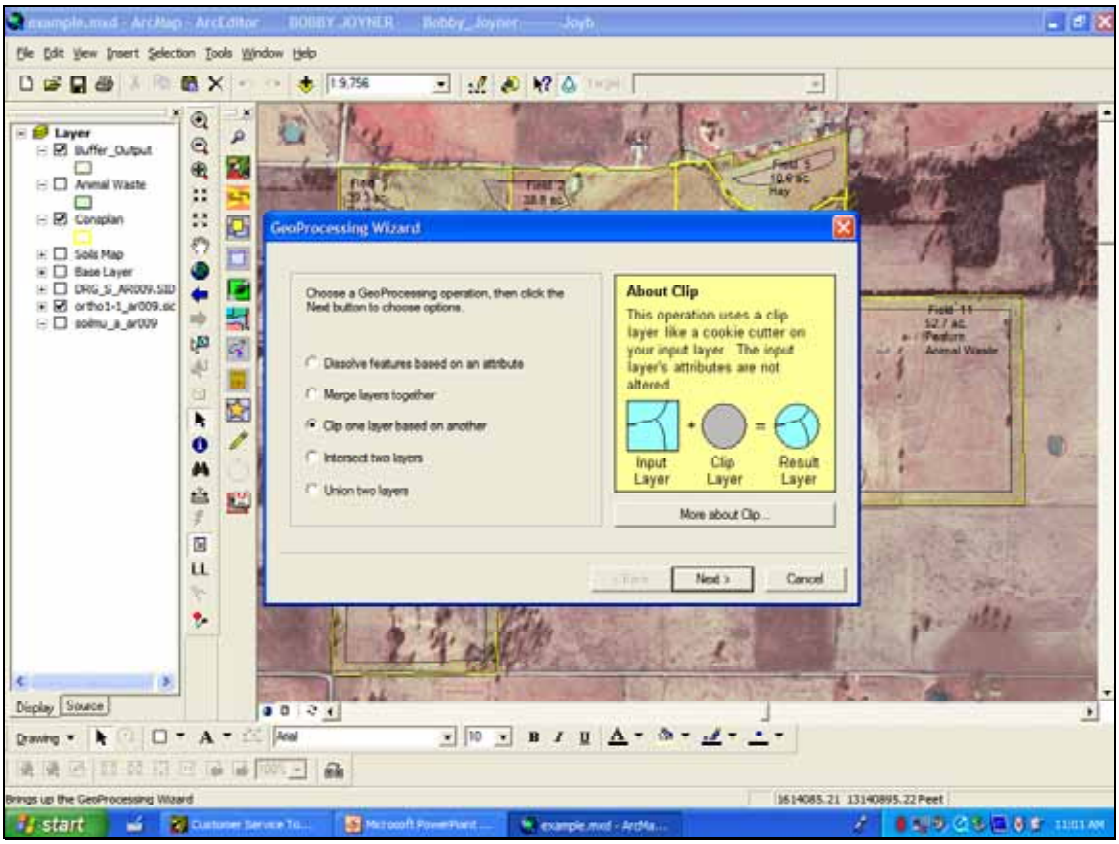

A merge window appears to determine which polygon's attribute data should be assigned to the new polygon. Since this data is not important for this layer, select any one of them and click OK.



