

# Digital Soil Survey COOKBOOK

For Setup, Editing,  
Quality Control, and  
Data Management

ArcGIS 9

Version 1  
May 2005

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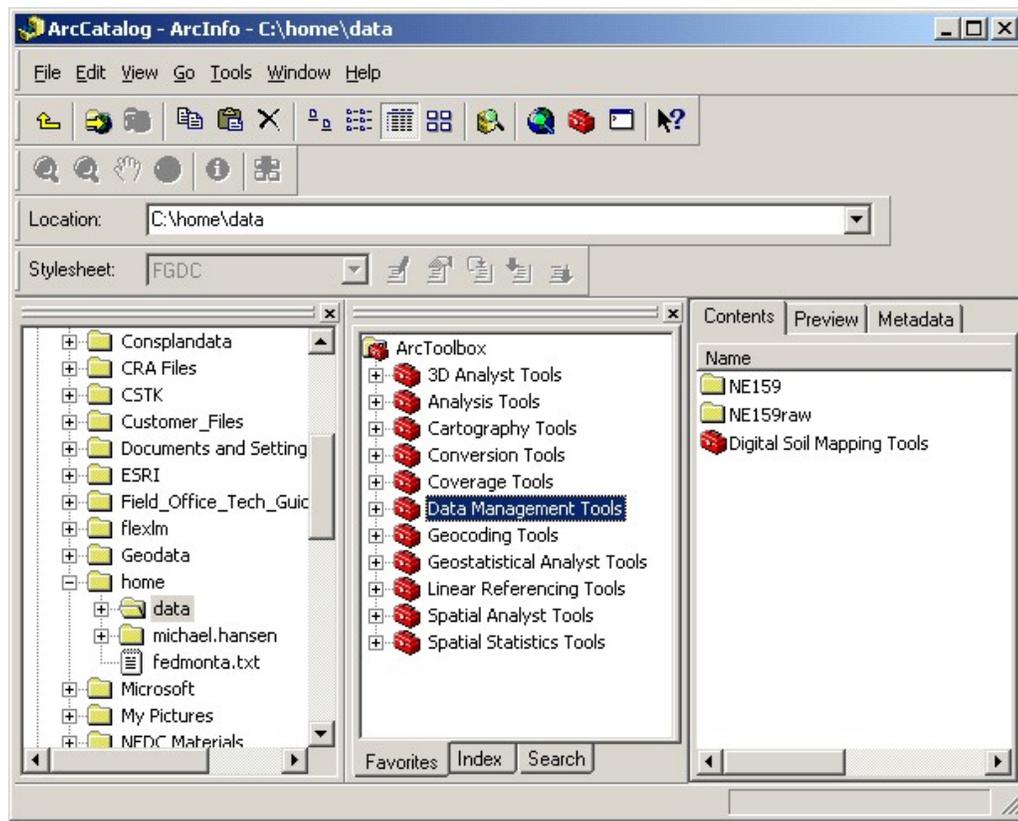
## INTRODUCTION

This manual was developed for use in the Digital Soil Survey Mapping and Updating course in conjunction with the power point presentations and hands-on exercises. The presentations contain more graphics and animations. The manual contains more text and more “cookbook” or step-by-step instructions. The cadre of instructors recognizes there is a wide range of experience in both field soil survey and GIS and hopes that this manual in combination with the presentations and hands-on exercises will meet the needs of the ever growing digital soil survey community.

This manual is written based on the assumption that the user will have at least had an introduction to ArcGIS. These instructions are for ArcGIS Version 9.

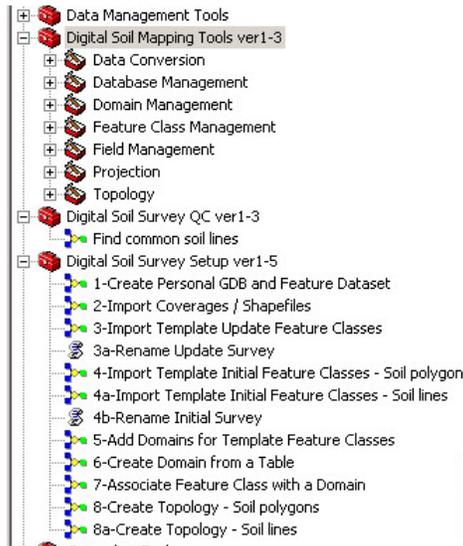
## ARCTOOLBOX SETUP

ArcToolbox in version 9 is opened within ArcCatalog or ArcMap by clicking on the red toolbox icon to show the ArcToolbox window. Toolboxes can be added (Rt. Click on ArcToolbox folder >> Add) or removed (Rt. Click >> Remove). New custom toolboxes can be created (Rt. Click >> New Toolbox).



## The Digital Soil Survey Toolboxes

Custom toolboxes have been developed for digital soil survey. The toolboxes include version information in the name. The cadre updates and improves the toolboxes regularly. The latest version of the toolboxes can be found on the DSS website.



The Digital Soil Mapping Tools toolbox contains the commands that are typically used for digital soil mapping.

The Digital Soil Survey QC toolbox contains a model that finds common soil lines.

The Digital Soil Survey Setup toolbox contains models and scripts to streamline geodatabase setup.

Additional toolboxes exist for Spatial Analyst.

Add the toolboxes (Rt. Click on ArcToolbox folder >> Add Toolbox >> Browse to toolbox location and select the toolboxes to add). We recommend storing them under C:\home\data\Custom\_Toolboxes. If the toolboxes are added in ArcCatalog they will become part of the default ArcToolbox. If the toolboxes are added in ArcMap they will become part of that map document. Use ArcCatalog to copy the toolboxes whenever possible. This prevents malfunctions in the toolboxes.

## GEODATABASE SETUP USING DIGITAL SOIL SURVEY SETUP TOOLBOX

### REQUIREMENTS:

- 1 DSS Setup Toolbox added to ArcToolbox.
- 2 Python scripts (RenameUpdate.py and RenameInitial.py) located in same folder as toolboxes (C:\home\data\Custom\_Toolboxes).
- 3 Templates folder containing template geodatabase (PG001.mdb) located under C:\home\data.
- 4 Service Pack 2 or later. The scripts don't work in earlier versions.

All of these required items except the service pack can be downloaded from the DSS website or the course CD. The toolboxes are versioned. Check the website to see if you have the latest version. Contact your local systems

administrator to find out about the service pack.

## Soil Survey Geodatabase Template

A soil survey geodatabase template was developed for consistency. The template will be utilized throughout the setup process. As mentioned above, the templates folder should be stored under C:\home\data for the models to work.

### PG### – Personal Geodatabase

- **FD### - Feature Dataset**
  - **FD###\_Topology - Topology Object**
  - **st###\_a – soil map unit polygons**
  - **st###\_b – soil survey area boundary**
  - **st###\_c – soil map unit lines**
  - **st###\_d – soil map unit points**
  - **st###\_dl – documentation lines, e.g., transects**
  - **st###\_dp - documentation points, e.g., observation sites**
  - **st###\_f – update flag points (need field verification)**
  - **st###\_int – initial mapping progress polygons**
  - **st###\_l – line special features**
  - **st###\_p – point special features**
  - **st###\_q – USGS 7.5 min. quad boundary polygons**
  - **st###\_sl – soil lines (line option, initial surveys)**
  - **st###\_ss – soil symbol points (line option, initial surveys)**
  - **st###\_upd – update mapping progress polygons**

## Geodatabase Setup for an Update Survey

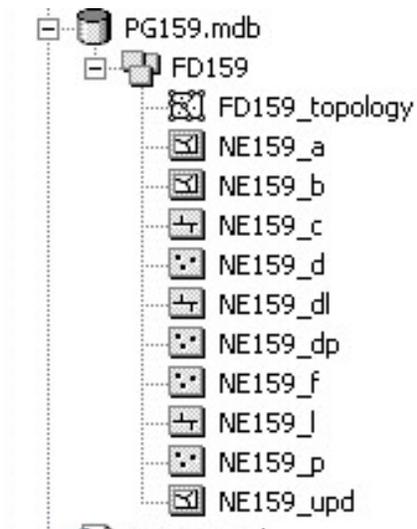
*Assumes soils data for update are on the Soil Data Mart. ### refers to soil survey area id number.*

1. Download **shapefiles** in UTM projection from Soil Data Mart.
  - a. <http://soildatamart.nrcs.usda.gov/>
2. Select Model 1 – Create Personal GDB and Feature Dataset
  - a. Enter Inputs
    - New Personal GDB Name (PG###)
    - Output Location (C:\home\data\ST### or location of your choice)
    - New Feature Dataset Name (FD###)
    - Import Spatial Reference (Browse to and select soils shapefile, soilmu\_a\_st###)
  - b. *What just happened?* A new personal geodatabase and feature dataset were created using the soils shapefile downloaded from the data mart to define the spatial reference (coordinate system and XY

- domain).
3. Select Model 2 – Import Coverages / Shapefiles
    - a. Enter Inputs
      - Input Features (Browse to and select shapefiles)
      - Output Geodatabase – Feature Dataset (Browse to and select FD###)
    - b. *What just happened?* All of the shapefiles downloaded from the data mart have been converted to feature classes in the feature dataset.
  4. Select Model 3 – Import Template Update Feature Classes
    - a. Enter Inputs
      - Output Geodatabase – Feature Dataset (Browse to and select FD###)
    - b. *What just happened?* Additional feature classes for an update survey were added to the feature dataset.
  5. Select Script 3a – Rename Update Feature Classes
    - a. Enter Inputs
      - Feature Dataset (Browse to and select FD###)
      - ssaid (enter state abb. and survey number, i.e. NE159)
    - b. *What just happened?* All of the feature classes in the feature dataset were renamed with the Soil Survey Geodatabase Structure naming convention.
  6. Drop extraneous shapefile or coverage fields
    - a. Digital Soil Mapping Tools >> Field Management >> Drop Field
      - Soils feature class (st###\_a) – Drop all fields except MUSYM
      - Special feature classes (st###\_p or st###\_l) – Drop all fields except FIELDSYM
    - b. *What just happened?* Fields not needed were dropped from the soils and special feature feature classes to simplify labeling.
  7. Select Model 5 – Add domains for template feature classes
    - a. Enter Inputs
      - Input Geodatabase (Browse to and select PG###)
    - b. *What just happened?* Domains (choice lists) for several of the template feature classes were added to the geodatabase.
  8. Select Model 6 – Create Domain from a Table
    - a. Enter Inputs
      - Browse to and Select Table (mapunit.dbf)
      - Select Code Field (musym)
      - Select Display Field (musym)
      - Browse To and Select Geodatabase (PG###)
      - Enter Domain Name (Soil labels)
    - b. *What just happened?* A domain (choice list) for soil labels was generated from a mapunit.dbf file and added to the geodatabase.
  9. Select Model 7 – Associate Feature Class With Domain
    - a. Enter Inputs
      - Browse to and Select Feature Class (st###\_a)

- Select field to link to domain (musym)
  - Select domain name (Soil labels)
- b. *What just happened?* The soil label domain created in Model 6 was linked to the soils feature class so it can be used for labeling while editing in ArcMap.
10. Select Model 8 – Create Topology – Soil Polygons
- a. Enter Inputs
- Enter Topology Name (FD###\_Topology)
  - Browse to and Select Feature Dataset (FD###)
  - Browse to and Select Soils Feature Class to Participate (st###\_a)
- b. *What just happened?* A topology object was created in the feature dataset. Two rules were set up for the soils feature class – no gaps and no overlaps. The cluster tolerance was set to 0.0005 meters.

### Results of Update Setup



### Geodatabase Setup for an Initial Survey (Soil Polygon Digitizing)

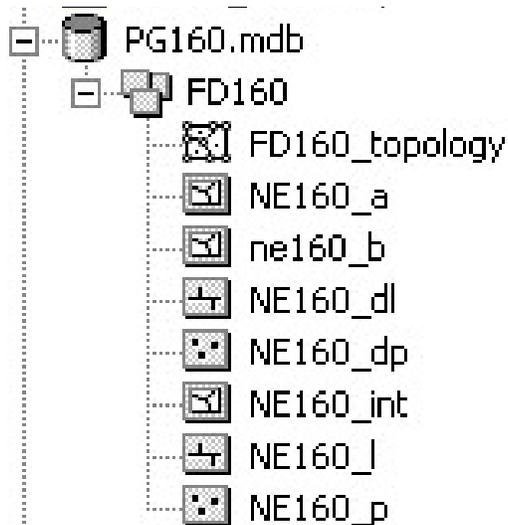
*Use this setup if you prefer digitizing soil lines as polygons. ### refers to soil survey area id number.*

1. Acquire a boundary shapefile in UTM projection
  - a. Possible sources: digitizing unit, local, digitize your own
2. Select Model 1 – Create Personal GDB and Feature Dataset
  - a. Enter Inputs
    - New Personal GDB Name (PG###)
    - Output Location (C:\home\data\ST### or location of your choice)

- New Feature Dataset Name (FD###)
    - Import Spatial Reference (Browse to and select boundary file)
  - b. *What just happened?* A new personal geodatabase and feature dataset were created using the boundary shapefile to define the spatial reference (coordinate system and XY domain).
- 3. Select Model 2 – Import Coverages/Shapefiles
  - a. Enter Inputs
    - Input Features (Browse to and select boundary shapefile)
    - Output Geodatabase – Feature Dataset (Browse to and select FD###)
  - b. *What just happened?* The boundary shapefile was converted to a feature class in the feature dataset.
- 4. Select Model 4 – Import Template Initial Feature Classes – Soil polygons
  - a. Enter Inputs
    - Output Geodatabase – Feature Dataset (Browse to and select FD###)
  - b. *What just happened?* Additional feature classes for an initial survey were added to the feature dataset.
- 5. Select Script 4b – Rename Initial Feature Classes
  - a. Enter Inputs
    - Feature Dataset (Browse to and select FD###)
    - ssaid (enter state abb. and survey number, i.e. NE160)
  - b. *What just happened?* All of the feature classes in the feature dataset except the boundary were renamed with the Soil Survey Geodatabase Structure naming convention. Since the boundary could have any original filename, rename it manually to st###\_b with a Rt. Click >> Rename.
- 6. Select Model 5 – Add domains for template feature classes
  - a. Enter Inputs
    - Input Geodatabase (Browse to and select PG###)
  - b. *What just happened?* Domains (choice lists) for several of the template feature classes were added to the geodatabase.
- 7. Select Model 8 – Create Topology – Soil Polygons
  - a. Enter Inputs
    - Enter Topology Name (FD###\_Topology)
    - Browse to and Select Feature Dataset (FD###)
    - Browse to and Select Feature Class to Participate (st###\_a)
  - b. *What just happened?* A topology object was created in the feature dataset. Two rules were set up for the soils feature class – no gaps and no overlaps. The cluster tolerance was set to 0.0005 meters.
- 8. Load boundary polygon into soils feature class using the Simple Data Loader.
  - a. In ArcCatalog, highlight soils feature class in the Catalog Tree, click on Load Data button. Add boundary feature class, accept defaults.
  - b. If you don't have a Load Data button, add it to a toolbar: Tools >> Customize >> Commands Tab >> Data Converters >> Drag and drop "Load Data" command on a toolbar.

