

# Getting Started



# Managing Geoattributes



with  
**TNTmips®**  
**TNTedit™**  
**TNTview®**

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## Before Getting Started

TNTmips<sup>®</sup>, TNTedit<sup>™</sup>, and TNTview<sup>®</sup> provide a complete set of tools for associating attributes with geospatial objects and maintaining these attributes as you extract, merge, edit and otherwise manipulate these objects. You can view the complete set of associated attributes, attributes associated with selected elements, or use attributes of interest to select elements.

**Prerequisite Skills** This booklet assumes you have completed the exercises in *Getting Started: Displaying Geospatial Data* and *Getting Started: Navigating*. Those exercises introduce essential skills and basic techniques that are not covered again here. Please consult these booklets for any review you need.

**Sample Data** The exercises presented in this booklet use sample data distributed with the TNT products. If you do not have access to a TNT products CD, you can download the data from MicroImages' web site. The first exercises in this booklet use the CBUTTE Project File in the ATTMGT directory of LITEDATA. The objects in the other Project Files in this directory are also used. Make a read-write copy of the sample data on your hard drive so changes can be saved when you use these objects.

**More Documentation** This booklet is intended only as an introduction to the attribute management techniques in TNTmips, TNTedit, and TNTview. There is a companion booklet, *Getting Started: Managing Relational Databases*, that discusses general database management issues, such as importing or linking to external databases, creating new tables and forms, and establishing relationships between tables. You may also wish to consult the TNTmips reference manual for additional information.

**TNTmips and TNTlite<sup>™</sup>** TNTmips comes in two versions: the professional version and the free TNTlite version. This booklet refers to both versions as "TNTmips." If you did not purchase the professional version (which requires a software license key), TNTmips operates in TNTlite mode, which limits the size of your project materials and does not allow export. All exercises in this booklet can be completed in TNTlite using the sample geodata provided.

*Merri P. Skrdla, Ph.D., 12 June 2001*

It may be difficult to identify the important points in some illustrations without a color copy of this booklet. You can print or read this booklet in color from MicroImages' web site. The web site is also your source of the newest Getting Started booklets on other topics. You can download an installation guide, sample data, and the latest version of TNTlite.

<http://www.microimages.com>

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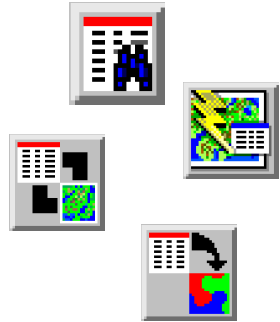
# Welcome to Managing Geoattributes

Two major features separate GIS software packages from simple graphics packages: use of georeference information and attribute management. These topics are so important to the overall understanding of the potential applications of the TNT products that they are presented in companion sets of booklets. *Introduction to Map Projections* and *Getting Started: Georeferencing* present the former topic while this booklet and *Getting Started: Managing Relational Databases* address the latter.

This booklet describes many facets of attribute management, such as attaching attributes to elements in geospatial objects, using attached attributes to select elements, and viewing attributes attached to elements. The implications of various attribute attachment types for ease in manipulation both when creating attachments and when combining or editing objects are also described. Although many of the same topics are discussed in this booklet and its companion, the approach is different. In this booklet, for example, the Database Editor functions are approached as a means of familiarizing you with the structure of a database that is associated with elements in a geospatial object. The *Managing Relational Databases* booklet approaches the functions of the Database Editor mechanically, addressing what the right and left mouse buttons do in each of the editing modes.

You should probably start your journey to understanding relational databases and attribute management with the *Managing Relational Databases* booklet because creating tables is handled at length there. This booklet assumes you have a basic understanding of this topic and database terminology.

An important use of attributes not covered in this booklet is the generation of GeoFormula layers from attached attributes. This topic is presented in *Getting Started: Using Geospatial Formulas*.



## STEPS

- launch TNT
- copy the files in the  
ATTMGT data collection to  
your local drive

The exercises on pages 4 and 5 familiarize you with database structure as presented in the Database Editor. Viewing attributes is described on pages 6–7 and again on 15 with the features of single record and tabular views discussed on pages 8–14. Attaching attributes, viewing attributes as DataTips, and determining whether attributes are attached is discussed on pages 16–23. The implications of various attachment types are described on pages 24–28. Transformation of computed fields to permanent fields is described on page 29. Methods of attaching records in the Spatial Data Editor are discussed on pages 30–32. The booklet concludes with exercises on XY Plots, CAD snapshots, and using .dbf files (pages 33–35).