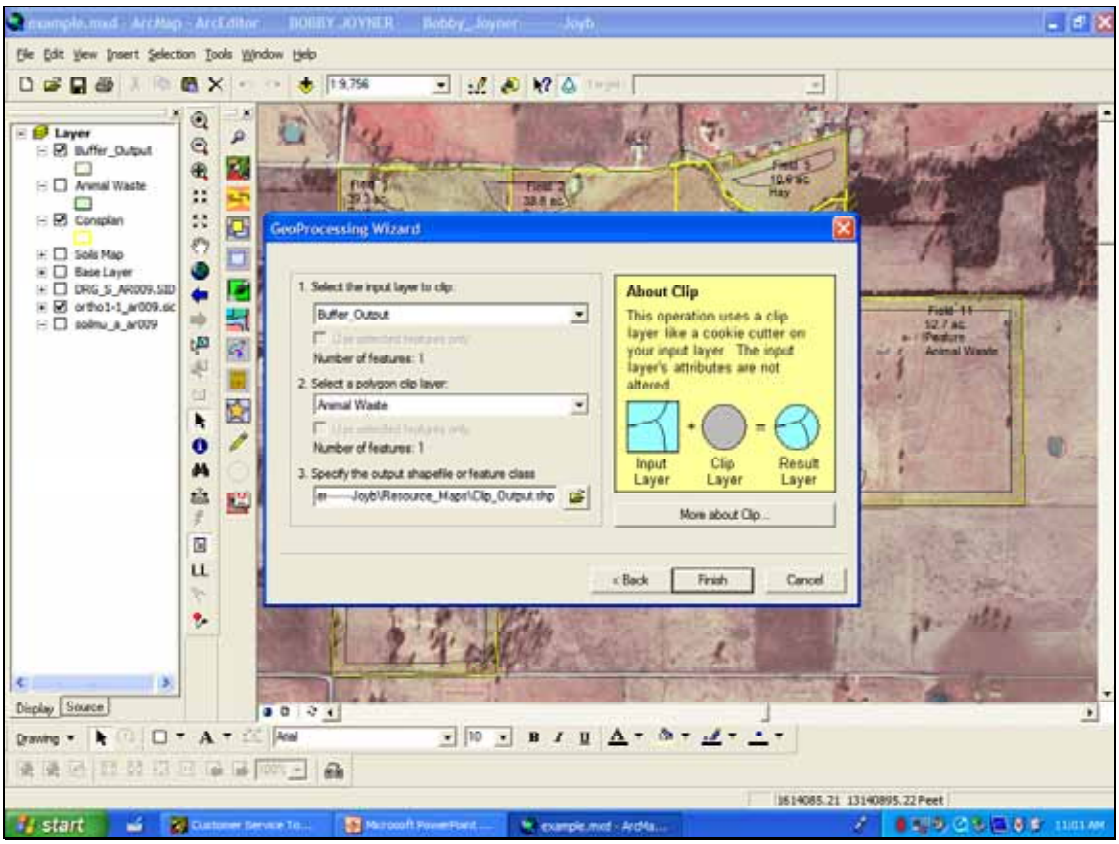

The polygons are merged. Click the Editor dropdown button on the Polygons Editor Toolbar. Click Stop Editing. Click Yes when prompted to save edits.