- c. *What just happened?* A boundary polygon was added to the empty soils feature class.

### Results of Initial Survey Setup – Soil Polygon Digitizing



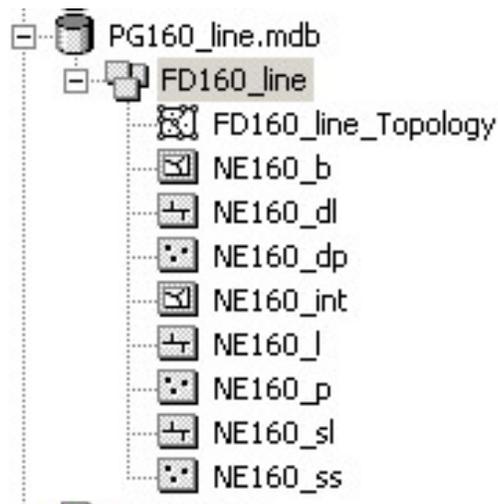
### Geodatabase Setup for an Initial Survey (Soil Polyline Digitizing)

*Use this setup if you prefer digitizing soil lines as polylines. ### refers to soil survey area id number.*

1. Acquire a boundary shapefile in UTM projection
  - a. Possible sources: digitizing unit, local, digitize your own
2. Select Model 1 – Create Personal GDB and Feature Dataset
  - a. Enter Inputs
    - New Personal GDB Name (PG###\_line)
    - Output Location (C:\home\data\ST### or location of your choice)
    - New Feature Dataset Name (FD###\_line)
    - Import Spatial Reference (Browse to and select boundary file)
  - b. *What just happened?* A new personal geodatabase and feature dataset were created using the boundary shapefile to define the spatial reference (coordinate system and XY domain).
3. Select Model 2 – Import Coverages/Shapefiles
  - a. Enter Inputs
    - Input Features (Browse to and select boundary shapefile)
    - Output Geodatabase – Feature Dataset (Browse to and select FD###\_line)
  - b. *What just happened?* The boundary shapefile was converted to a feature class in the feature dataset.
4. Select Model 4a – Import Template Initial Feature Classes – Soil lines

- a. Enter Inputs
  - Output Geodatabase – Feature Dataset (Browse to and select FD###\_line)
- b. *What just happened?* Additional feature classes for an initial survey were added to the feature dataset.
5. Select Script 4b – Rename Initial Feature Classes
  - a. Enter Inputs
    - Feature Dataset (Browse to and select FD###\_line)
    - ssaid (enter state abb. and survey number, i.e. NE160)
  - b. *What just happened?* All of the feature classes in the feature dataset except the boundary were renamed with the Soil Survey Geodatabase Structure naming convention. Since the boundary could have any original filename, rename it manually to st###\_b with a Rt. Click >> Rename.
6. Select Model 5 – Add domains for template feature classes
  - a. Enter Inputs
    - Input Geodatabase (Browse to and select PG###\_line)
  - b. *What just happened?* Domains (choice lists) for several of the template feature classes were added to the geodatabase.
7. Select Model 8a – Create Topology – Soil Lines
  - a. Enter Inputs
    - Enter Topology Name (FD###line\_Topology)
    - Browse to and Select Feature Dataset (FD###\_line)
    - Browse to and Select Soil Line Feature Class to Participate (st###\_sl)
  - b. *What just happened?* A topology object was created in the feature dataset. Four rules were set up for the soil line feature class – must not have dangles, must not intersect, must not self-overlap, and must not self-intersect. The cluster tolerance was set to 0.0005 meters.
8. Load boundary lines into soils feature class using the Simple Data Loader.
  - a. First convert the boundary polygon shapefile to lines.
    - Data Management Tools >> Features >> Feature to line
  - b. In ArcCatalog, highlight soils feature class in the Catalog Tree, click on Load Data button. Add boundary line shapefile, accept defaults.
  - c. If you don't have a Load Data button, add it to a toolbar: Tools >> Customize >> Commands Tab >> Data Converters >> Drag and drop "Load Data" command on a toolbar.
  - d. *What just happened?* Boundary lines were added to the empty soil line feature class.

## Results of Initial Survey Setup – Soil Polyline Digitizing



## ARCMAP SETUP

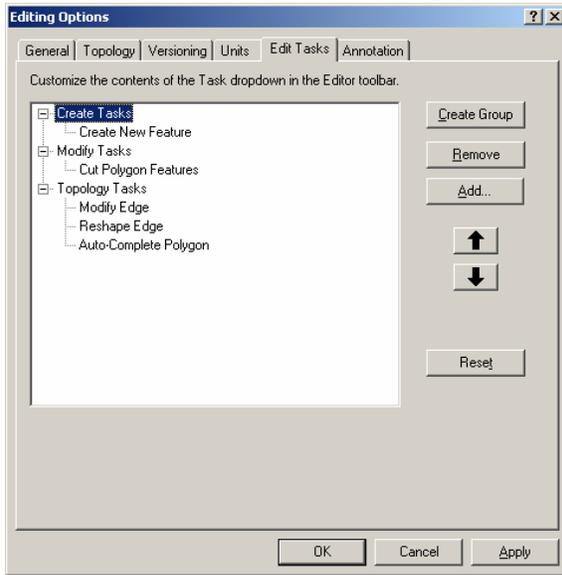
ArcMap lets you view, create, and query maps, as well as edit data. The ArcMap user interface can be customized to reflect your preferences. The cadre did some customizations to the user interface to reflect the type of work soil scientists do in ArcMap. These customizations are stored in a template file called normal.mxt. This file can be found on the course CD and on the DSS website. Copy the file to:

**C:\Documents and Settings\first.last\Application Data\ESRI\ArcMap\Templates**

This will overwrite a normal.mxt file if it already exists. If you don't want to use our template, you can revert back to the original template by deleting the normal.mxt file and starting up ArcMap again. ArcMap will regenerate Normal with software defaults upon startup.

## Customizing the Editor Task List

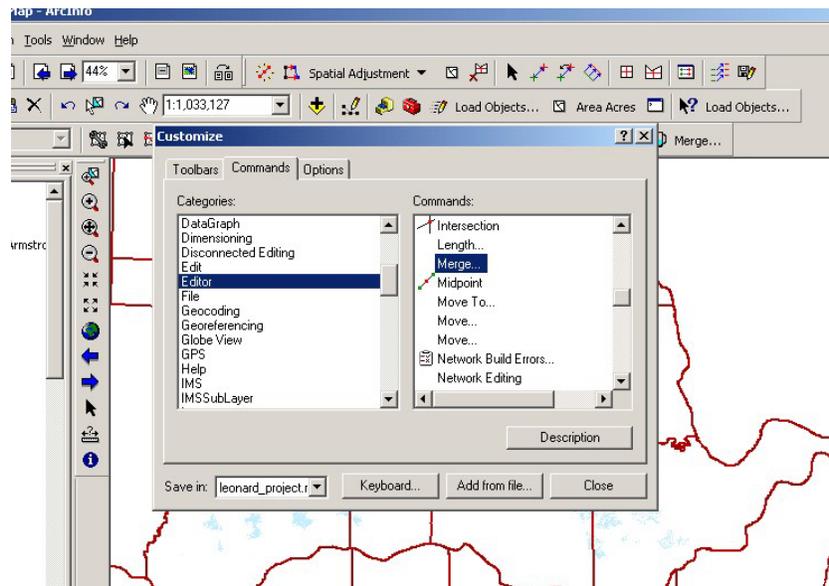
There are many editor tasks found in the default task list that will not be used. There are also a few commands that should not be used because they could create errors. Remove those commands from the Editor Toolbar. Select Editor >> Options >> Edit Tasks tab. Highlight a command and select Remove.



Retain these commands:  
 Create New Feature  
 Cut Polygon Features  
 Modify Edge  
 Reshape Edge  
 Auto Complete Polygon

## Customizing Toolbars

You may want to add or remove commands from toolbars. From the Main toolbar, select Tools >> Customize >> Commands tab. Select a Category and then select a command within that category. Drag and drop the command directly onto a toolbar.



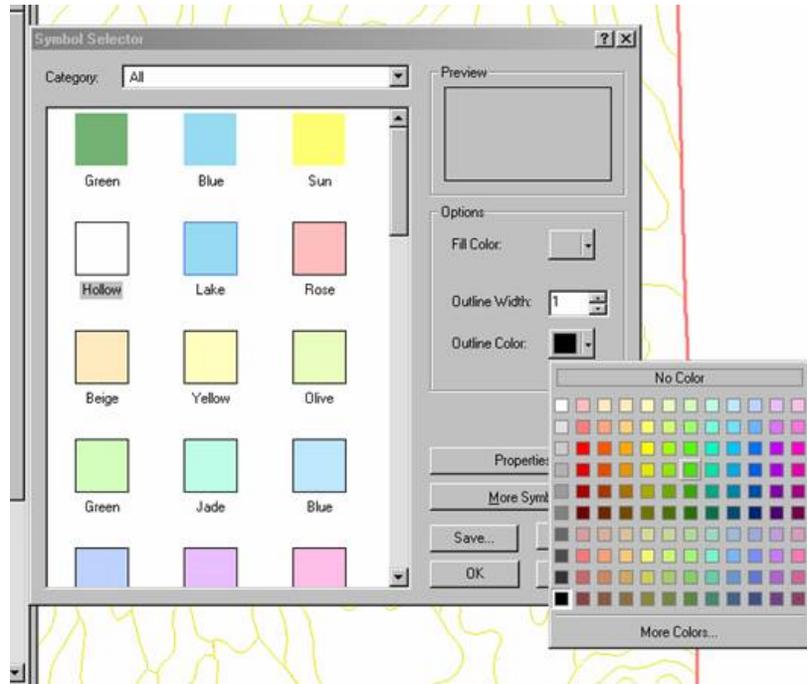
To remove a command from a toolbar, drag it off of a toolbar after selecting Tools >> Customize.

## Symbolizing a Map

### Changing the appearance of soil polygons.

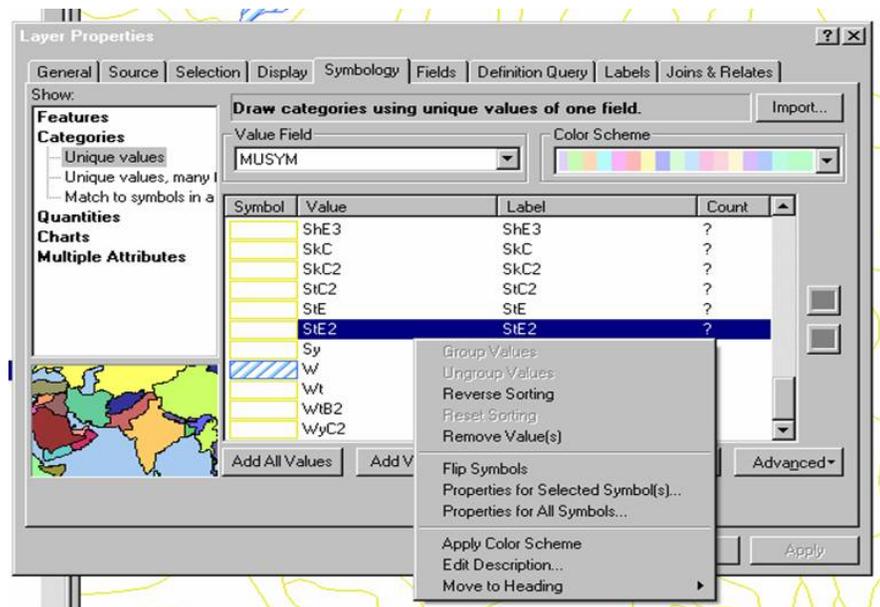
**Uniform symbology** (all polygons appear the same):

Double click on the symbol for the soils layer in the Table of Contents to open the Symbol Selector. Select Fill Color, Outline Width, and Outline Color in the Options box.