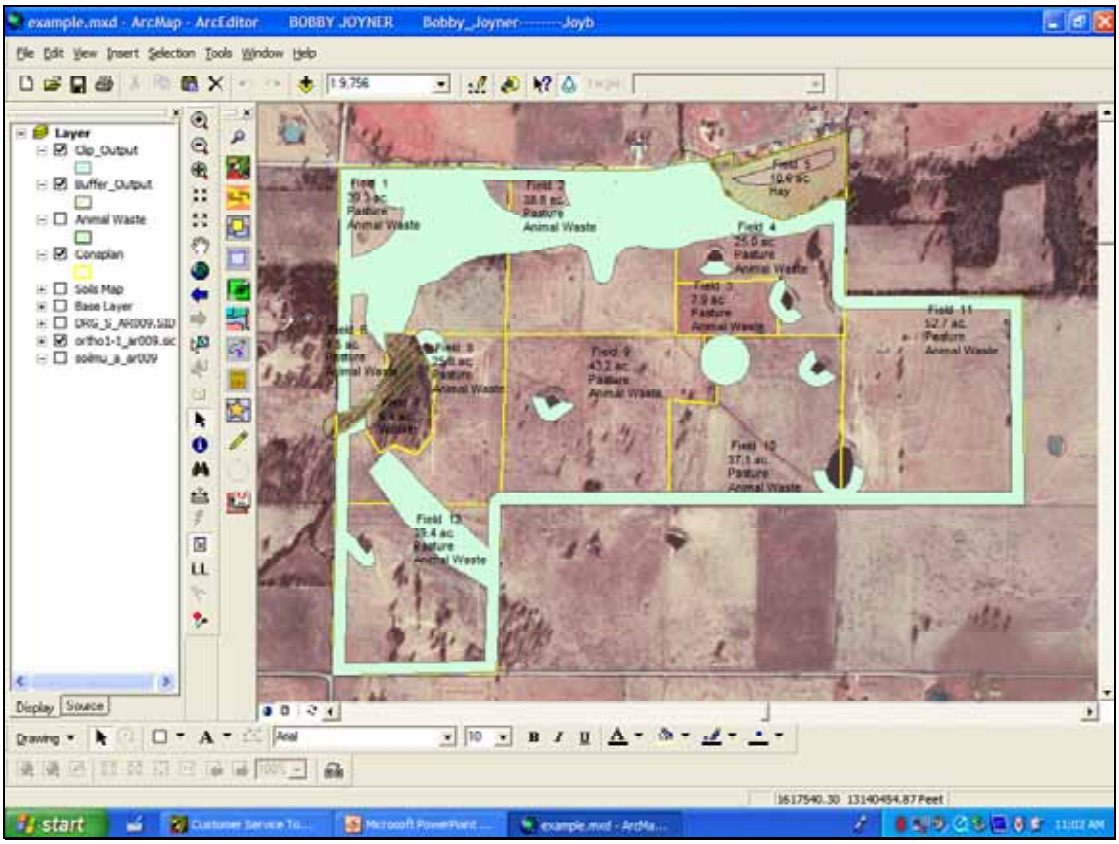

Now the Buffer layer should be clipped with the Animal waste layer so that only land units that have animal waste applied will have buffer and exclusion areas. Click Tools, Geoprocessing Wizard.



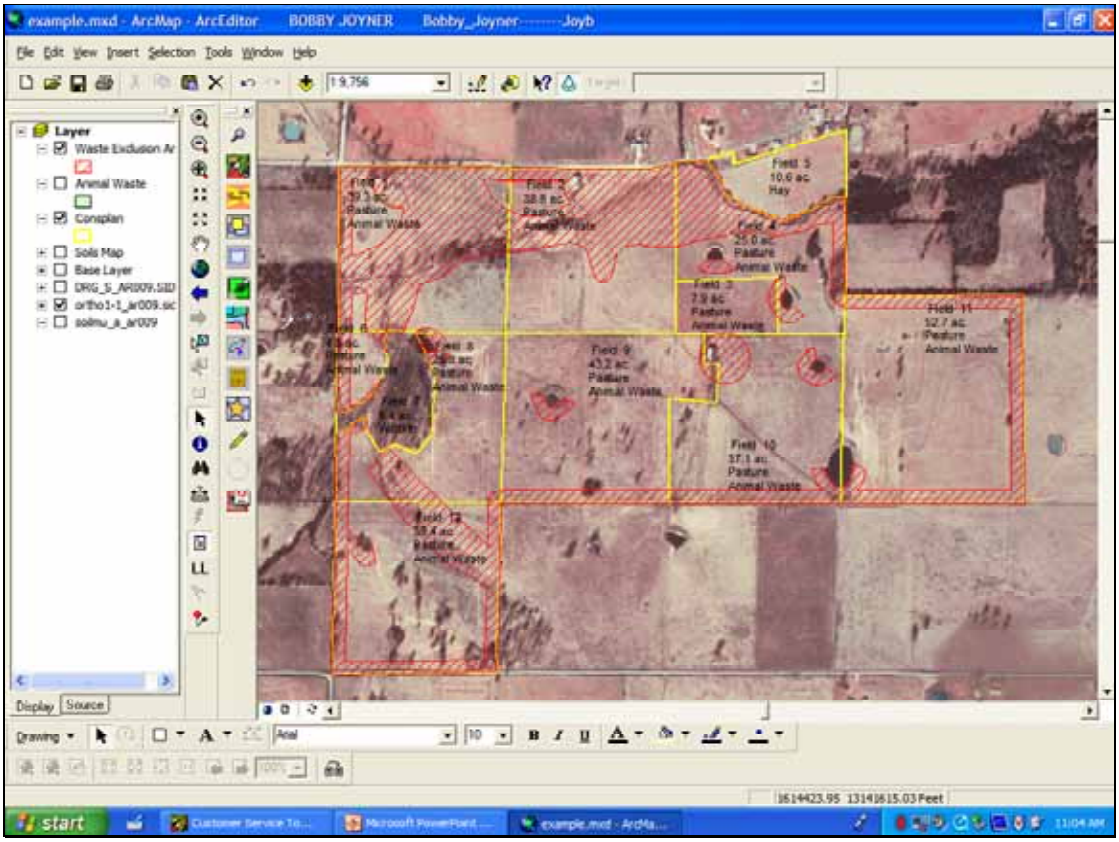

Click the radio button by Clip one layer based on another. Click Next.