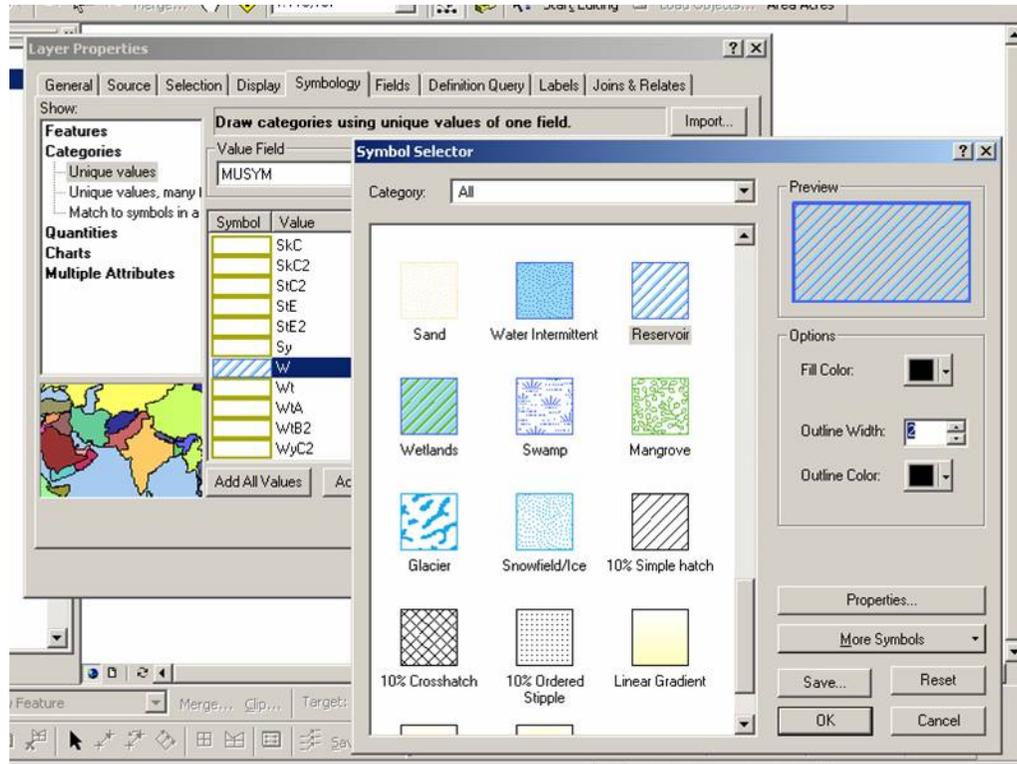
**Unique symbology:** Rt. click on the soils layer in the TOC, select Properties, Symbology Tab:

- (1) Show Categories Unique values
- (2) select MUSYM as Value Field
- (3) Add All Values
- (4) Rt. click in symbol window, select Properties for All Symbols, and choose a symbol for all.



Now select properties for selected symbols:

Highlight a unique symbol to change in the symbol box (W for example), rt. click in the symbol box and select Properties for Selected Symbols. Choose a symbol to represent the selected symbol from the symbol selector. Or double click on the symbol in the symbol box and select a new symbol from the symbol selector.



### Displaying labels:

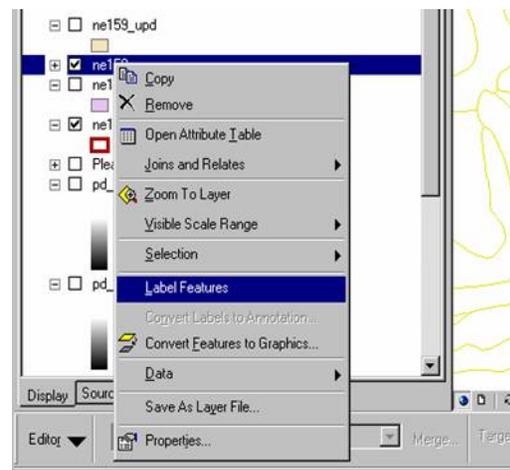
Rt. click on the layer in the TOC, check Label Features.

To modify the appearance of the labels:

Rt. click on the layer in the TOC, select Properties, Labels tab.

Select the Label Field to display in the Text String box.

Select Font, Size, and Color of labels in the Text Symbol box.



### Modifying appearance of reference imagery:

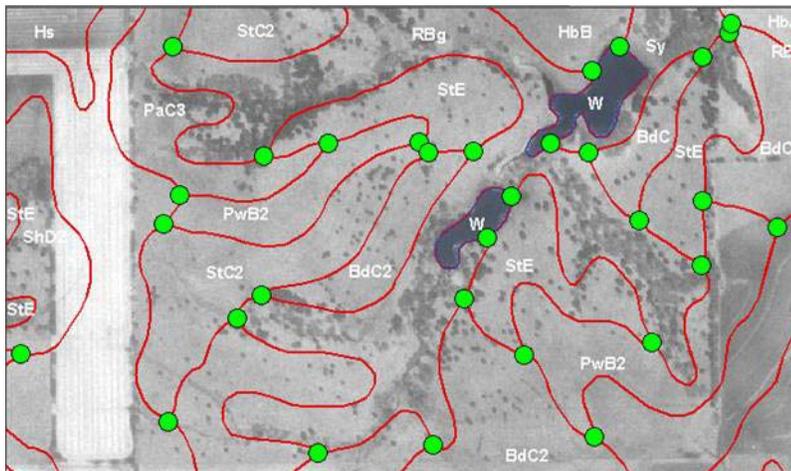
Use the Effects toolbar. Select the layer to modify and adjust contrast, brightness, and/or transparency by selecting the appropriate button.



**Saving the map document:** Select File Save or Save As from the main toolbar to save the location and symbology of the map layers as an mxd file. This does not save edits to feature classes. Select Save Edits from the Editor toolbar to do that.

### Editing in ArcMap

The editing section will begin with the simplest editing tools and move on to more advanced tools. Editing between nodes will be covered first. Nodes are represented as bright green circles in the illustration below. Nodes are located at the intersection of line segments or arcs. To display nodes check “Unselected Nodes” under Editor >> Options >> Topology Tab.



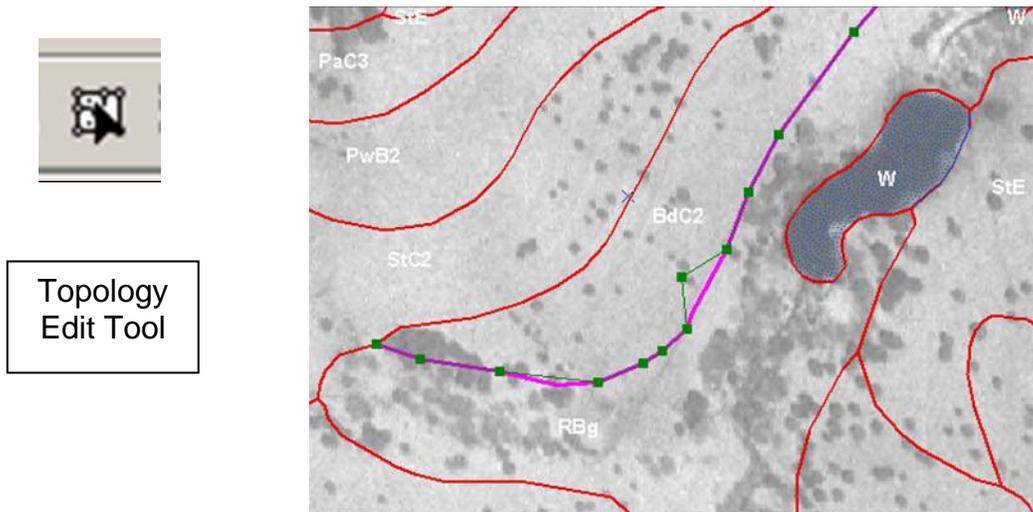
**Compact geodatabase:** Geodatabases increase in size rapidly during editing. Compact your geodatabase at least once per editing session. Select ArcToolbox >> Digital Soil Mapping Tools >> Database Management >> Compact.

**Editing Scale:** Validate maps for editing at about half the publication scale (validate 1:24000 scale maps at 1:12000, validate 1:12000 scale maps at 1:6000). Zoom in to edit no further than about 1:3000.

**To begin editing:** Select Start Editing from the Editor toolbar. Set selectable layers from the Selection tab in the Table of Contents. Only turn on the layers you want to edit. Typically this will be only the soils layer and the special feature layers if they exist. Edits are not saved until you select Save Edits from the Editor toolbar.

### **Node to Node Editing: Modify Edge**

Set edit task to Modify Edge on the Editor toolbar. Select the line to edit with the Topology Edit tool from the Topology toolbar. The line will turn magenta when selected and vertexes will appear as green boxes.



To move a single vertex: hold cursor over a vertex, cursor symbol will change from an arrow to a diamond shape, left click mouse and drag the vertex to desired location. New vertex position is a sketch. Either double left click or press F2 to make permanent.

To delete a vertex: hold cursor over the vertex to delete, cursor symbol will change from an arrow to a diamond shape, right click mouse, select Delete Vertex. New line without vertex is a sketch. Either double left click or press F2 to make permanent.

To insert a vertex: hold cursor over line where you want to insert the vertex, cursor symbol will change from arrow to a cross, right click mouse, select Insert Vertex. New line with new vertex is a sketch. Either double left click or press F2 to make permanent.

To move all vertexes on a line proportionately: Go to Editor, Options, General tab, turn on "Stretch geometry proportionately when moving a vertex". Hold

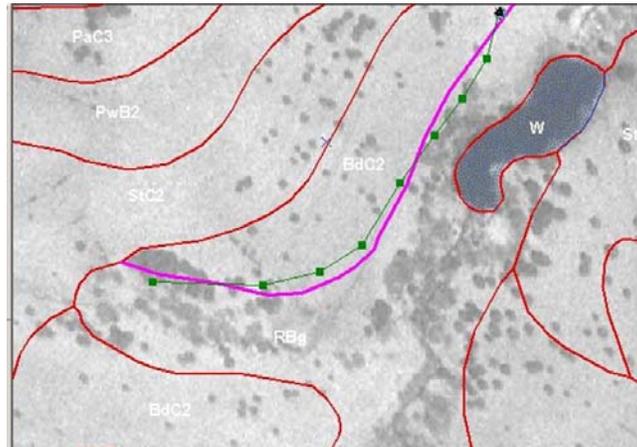
cursor over a vertex, left click mouse, drag all vertexes to new location. New line is a sketch. Either double left click or press F2 to make permanent.

### Node to Node Editing: Reshape Edge

Set edit task to Reshape Edge. Select the line to edit with the Topology Edit tool. The line will turn magenta when selected. Select the sketch tool from the Editor toolbar. Sketch a new line with the sketch tool crossing the old line at least twice. Left click mouse to drop a vertex. New line is a sketch. Double left click or press F2 to make permanent.



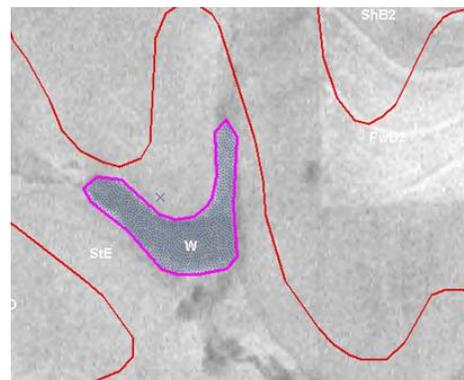
The Sketch Tool



To sketch in stream mode: Set stream tolerance under Editor, Options, General tab, Stream tolerance. Try 30 map units (meters). Select the sketch tool. Press F8 to turn on stream mode. Left click mouse to begin sketch. Move mouse to sketch new line. New line is a sketch. Double left click or press F2 to make permanent. Press F8 again to turn off stream mode.

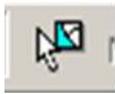
### Node to Node Editing: Move an island polygon

Set edit task to Reshape Edge. Select island polygon with Topology Edit tool. Hold cursor over the polygon line, cursor becomes a cross, left click mouse, drag entire polygon to new location without crossing any other polygon lines.

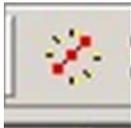
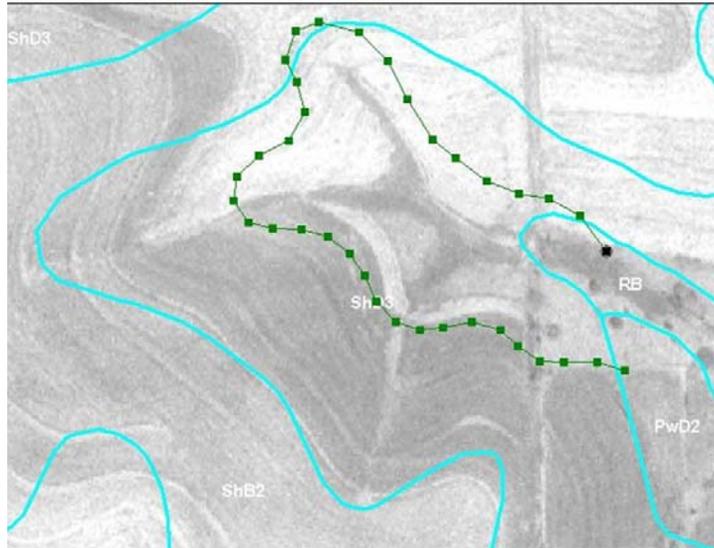


## Across Node Editing: Cut Polygon Features / Merge

Set edit task to Cut Polygon Features. Select polygon or polygons to cut with the Select Features tool. Selected polygons are outlined in cyan. Select the sketch tool. Sketch the cut line with the sketch tool crossing existing polygon lines at the beginning and end of the sketch. Double left click to end the sketch.



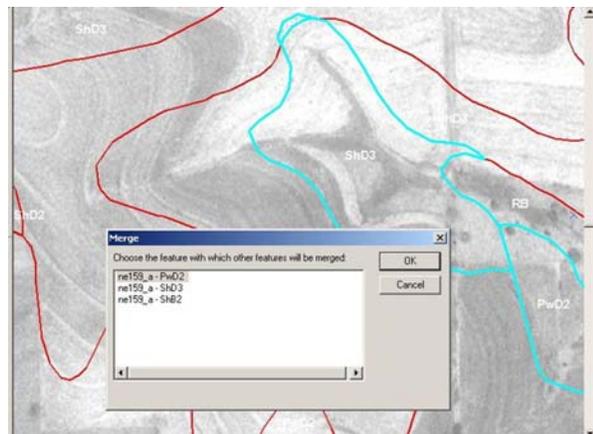
Select  
Features  
Tool



Depending on how the cut was made, multi-part polygons may have been created. While all of the polygons involved in the cut are still selected, select the Explode button from the Spatial Adjustment toolbar (or Advanced Editing toolbar) to explode them back to single part polygons.

It may be necessary to merge selected polygons together after the cut. Select polygons to merge with the Select Features tool. Select the Merge command, highlight the label to retain after the merge, and click OK.

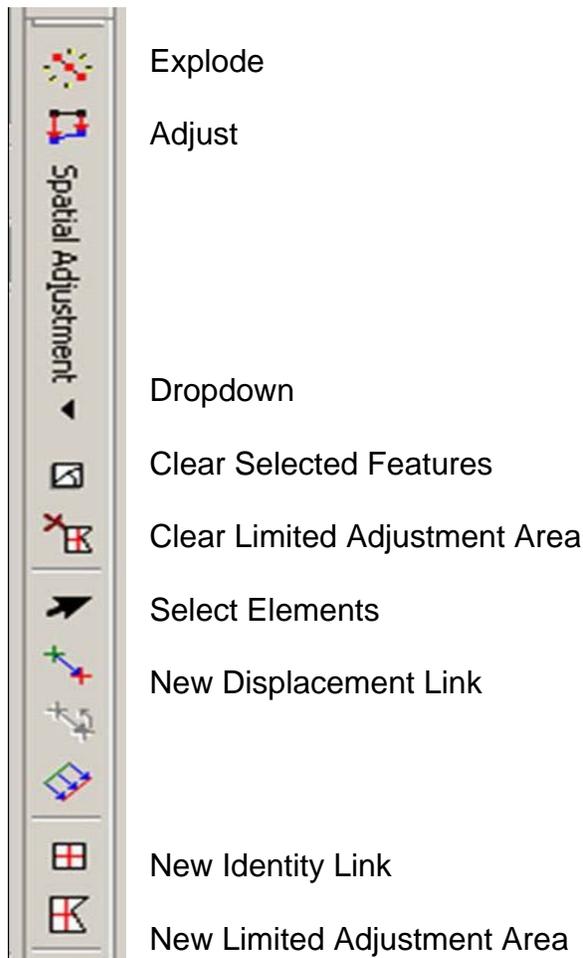
Merge...



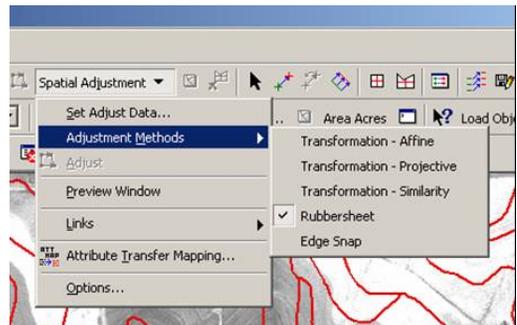
## Spatial Adjustment

This technique is used to correct geometric distortions in the data through a process called rubbersheeting. Displacement links are used to determine where features are moved. The user can limit the area to adjust.

The Digital Soil Survey Spatial Adjustment Toolbar :



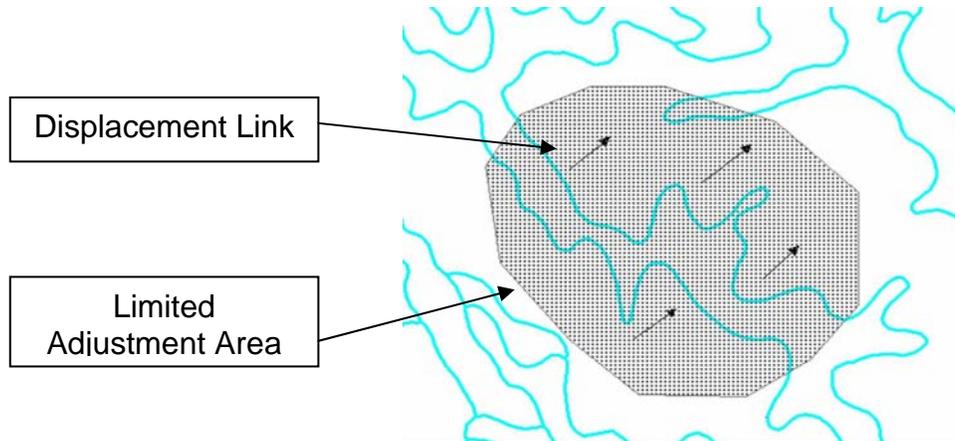
Setup for Spatial Adjustment:  
Set the Adjustment Method to  
Rubbersheet from the Spatial  
Adjustment toolbar dropdown.



Check the selection tab on the table of contents. Only the layers that you want adjusted should be checked as selectable.

Place displacement links. The length and direction of the links determine the direction and degree of adjustment. Click the New Displacement Link button on the Spatial Adjustment toolbar. Left click to start the link and left click again to end it. After placing all of the links, define the area to adjust. Select the New Limited Adjustment Area tool from the Spatial Adjustment toolbar. Draw a boundary around the area to adjust including all of the links and in close

proximity to the links. Double click to finish the area. The limited adjustment area will be hatched. Select all polygons involved in the adjustment by drawing a box around it with the select features tool. Selected polygons are cyan.



If there are areas within the limited adjustment area you don't want to move, place identity links to anchor with the New Identity Link button, just left of the limited adjustment area button.

Click the Adjust button to perform the adjustment. Only the features within the limited adjustment area will be affected by the adjustment. If you are satisfied with the results, save edits. If not, try again without saving. To clean up after the adjustment, select all of the links with the Select Elements tool on the Spatial Adjustment toolbar and press the Delete key on your keyboard. Also clear selected features and clear limited adjustment area using the buttons on the Spatial Adjustment toolbar.

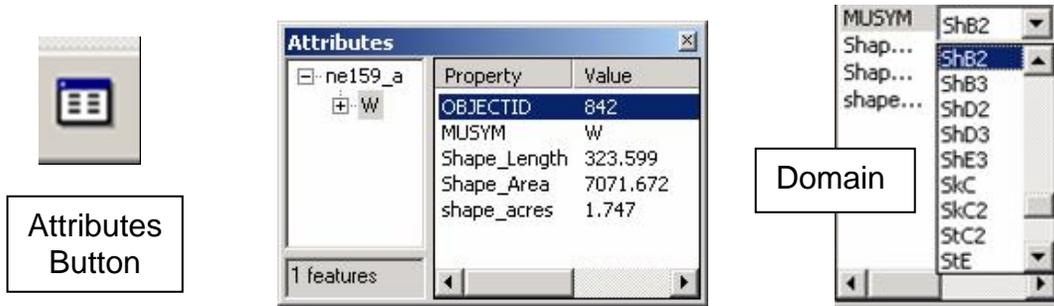
### **Moving a Node:**

Set edit task to Reshape Edge or Modify Edge. Select node to move: Select the Topology Edit tool, press the letter n on the keyboard and left click on the node. Hold the cursor over the selected node, left click and drag to new location. If "Stretch geometry proportionately when moving a vertex" is turned on under Editor, Options, vertices near the node will move proportionately with the node.

### **Labeling Features in ArcMap**

Select feature to label with the select features tool. Open the Attributes box for the selected feature by clicking on the Attributes button on the Editor toolbar. Click in the value field in the attributes box for the property you want to label or re-label, MUSYM for example. Enter a new label. If a domain is associated with that field, you will select an attribute from the choice list. If no domain is

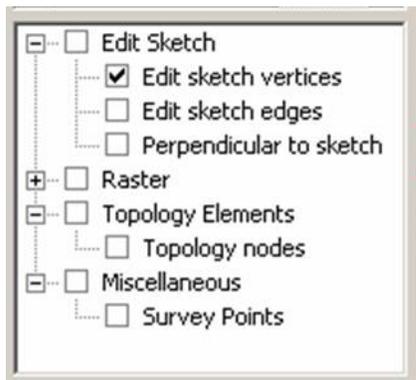
associated, you can enter a new label from the keyboard.



Instructions for creating a domain for soil labels were included in the update survey setup section. To turn off the domain, select ArcToolbox >> Digital Soil Mapping Tools >> Domain Management >> Remove Domain from Field. To turn it back on, select Assign Domain to Field.

## Creating New Features in ArcMap

### Create New Island Polygon:



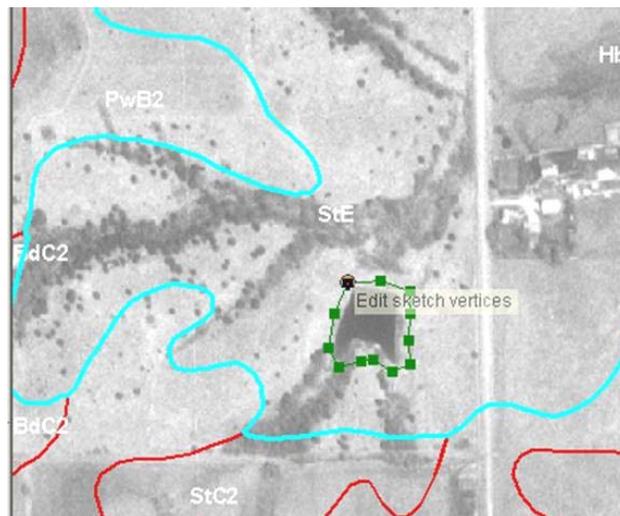
Select Editor >> Snapping.

Turn on Edit sketch vertices.

This allows you to create a new island polygon with the Cut Polygon Features edit task.

Set edit task to Cut Polygon Features. Select polygon that will contain the new island polygon with the select features tool. Sketch new polygon with the sketch tool. Double click to finish the sketch.

Select the new polygon, open the attribute box, and label.



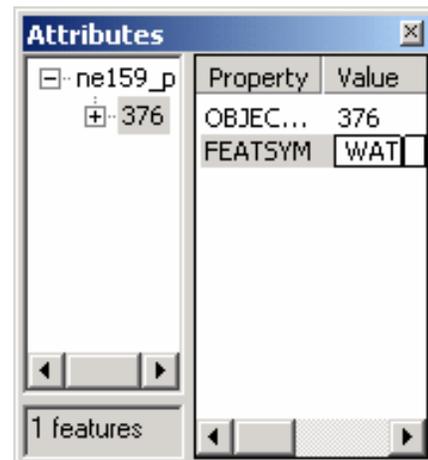
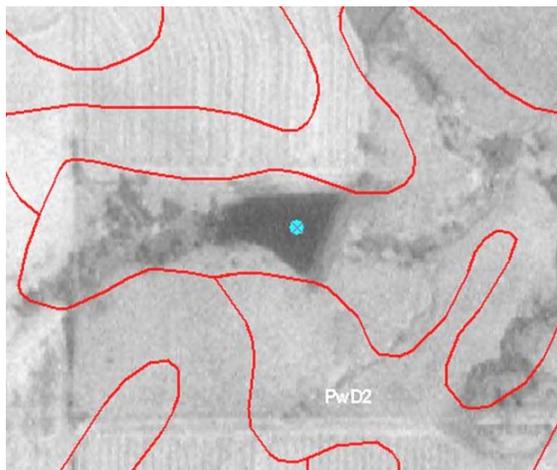
### Create New Polygon Feature beyond feature class edge:

Set edit task to **Auto Complete Polygon**. Use sketch tool to delineate a new polygon in single vertex or stream mode. Double click to finish the sketch. Select the new polygon, click on the attributes box, and label.



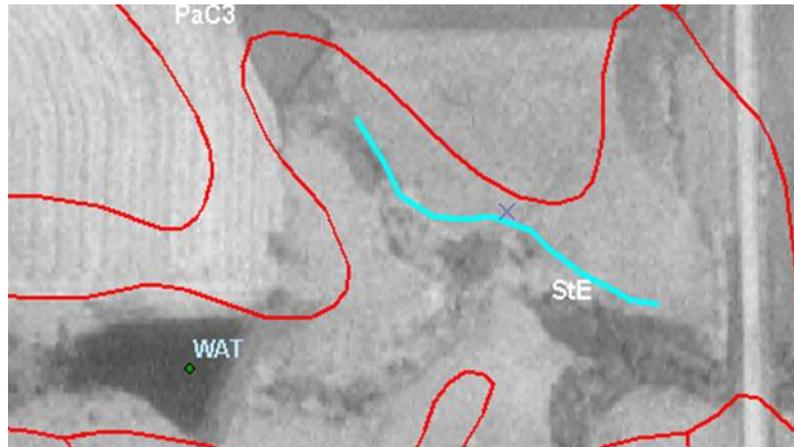
### Create New Point Feature:

Set edit task to Create New Feature. Set target to point feature class from the Editor toolbar target dropdown. Activate the sketch tool. Left click mouse on the map where you want to place the point. Label selected point from attributes box.



### **Create New Line Feature:**

Set edit task to Create New Feature. Set target to line feature class from the Editor toolbar target dropdown. Activate the sketch tool. Sketch the new line in single vertex or stream mode. Double click to finish the sketch. Label selected line from attributes box.



### **Moving or Deleting Point or Line Features:**

Check selectable layers in Table of Contents selection tab. Turn on point and/or line feature class containing points to move or delete. Turn off all others to avoid inadvertently selecting those features.