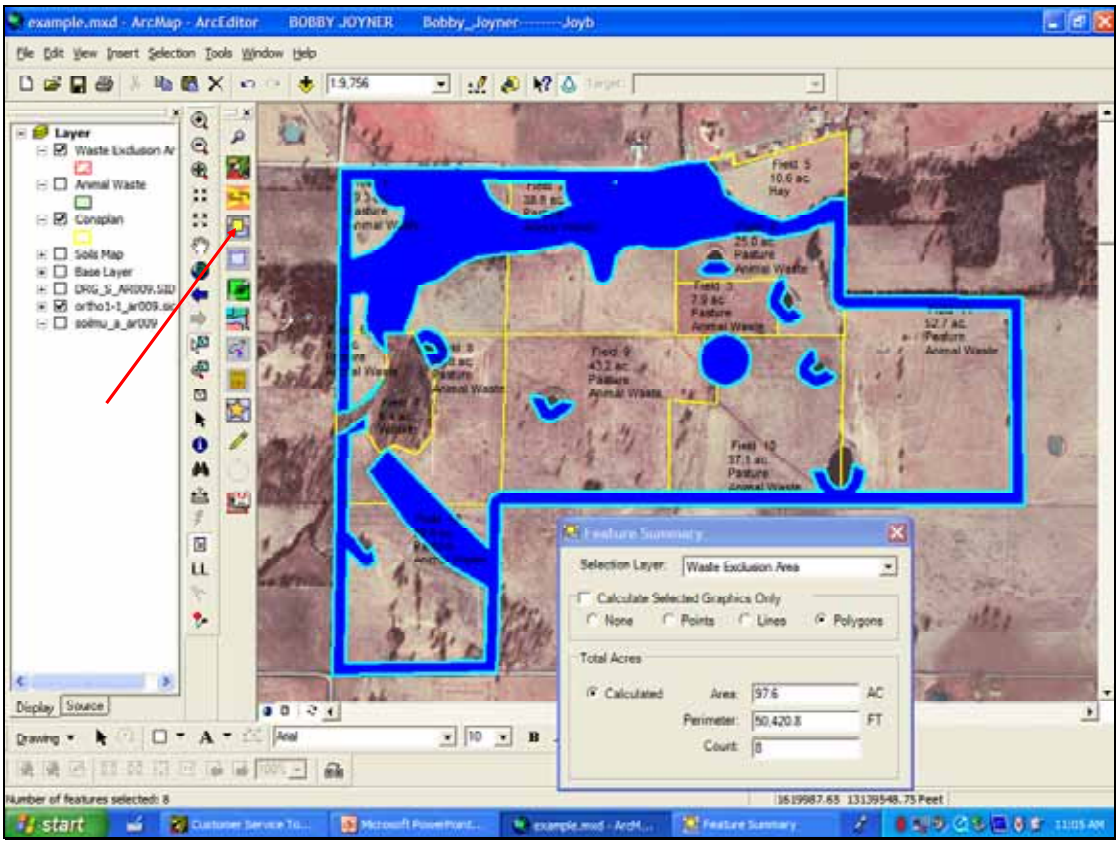

In the Select the input layer to clip field choose Buffer_Output. In the Select a polygon clip layer field choose Animal Waste. Use the default filename, click Finish.