Use Edit tool on Editor toolbar to select point or line feature. Press delete key on keyboard to delete selected feature. To move selected point or line feature, hold cursor over selected feature, left click mouse, and drag to new location.

## **TOPOLOGY TOOLS**

A topology object for the feature dataset was created after running Model 8 in the Digital Soil Survey setup toolbox. The object contains two rules for the soils polygon feature class – no gaps and no overlaps. Validating the topology of the feature class will fix all gaps and overlaps that fall within the cluster tolerance setting and identify gaps and overlaps greater than the cluster tolerance setting. The model set the cluster tolerance at 0.0005 meters to meet SSURGO standards.

## Validating Topology

There are three choices for validating topology from the topology toolbar:



Specified Area  
Current Extent  
Entire Topology

Start editing. Validate the topology by one of the three methods by clicking on the appropriate button. Topology errors will be either fixed or flagged after validating depending on the cluster tolerance setting.

## Fixing Topology Errors

Open the Topology Error Inspector from the Topology toolbar.

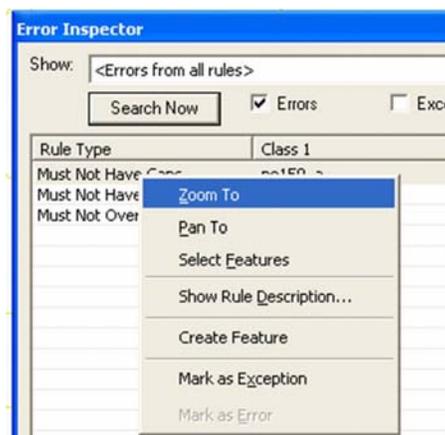


Select Search Now (Visible Extent only should not be checked). Errors from all rules will be displayed in the table.

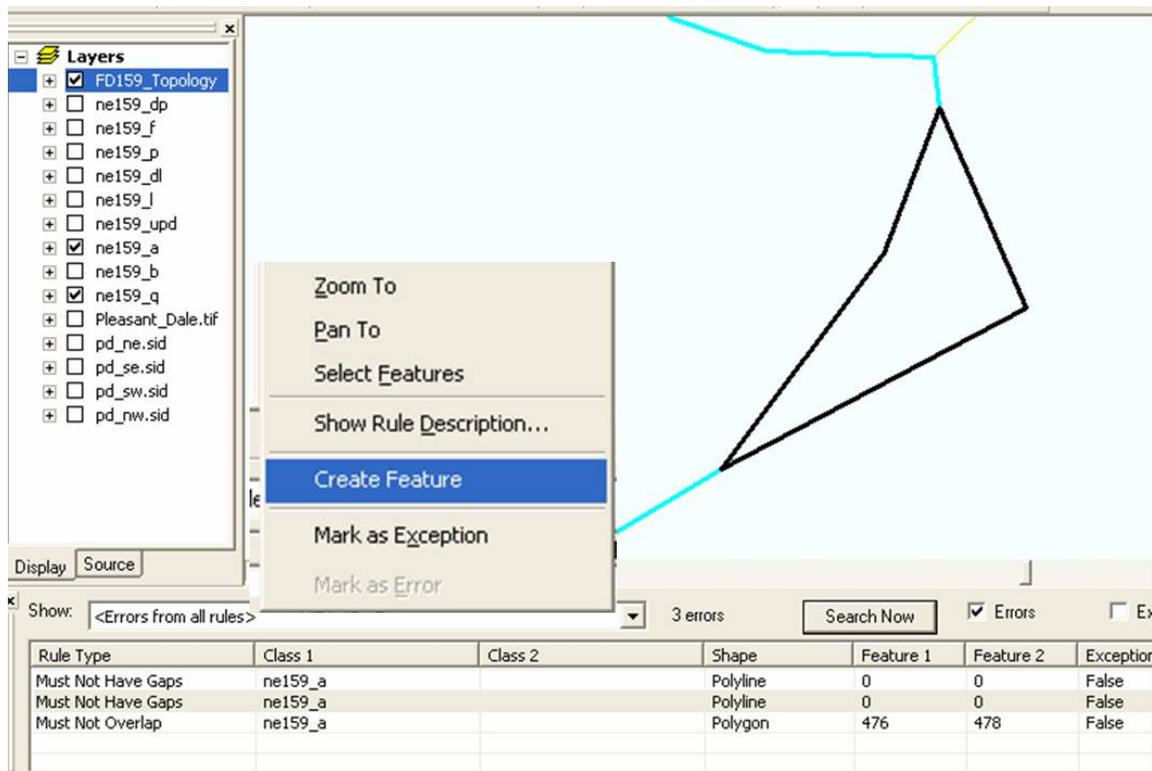
| Rule Type          | Class 1 | Class 2 | Shape    | Feature 1 | Feature 2 | Exception |
|--------------------|---------|---------|----------|-----------|-----------|-----------|
| Must Not Have Gaps | ne159_a |         | Polyline | 0         | 0         | False     |
| Must Not Have Gaps | ne159_a |         | Polyline | 0         | 0         | False     |
| Must Not Overlap   | ne159_a |         | Polygon  | 476       | 478       | False     |

Right click on an error in the table.  
Select Zoom To.

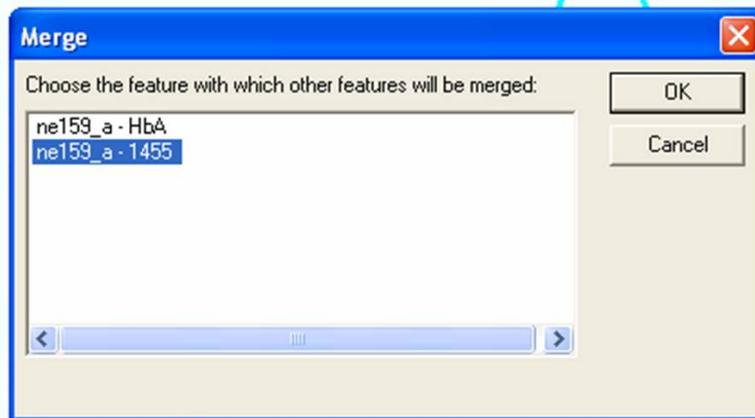
The selected error will be displayed  
in the current extent of the map.



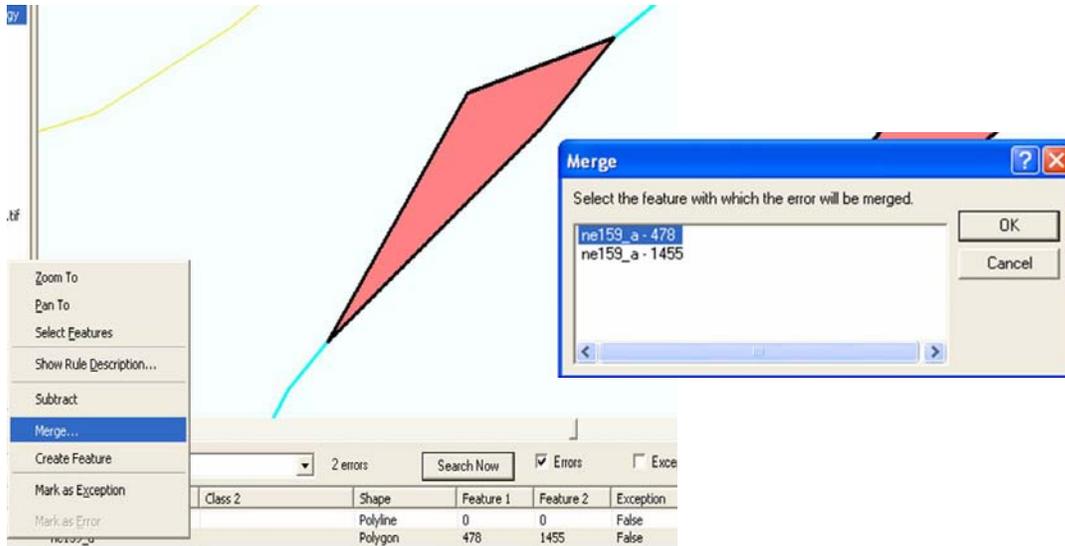
**Fixing Gap Errors:** Gap edges will be black when selected with hollow fill. Right click on selected gap error in error inspector table, select Create Feature.



A new polygon is created to fill in the gap. Select the new polygon and an adjacent polygon with the Select Features tool. Select Edit Merge and merge the new polygon with the selected adjacent polygon by highlighting the adjacent polygon in the Merge window. The gap is fixed.



**Fixing Overlap Errors:** Overlap polygons have black edges when selected with red fill. Right click on selected overlap error in error inspector table, select Merge.



Select the feature with which the error will be merged by highlighting the adjacent polygon in the Merge window. The overlap is fixed.

**Alternate method for fixing gaps and overlaps:**

Select gap line or overlap polygon with the Fix Topology Error Tool. Click tool and then left click on the feature.



- Gap: Right click selected gap, select Create Feature, then Edit Merge with adjacent polygon.
- Overlap: Right click selected overlap, select Merge, highlight adjacent polygon to merge with.

**Helpful Topology Hints:**

Occasionally while editing you will notice “lines” left after a merge. The lines are actually very small gaps. The gaps will almost always go away simply by validating the topology in the current extent.

Occasionally you may find you have hundreds or even thousands of topology errors probably due to improper setup, editing without topology, or improper use of editing tools. A quick way to fix a lot of them is to temporarily raise the cluster tolerance to no higher than 0.5 to 1 meter, validate the entire topology, and lower the cluster tolerance back to the recommended 0.005 m. Most of the errors were

probably within the higher cluster tolerance and will have been fixed by validating the topology. The cluster tolerance is set through ArcToolbox >> Digital Soil Mapping Tools >> Topology >> Set Cluster Tolerance.

## POLYLINE DIGITIZING

*What is it?* Soil boundaries are digitized as lines rather than polygons.

### Advantages

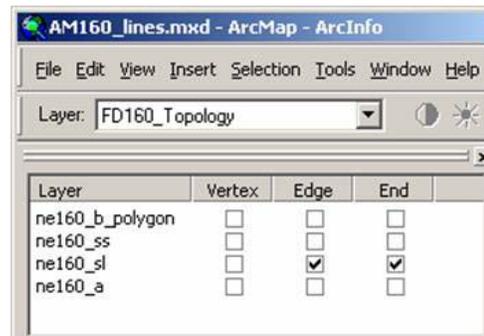
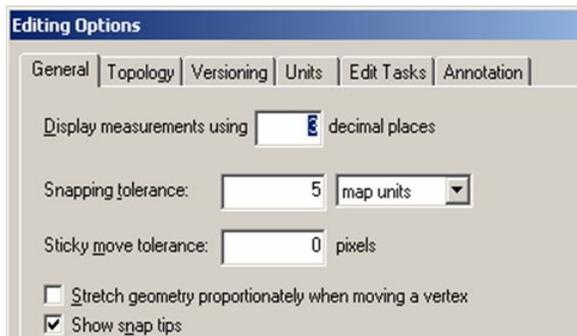
You can leave lines dangling or open. Polygons have to be closed. Smoothing tools work well on lines, cause gaps and overlaps with polygons.

### Setup

Requires a line feature class for soil lines, a topology object with line rules, and a point feature class for label points. Follow the setup procedures for an initial survey (soil polyline digitizing) described in the geodatabase setup section of this manual.

### Procedure

Start editing. Set the snapping tolerance to 5 map units (meters) under Editor >> Options >> General >> Snapping Tolerance. Turn on Show Snap Tips. Select Editor >> Snapping and turn on Edge and End snapping for the soil line feature class.

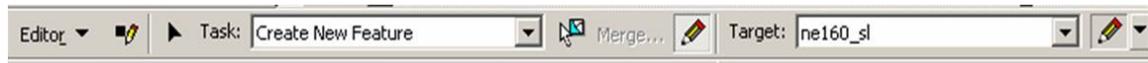


Add the split tool to a toolbar. Select Tools >> Customize >> Editor Category. Highlight the Split Tool command and drag and drop it onto a toolbar.

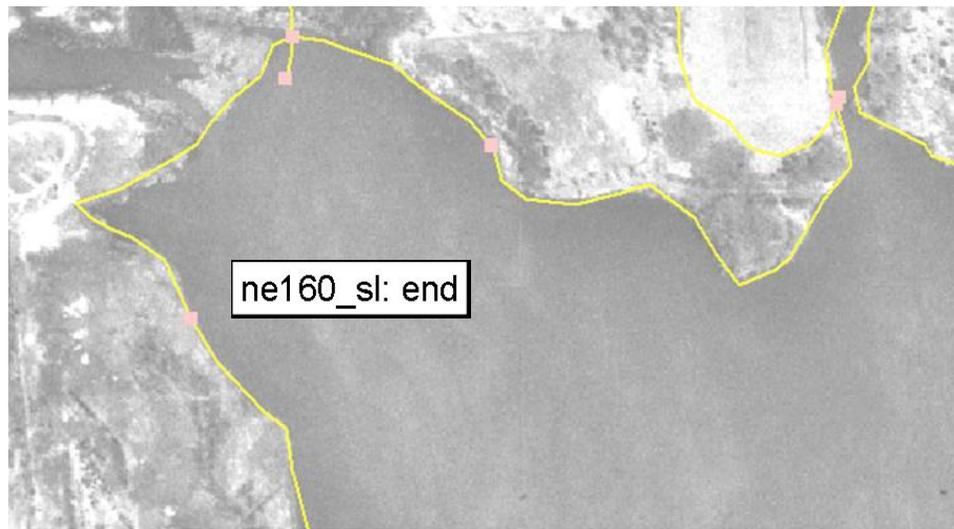


### Drawing Lines:

Set edit task to Create New Feature on the editor toolbar. Set target to the soil line feature class (###\_sl). Select the sketch tool from the editor toolbar and sketch lines with the mouse in either single vertex or stream mode. Double left click to finish the sketch.



To add to an existing line, hold the cursor over the end of the existing line so that the snap tip box appears. Then start drawing. This ensures that the lines will be snapped.



### The Split Tool:

Clicking on a line with the split tool will split the line at that point into separate segments. This can be useful if you want to select just a portion of a line for editing or deleting.

### Modify Feature and Reshape Feature:

These commands were removed from the edit task list to prevent digitizing errors while editing polygons. These commands can be used to modify or reshape line features. Select Editor >> Options >> Edit Tasks >> Add to add them to the edit task list. The commands work in the same fashion as modify edge and reshape edge except that you are not required to select the features with the topology edit tool. Use the select features tool to select the features to modify or reshape.

### Adding Label Points:

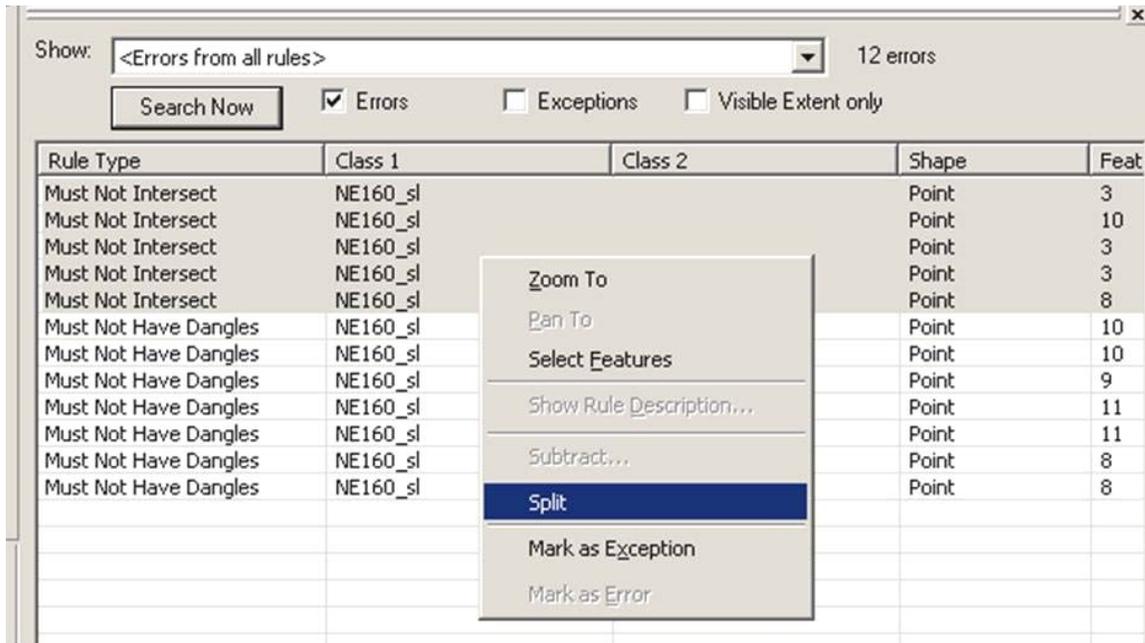
Attributes for a map unit will be assigned to a point. Both the line feature class and label point feature class will be converted to a polygon feature class after digitizing.

Set edit task to Create New Feature and set target to soil symbol point feature class (###\_ss). Use the sketch tool to digitize a point inside the map unit. Label selected point using the attributes button on the editor toolbar.

**Fixing Line Topology Errors:**

Validate the entire topology for the line feature class. Open the error inspector, uncheck visible extent only, and click Search Now. Sort the table by rule type by clicking on Rule Type header in error inspector table.

Fix point shape intersect errors first. Select all of the point shape intersect errors in the table by holding the shift key on your keyboard while left clicking the first and last point shape intersect error in the list with the mouse. Right click on the selected intersect errors in the table. Select Split from the menu to fix point shape selected point shape intersect errors and remove them from the table.



Polyline shape intersect errors are fixed by selecting the errors and then selecting Subtract from the menu.

There are several options for fixing dangles. Some may be legitimate because they are temporarily at the edge of mapping. Leave those alone. Some are overshoots where a line was extended beyond an intersecting line. Select the overshoot line segment and delete. Or leave the segment alone because it will not be converted to a polygon and in essence deleted during the conversion process. Some dangles are undershoots where the line segment was not extended far enough. Right click on selected dangle in the table and select Snap. A Snap Tolerance box appears. Enter a snap distance and if the distance

between lines is within the snap distance entered, the lines will be snapped together. If nothing happens, increase the snap distance.

### Smoothing Lines

Selected lines can be smoothed and simplified using the smooth and generalize tools on the Advanced Editing toolbar. The user inputs an offset value. Keep the number low and observe what happens closely. Don't attempt to select all of the



lines for smoothing and generalizing at once because the results can be so unpredictable. If you don't generalize after smoothing, you will have an inordinate amount of unnecessary vertices that will greatly increase file size. Be careful not to smooth or generalize the survey area boundary. Topology errors are sometimes created after using these tools. Validate the topology and fix any errors after using these tools.

### Converting Lines and Label Points to Polygons

*Why?* SSURGO data must be polygons. Most of the error checks are done on polygons. Digitizing units will only accept polygons.

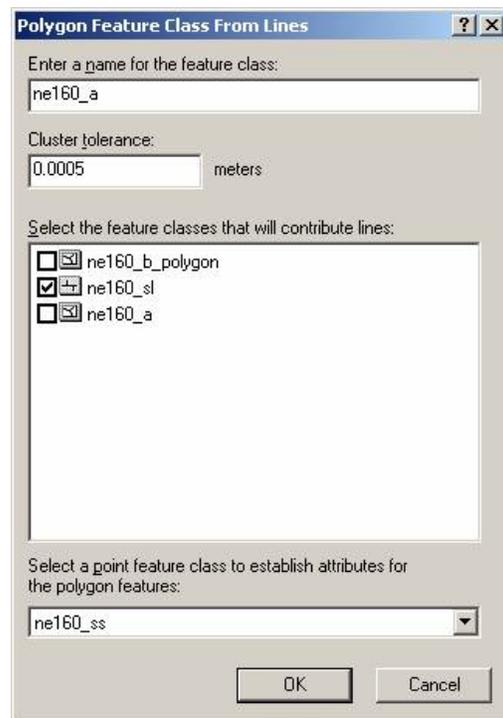
Open ArcCatalog. Right click on the feature dataset containing the soil line feature class. Select New >> Polygon feature class from lines.

Enter a name for the soil polygon feature class in the Soil Survey Geodatabase Structure format: st###\_a.

Enter 0.0005 m for the cluster tolerance.

Select the soil line feature class (st###\_sl) to contribute the lines.

Select the soil symbol point feature class (st###\_ss) to establish attributes for the polygon features.



Any dangles or lollipops in the line feature class will not be converted to polygons.

## Adjacent Data

### Edge Matching to Adjacent Surveys

There is an edge matching tool in ArcGIS. It does not work satisfactorily. The cadre is recommending at this time that you get the lines close enough so that it is obvious to the digitizing units which lines should be snapped if any. The digitizing units will handle the edge matching. SSURGO requires only that the survey area boundaries match within about 6 meters at 1:24000 scale. The digitizing units will make sure the boundaries match before posting data to the data mart.

### Getting the lines close enough:

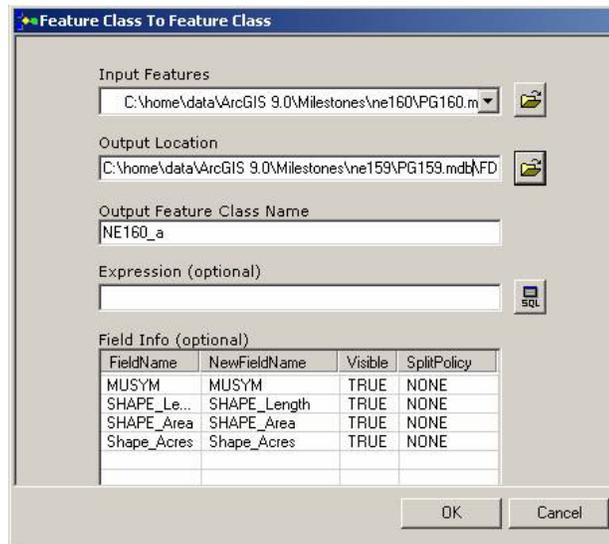
The simplest way to edit adjacent surveys is to load the adjacent feature class into your geodatabase, edit, and then export the edited feature class back to its original geodatabase. This allows you to edit both feature classes in the same edit session.

To add an adjacent feature class:

ArcToolbox >> Conversion Tools >> To Geodatabase >> Feature Class to Feature Class

Make sure to select the feature dataset of your geodatabase as the Output Location.

After editing, use the same tool to export the edited feature class back to its original geodatabase, replacing the original feature class.

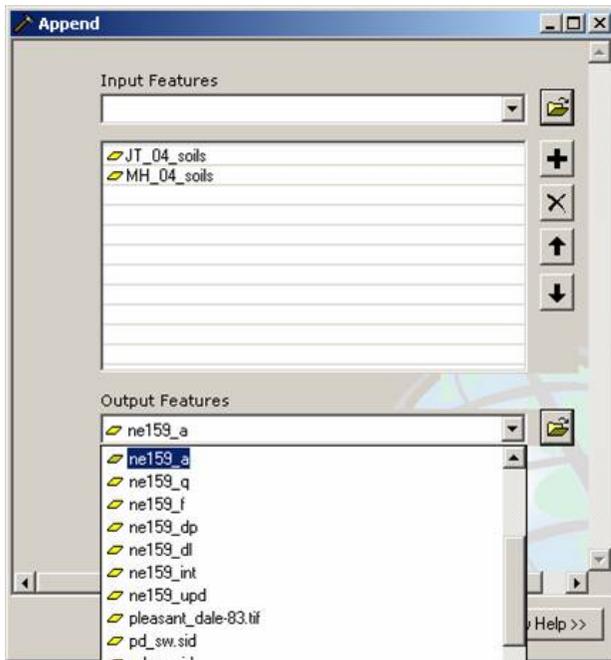


### Combining Adjacent Feature Classes

You may need to combine adjacent feature classes into one feature class sometimes, combining adjacent mapping for the same survey for example. There are two options: the append tool or the load data tool as described in initial survey setup.

## Appending Feature Classes

ArcToolbox >> Digital Soil Mapping Tools >> Feature Class Management >> Append OR ArcToolbox >> Data Management Tools >> General >> Append



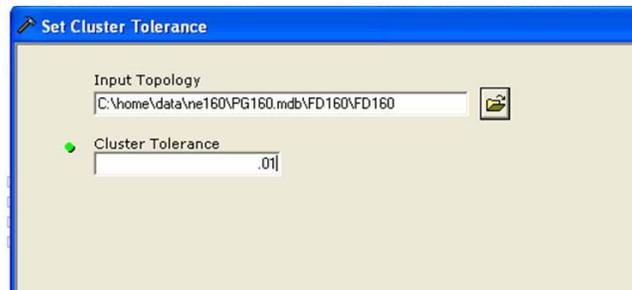
Select input feature(s) that will be appended to the target feature class.

Select the existing output feature class that will contain the appended input features.

Validate topology of appended feature class to determine if there are any gaps or overlaps between the original data and appended data. If there are gaps or overlaps, measure their width by zooming to the errors and using the distance tool. Temporarily raise the cluster tolerance to a number slightly higher than the largest distance. Validate the topology in just the specified area where the errors occur. All gaps and overlaps in the specified area should be eliminated after validating the topology with the higher cluster tolerance. Reset the cluster tolerance to the recommended setting of 0.0005 meters to continue editing.

Setting the cluster tolerance of the topology object:

ArcToolbox >> Data Management Tools >> Topology >> Set Cluster Tolerance



## Printing Hard Copy Maps for Validation

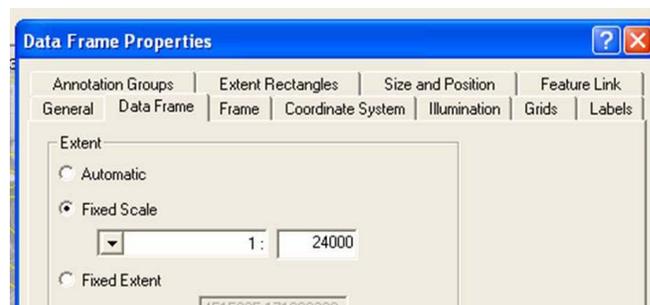
Select map layers to print by checking them in the table of contents.

Select symbology for each layer. Refer to map setup section for instructions.

Select Page and Print Setup from the File menu to set the printer and page size properties.

Switch to Layout View (View >> Layout View).

Set the scale for printing. Select View >> Data Frame Properties >> Data Frame tab. Click Fixed Scale extent and enter a scale in the box.



Position the area to print within the selected page size by using the pan tool.

Insert other map features as desired from the Insert menu (title, north arrow, etc).

Send the file to selected printer. File >> Print >> OK.

## Quality Control

Quality control of the spatial data is the responsibility of the soil survey project leader. One hundred percent of the data should be checked to ensure that the following are true before submitting the data to a digitizing unit for review and archiving on the Soil Data Mart.

- **Soil Survey Geodatabase Template followed**
- **No missing/null symbols**
- **No slivers**
- **No common soil lines**
- **No gaps or overlaps**
- **Edge matched to adjacent surveys**
- **Spatial data fits compilation base**
- **All symbols are correct**
- **Metadata information is recorded**

The soil survey geodatabase template was described in the setup section of this manual. Procedures for finding missing or null symbols, slivers, and common soil lines will be described in this section. Finding and fixing gaps and overlaps was covered in the topology tools section. Recommendations for edge matching were covered in the adjacent data section.