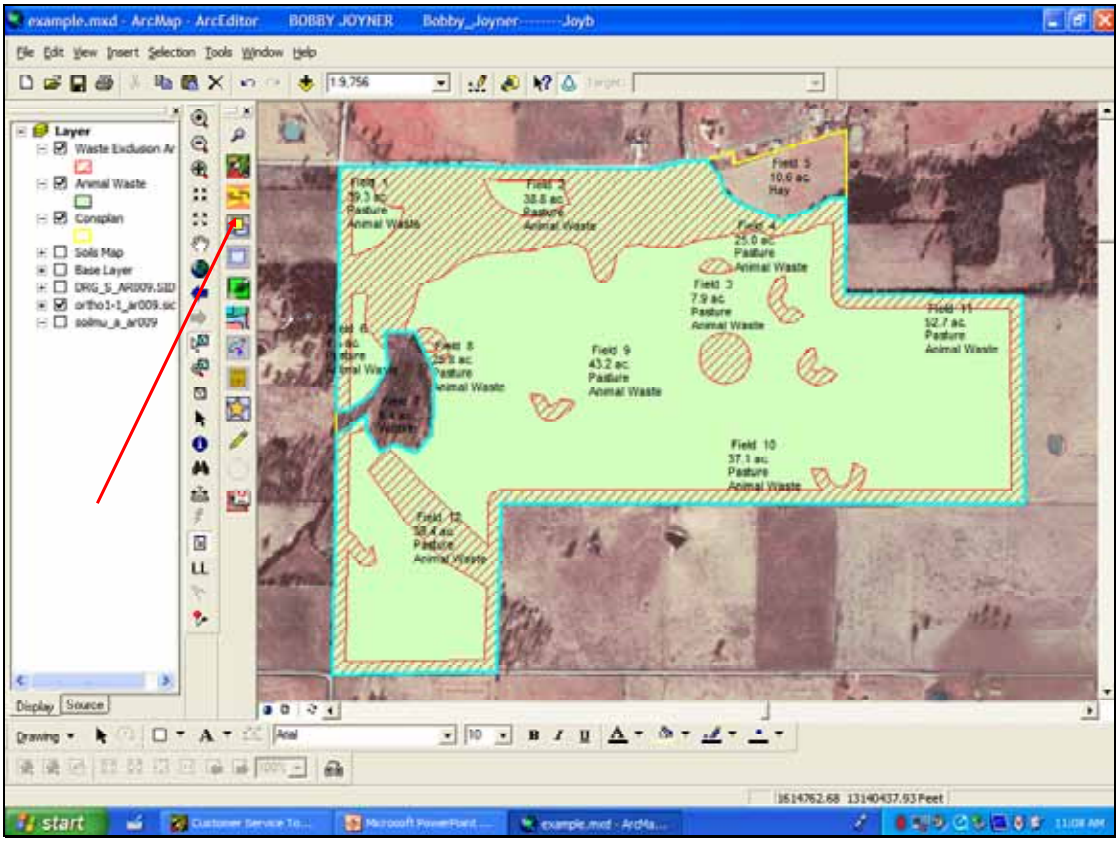
Extra areas outside the property and in areas where animal wastes are not applied are clipped off.



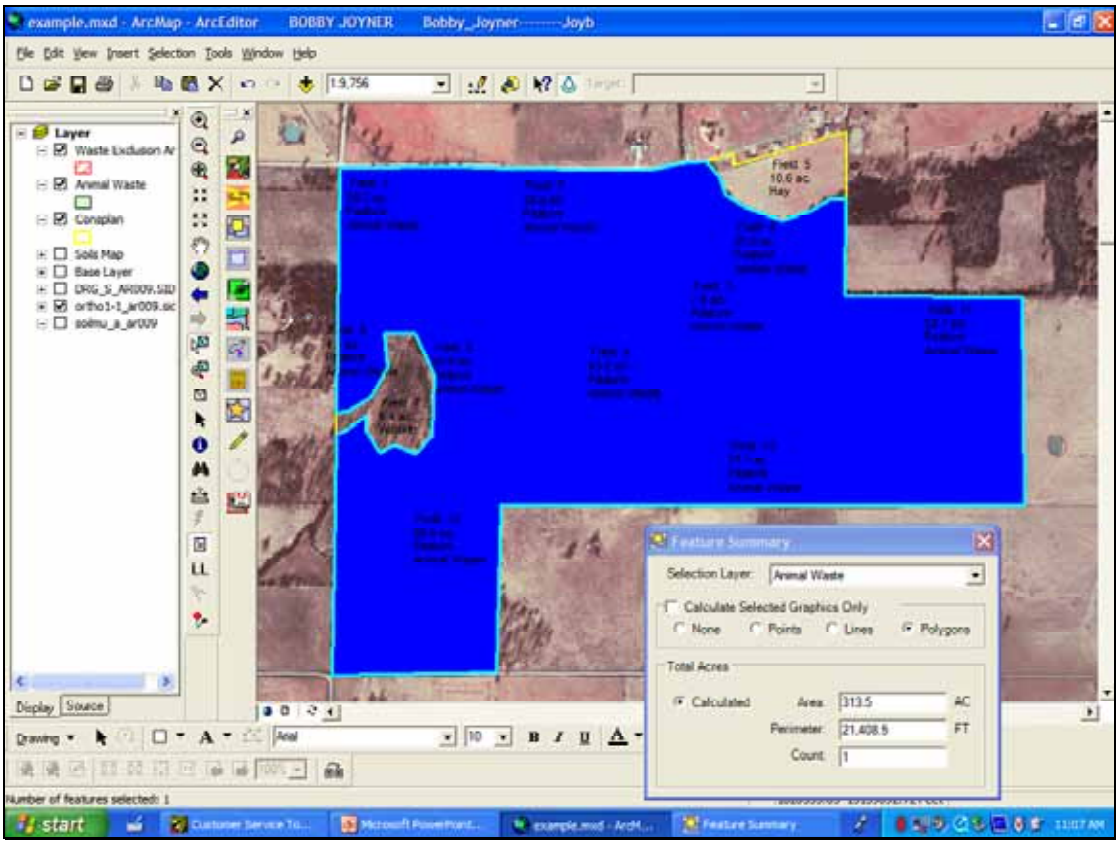
Remove the Buffer_Output layer by right clicking on the layer name and clicking Remove. Click twice on the Clip_Output layer name and rename it to Waste Exclusion Areas. Double click on the symbol and change it to 10% single hatch and change the outline and fill color to red.