The fit to the compilation base and symbol check can be done visually on screen or reviewed on hard copy plots. Instructions for printing maps were covered in the printing maps section.

Metadata information can be recorded in a text file or populated using the metadata toolbar in ArcCatalog. The critical metadata information to record is the date and type of compilation source material(s) and process used for digitizing.

### Missing or Null Symbols

Open the attribute table for the feature class, rt. click on the layer in the table of contents, select Open Attribute Table. Sort the attribute table by MUSYM. Rt. click on field heading in table, select Sort Ascending. Select null record in table by clicking in box on far left side. Click Zoom To Selected Features button to go to the selected polygon. Label the unlabeled polygon in the MUSYM field in the table.

| OBJECTID* | Shape*  | MUSYM | Shape Length |
|-----------|---------|-------|--------------|
| 1         | Polygon | RB    |              |
| 2         | Polygon | BdC2  |              |
| 3         | Polygon | StE   |              |
| 4         | Polygon | ShB2  |              |
| 5         | Polygon | BdC2  |              |
| 6         | Polygon | 2Hb   |              |
| 7         | Polygon | Sy    |              |
| 8         | Polygon | Ha    |              |
| 9         | Polygon | StE   |              |
| 10        | Polygon | HbB   | 2332.4       |
| 11        | Polygon | Sy    | 316.7        |
| 12        | Polygon | HbA   | 6408.2       |

| OBJECTID* | Shape*  | MUSYM  |
|-----------|---------|--------|
| 1009      | Polygon | <Null> |
| 23        | Polygon | 2Bu    |
| 352       | Polygon | 2Bu    |
| 449       | Polygon | 2B...  |



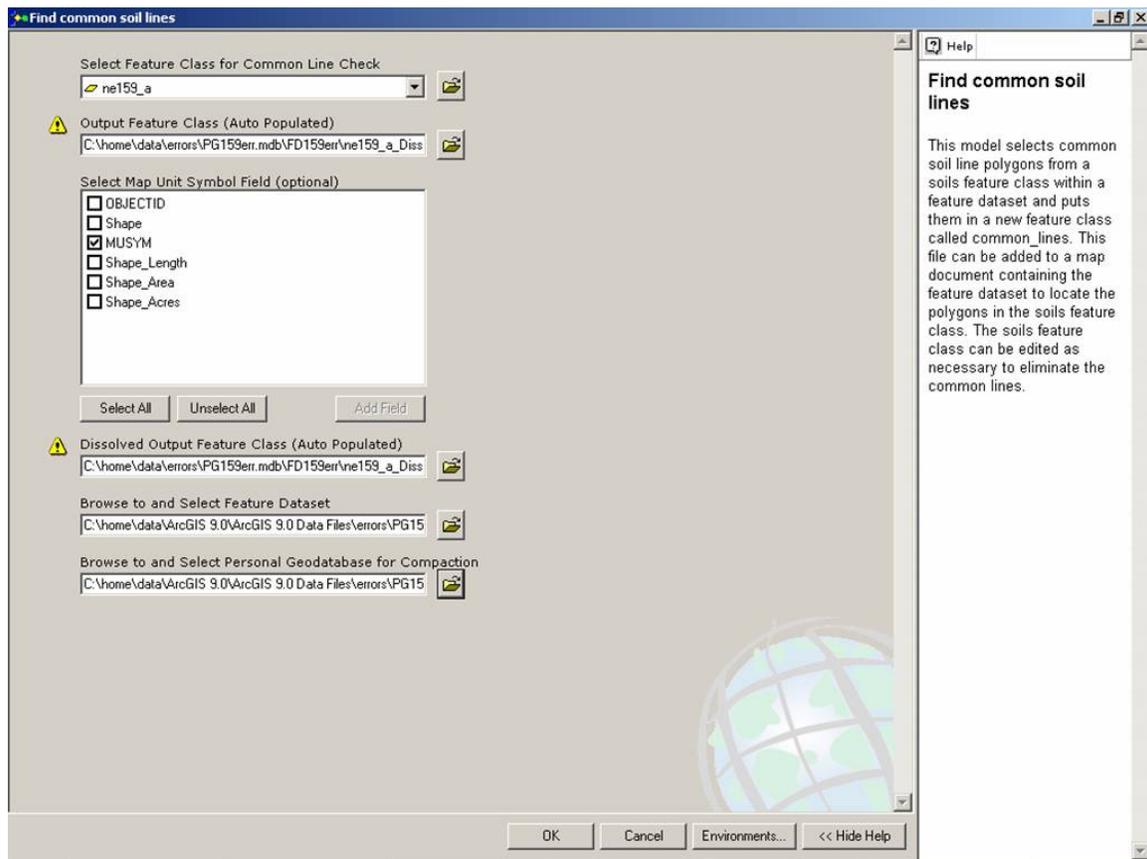
### Sliver Polygons

Use the same procedure as for null symbols above except sort the shape\_area column or shape\_acres column. Merge the slivers with adjacent polygons using the Edit Merge command.

## Common Soil Lines

The procedure for finding common soil lines involves many steps. A model was built to streamline the procedure. The model is located in the Digital Soil Survey QC toolbox. Instructions for adding the toolbox can be found in the ArcToolbox setup section of this manual.

Double click on the model to open it. Fill in the required parameters and press OK. Descriptions of the models and required parameters are found in the help window on the right side of the model window. Clicking in a parameter box will bring up the help description. Select Show Help to the right of the OK button if you can't see help.



A common lines feature class will be created in your feature dataset after running the model. It contains all of the polygons that share a common map unit symbol with an adjacent polygon. Add the common\_lines feature class to your map document. Open the attribute table. Select a feature in the table and zoom to selected feature. Determine how to fix the common line. Options are to merge the common line polygons or to change the label for one of the polygons. Remember to edit the soils feature class, not the common\_lines feature class. Run the model again to see if the common lines have been fixed. Remove the old common line feature class from your map document. Add the new one. If

there are no common lines, the feature class will be empty. The common\_lines feature class will also find multi-part polygons. Use the Explode tool as described in the editing section to fix them.

| Attributes of common_lines |         |       |              |
|----------------------------|---------|-------|--------------|
| OBJECTID*                  | Shape*  | MUSYM | Shape_Length |
| 1                          | Polygon | ShE3  | 1046.19      |
| 2                          | Polygon | ShE3  | 1471.10      |
| 3                          | Polygon | StE   | 1441.98      |
| 4                          | Polygon | StE   | 1246.19      |
| 5                          | Polygon | StE   | 3232.70      |



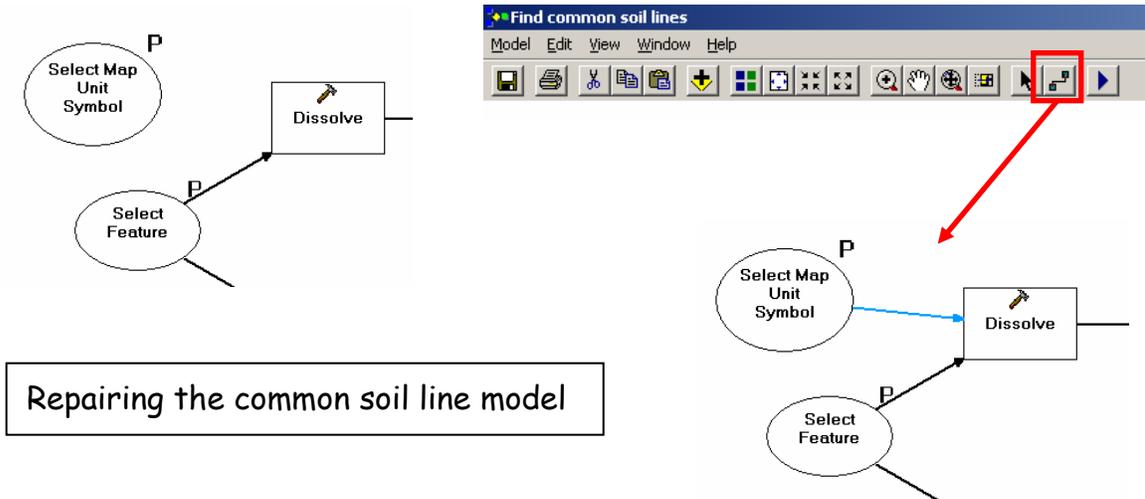
### Troubleshooting the Common Soil Line Model

This model saves a great deal of time and frustration compared to performing each of the steps individually; however, it is not without its glitches. Following are some common glitches and solutions. You typically only have to fix a glitch once. Pay attention to the dialog box while the model is running to assist with troubleshooting.

#### Model has a red X over it in ArcToolbox and will not run.

The model has a broken connection. It almost always occurs in the same place and possibly occurs if the toolbox was copied outside of ArcCatalog.

To repair the connection open the model in edit mode (Rt. click >> Edit). Select the connector tool from the toolbar. The cursor becomes a magic wand. First click on the "Select Map Unit Symbol" circle and then click on the "Dissolve" box. The connection will be restored. Save the model, close the model builder, and run the model again. The red X disappears after you run the model once or twice and quit out of ArcCatalog once or twice.



### **The model crashes during dissolve.**

This indicates that there is a problem with the feature class. It happens almost exclusively with an 8.3 geodatabase that has been converted to 9.0. There are two options that have proven to be effective.

Option One: Create a new personal geodatabase and feature dataset with topology in 9.0. Load the feature class from the converted 8.3 geodatabase into the new 9.0 geodatabase: ArcToolbox >> Conversion Tools >> To Geodatabase >> Feature Class to Feature Class. Select the feature dataset for the new geodatabase as the output location for the feature class. Validate the entire topology, fix any topology errors, and then run the common soil line model again.

Option Two: Repair the geometry of the geodatabase. Select ArcToolbox >> Data Management Tools >> Features >> Repair Geometry. Select the soils feature class as the input feature to repair. Run the common soil line model again after repairing the geometry.

### **The common line feature class already exists.**

Delete the common\_line feature class and then run the model. ArcToolbox >> Data Management Tools >> Features >> Delete Features. Try checking "Overwrite the outputs of geoprocessing operations" in ArcCatalog under Tools >> Options >> Geoprocessing Tab to prevent this glitch.

### **Missing parameters.**

Make sure you fill in all four parameters. You may have to scroll to see all of them.

### **Auto-Populate fields don't auto-populate.**

Browse to the feature dataset containing the soils feature class and enter a name for the dissolve feature class (st###\_a\_Dissolve). The second auto-populate will probably auto-populate then. If not, browse to the feature dataset and enter a name for the exploded dissolve feature class (st###\_a\_Dissolve\_MultipartToSinglepart or as much as name length will allow).

### **Common line feature class contains many polygons that are not common line polygons and not multi-part polygons.**

Some of the outputs were probably saved as shapefiles and not as feature classes in the feature dataset so the model was not able to correctly select features by location. This probably means your current and scratch workspace settings are interfering with the model parameters. Click on the Environments button in the Find common soil lines model window. Expand the General Settings. The current and scratch workspace boxes should be blank. If not, delete the information in the boxes. Click OK and run the model again after filling in all of the parameters.

## SPATIAL DATA MANAGEMENT

### Tracking Progress

Two feature classes were provided in the soil survey geodatabase template for tracking progress – st###\_int for initial surveys and st###\_upd for update surveys. If you followed the setup instructions for either type of survey in the first part of this manual, you will have one of these feature classes in your feature dataset. There are two major methods of tracking – by delineating a geographic area or by extracting existing features.

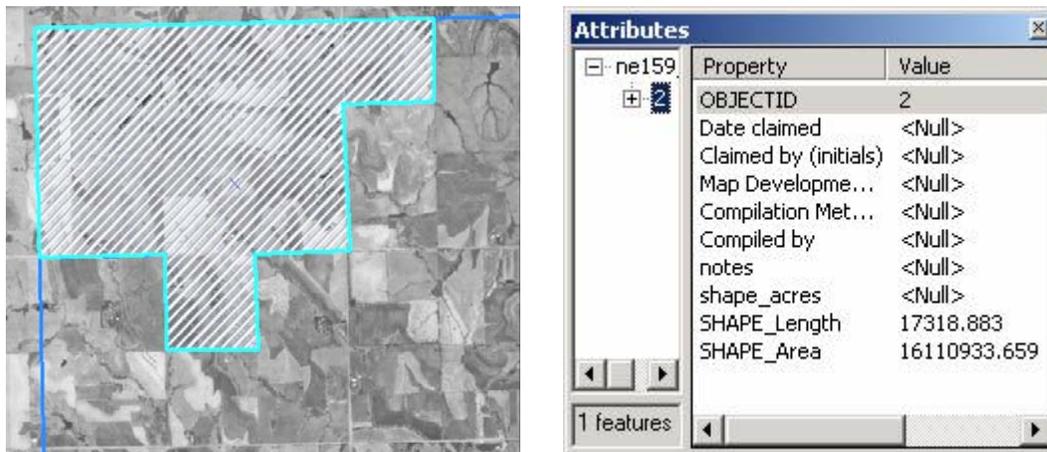
### Delineating a Geographic Area for Progress Reporting

Load the survey area boundary into the progress feature class using the Load Objects tool in ArcMap. To add the tool, select Tools >> Customize >> Data Converters. Drag and drop the Load Objects tool onto a toolbar.

Start editing, set target to progress feature class in the editor toolbar, and click Load Objects button. Browse to the boundary feature class, add it, and accept defaults.



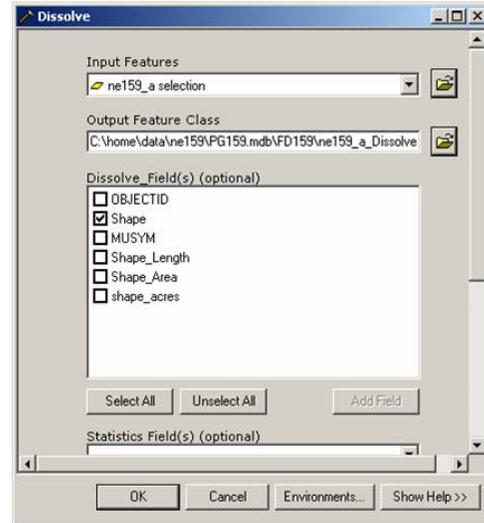
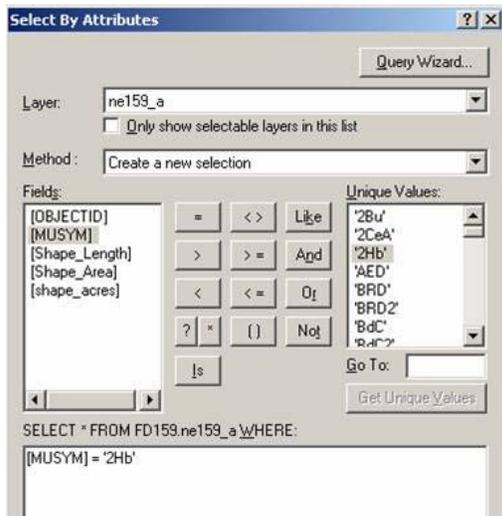
Set only the progress feature class as selectable from the selection tab in the table of contents. Set edit task to Cut Polygon Features and use the sketch tool to delineate a polygon around the area to report progress. Select the new polygon and use the attributes button to assign attributes.



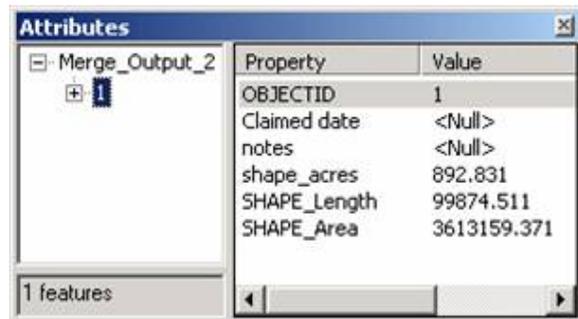
Selected progress polygons can be exported as a shapefile to deliver to the project leader, state office, whatever. Select polygons to export, right click on the progress feature class in the table of contents, and select Data >> Export Data. Choose selected features to export and enter a filename for the shapefile.

## Extracting Existing Features for Progress Reporting

Select polygons for reporting either with the select features tool or by using the Select by Attributes tool from the Selection menu. Then dissolve the selected features by shape to get one multi-part polygon with one record in the attribute table using the Dissolve tool: ArcToolbox >> Digital Soil Mapping Tools >> Feature Class Management >> Dissolve.



Append dissolve output into progress feature class using the Append tool in ArcToolbox (Digital Soil Mapping Tools >> Feature Class Management >> Append) and label selected polygons accordingly.



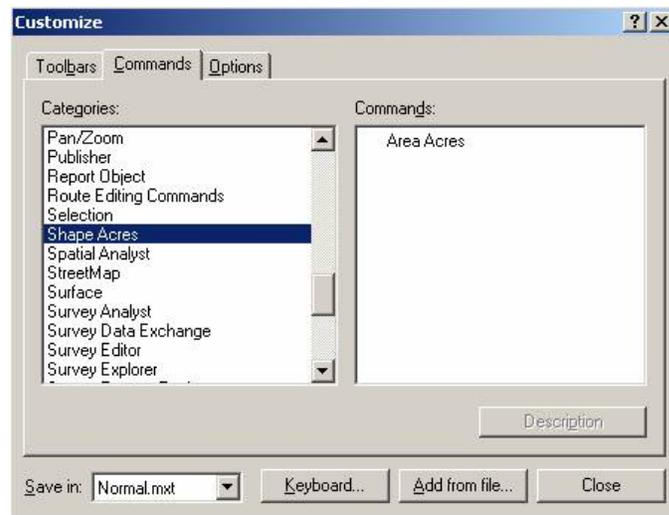
| OBJECTID* | SHAPE*  | Claimed date | notes  | SHAPE_Length | SHAPE_Area     | shape_acres |
|-----------|---------|--------------|--------|--------------|----------------|-------------|
| 2         | Polygon | <Null>       | <Null> | 99874.510737 | 3613159.306960 | 892.831114  |
|           |         |              |        |              |                |             |

Selected polygons can be exported to a shapefile as described in the geographic area section above.

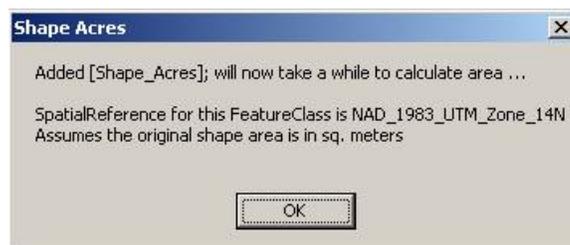
## Acreage Summary Reporting

### The Area Acres Tool

A tool for automatically calculating and updating acreage in a polygon feature class was developed at the National Cartography and Geospatial Center in Ft. Worth, TX. The tool can be downloaded from their website and from the Digital Soil Survey website and is provided on the Digital Soil Survey Course CD. Instructions for installing the tool are also included. After installation, drag and drop the tool on a toolbar in ArcMap from Tools >> Customize >> Shape Acres.



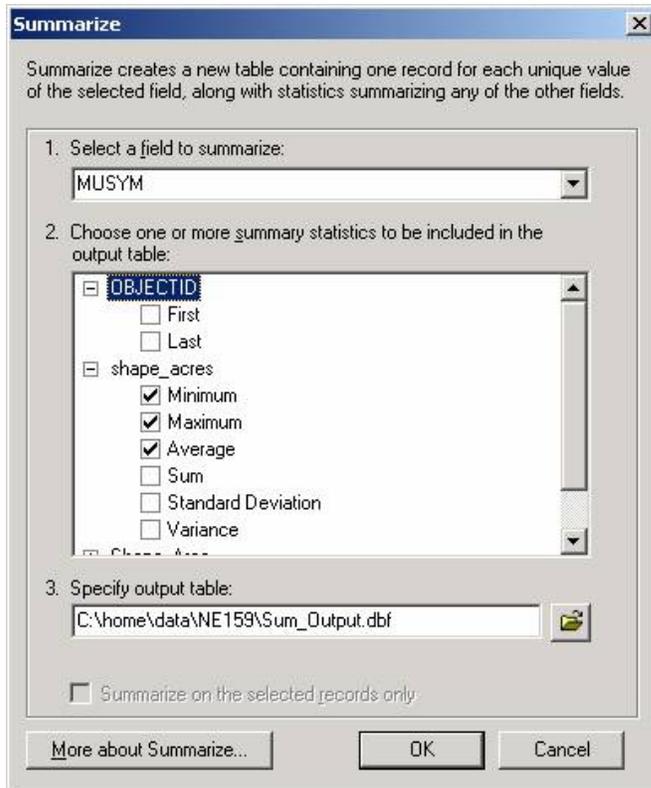
To use the tool, highlight a polygon feature class in the ArcMap table of contents, and click the Area Acres button. A Shape\_Acres field will be added to the feature class table and the acre values will be calculated. Every time you make an edit to a polygon the acreage will be recalculated automatically without having to click the tool.



| OBJECTID* | Shape*  | MUSYM | Shape_Length | Shape_Area    | shape_acres |
|-----------|---------|-------|--------------|---------------|-------------|
| 1         | Polygon | 2Bu   | 2417.619736  | 235916.386184 | 58.296209   |
| 2         | Polygon | Hb    | 2422.001584  | 136020.054477 | 33.611288   |
| 3         | Polygon | Sy    | 996.587586   | 16772.728450  | 4.144631    |
| 4         | Polygon | HbA   | 6408.252632  | 351371.712569 | 86.825842   |
| 5         | Polygon | Sy    | 316.723059   | 3466.110462   | 0.856495    |
| 6         | Polygon | HbB   | 2332.431513  | 114453.398265 | 28.282051   |

## Creating a Text Acreage Summary Report

Right click on the soils feature class in the ArcMap table of contents and select Open Attribute Table. Right click on the MUSYM column header and select Summarize.



Select the MUSYM field to summarize.

Check the summary statistics for shape\_acres that you would like to see.

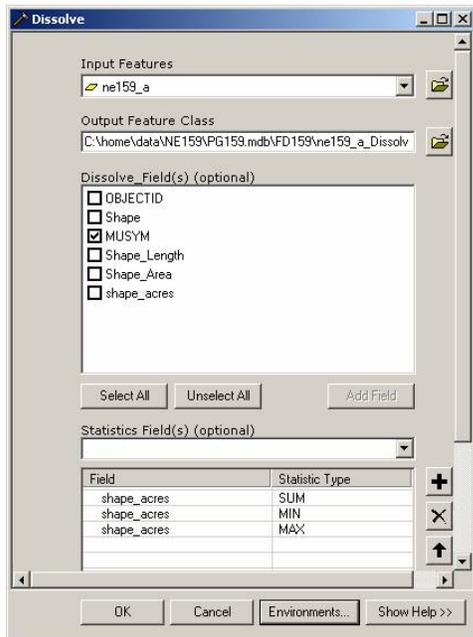
Specify a name and location for the output table.

Open the dbf file in Microsoft Excel or Access to view, modify, print, etc.

|    | A     | B        | C              | D               | E          |
|----|-------|----------|----------------|-----------------|------------|
| 1  | MUSYM | Cnt_MUSY | Min_shape_     | Max_shape_      | Ave_shape_ |
| 2  | 2Bu   | 7        | 2.48955044469  | 58.29620892510  | 17.1046    |
| 3  | 2CeA  | 3        | 4.60365742946  | 6.46403139278   | 5.6030     |
| 4  | 2Hb   | 27       | 0.13213312813  | 132.66322852100 | 33.0678    |
| 5  | AED   | 6        | 0.60750189588  | 23.06579431200  | 6.0339     |
| 6  | BRD   | 41       | 0.74312892059  | 133.99876573200 | 18.6164    |
| 7  | BRD2  | 8        | 2.72286599287  | 40.67033441340  | 12.7697    |
| 8  | BdC   | 33       | 0.42730238188  | 55.40326859060  | 11.4884    |
| 9  | BdC2  | 84       | 0.48360613789  | 72.90491695910  | 14.9393    |
| 10 | Bu    | 1        | 17.40008740340 | 17.40008740340  | 17.4001    |

## Creating a Spatial Acreage Summary Report

Use the Dissolve tool in ArcToolbox >> Digital Soil Mapping Tools >> Feature Class Management to dissolve the soils feature class by MUSYM creating a new feature class containing one record for each unique map unit symbol in its attribute table.



Select the soils feature class as input.

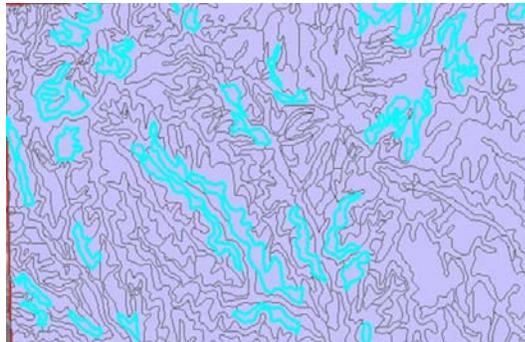
Select MUSYM as the dissolve field.

Select desired statistics fields.

Open the attribute table for the dissolve feature class to utilize the information.

| OBJECTID* | Shape*  | MUSYM | SUM_shape_acres | MIN_shape_acres | MAX_shape_acres |
|-----------|---------|-------|-----------------|-----------------|-----------------|
| 1         | Polygon | 2Bu   | 119.732236      | 2.489550        | 58.296209       |
| 2         | Polygon | 2CeA  | 16.808937       | 4.603657        | 6.464031        |
| 3         | Polygon | 2Hb   | 892.831114      | 0.132133        | 132.663229      |
| 4         | Polygon | AED   | 36.203626       | 0.607502        | 23.065794       |
| 5         | Polygon | BdC   | 379.118048      | 0.427302        | 55.403269       |
| 6         | Polygon | BdC2  | 1254.904691     | 0.483606        | 72.904917       |
| 7         | Polygon | BRD   | 763.273782      | 0.743129        | 133.998766      |

For example, selecting one record in the table will select all occurrences of that map unit in the survey.



## **Submitting Data to a Digitizing Unit for SSURGO Review and Posting to the Soil Data Warehouse Staging Server**

Submit a compacted personal geodatabase containing the feature dataset, topology object, and feature classes to a digitizing unit on CD or via FTP. Include metadata information as requested by the digitizing unit and include verification that the quality control procedures described in this document have been performed.

The digitizing unit will perform a SSURGO review and post the spatial data and metadata to the staging server. The state soil scientist is responsible for posting the tabular data from NASIS and committing all data to the Soil Data Mart.

## **MISCELLANEOUS ITEMS**

### **Converting 9.0 Geodatabases back to 8.3**

- **Step 1. - Create an empty 8.3 geodatabase in ArcCatalog 8.3 on system with 8.3 loaded. Store a copy in a safe place.**
- **Step 2. - From ArcCatalog 9.0, highlight the 9.0 feature classes to be moved from 8.3 to 9.0.**
- **Step 3. - Right click, selecting export >> to geodatabase (multiple)... (specify 8.3 template copy as output geodatabase)**
- **Your feature classes are now in an 8.3 geodatabase and ready for use in 8.3. All this can be done far removed from a system loaded with the 8.3 software, simply keep a copy of the 8.3 empty geodatabase to receive 9.0 feature class exports.**