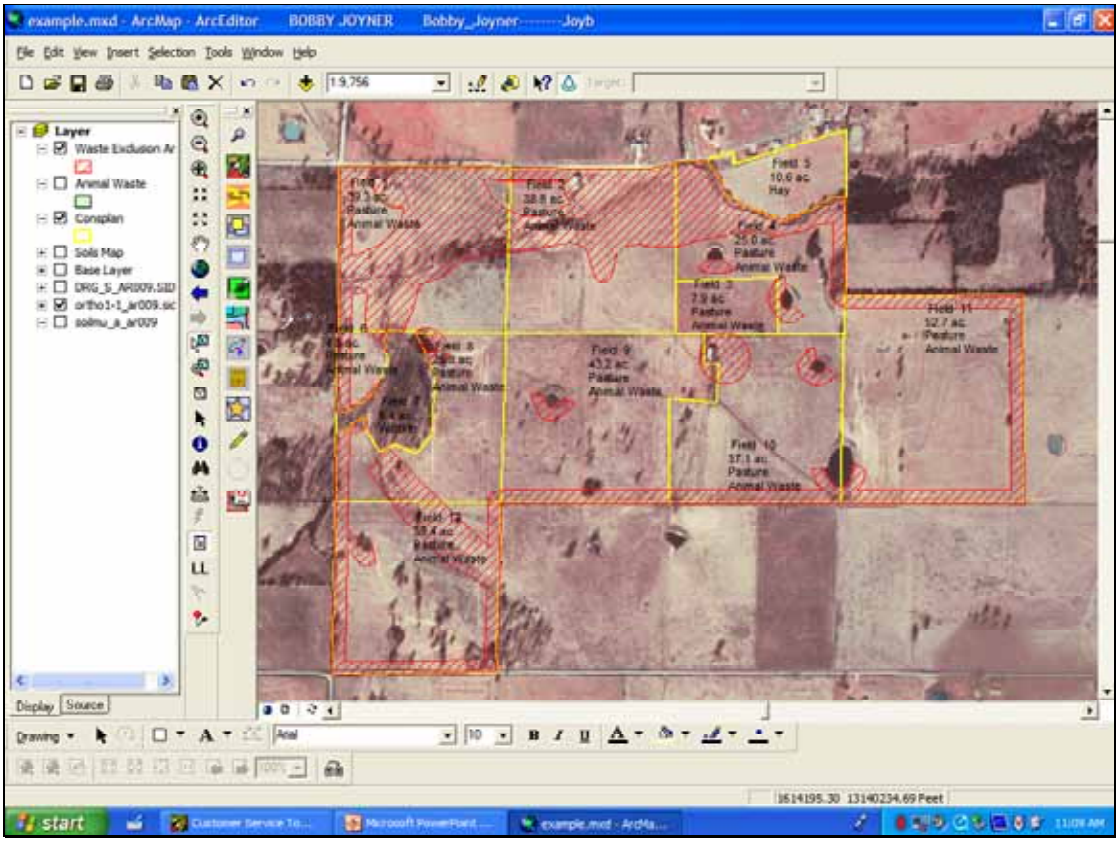

In the Feature Summary tool, select the Waste Exclusion Area layer, click on the polygon to select it and record the acres for the waste exclusion area. (97.6 acres), Close the Feature Summary




Display the Animal Waste layer. Click the Feature Summary tool.




In the Feature Summary tool, select the Animal Waste layer, click on the polygon to select it and record the acres for the animal waste area. (313.5 acres), Close the Feature Summary




Now a map can be printed that will show the producer areas where animal waste should not be applied. In addition, the producer will know that he has 215.9 (313.5-97.6) acres of land on which to apply animal wastes.