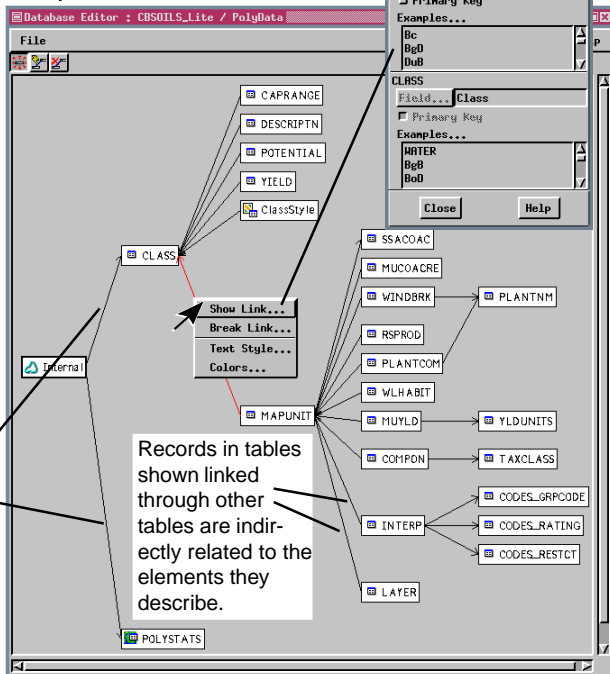
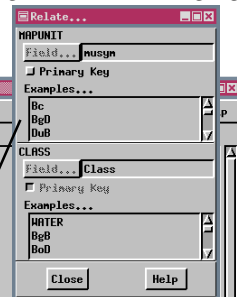
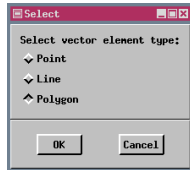
# Database Structure

## STEPS

- ☑ choose Attribute Databases from the Edit menu and select CBSOILS\_LITE from the C BUTTE Project File
- ☑ click on the Polygon radio button in the Select window, then on [OK]
- ☑ right click on the link between the CLASS and MAPUNIT tables and choose Show Link from the popup menu
- ☑ note that the musym field of the MAPUNIT table is related to the Class field of the CLASS table, then click on [Close]
- ☑ right click on the link between the POTENTIAL and CLASS tables and choose Show Link
- ☑ through what two fields are these tables related?
- ☑ do key fields used to relate tables have to have the same names?
- ☑ click on [Close] in the Relate window

The purpose of this exercise is to get you to think of the Database Editor as a tool to acquaint yourself with the structure of a database so you can evaluate the most logical relationships to set up for additional tables. Creating direct attachments to elements can be a lot of work and is unnecessary if you use the relational database features of TNTmips to establish indirect relationships using the information in fields in other tables.

The Crow Butte soil map polygon database contains many tables (24), which provide a good illustration for the utility of a graphical Database Editor. The features of the Database Editor that let you make changes in the database structure are described in the *Getting Started: Managing Relational Databases* booklet.



The records in tables shown linked to the internal elements table are directly related (attached) to the elements.

# Relationships in Table Definitions

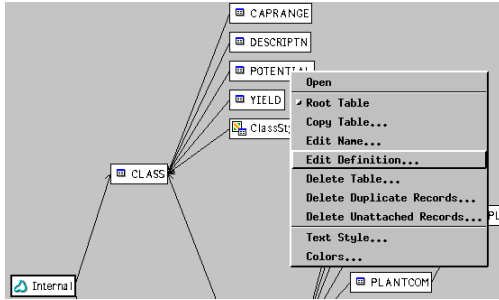
Hopefully, the answer to the second question on the preceding page was obvious; TNTmips does not require the fields in a primary key / foreign key relationship to have the same names. You can even change the field names after establishing the relationship without creating a problem.

The entries on the Primary

Key option menu are all the primary keys currently designated for tables in the database (in the form Table.Field). The entries in the primary / foreign key fields of related records and elements to be identified. For example, if the information in the primary key field is soil type, it cannot be just the symbol in one table and the symbol followed by the description in the other. If state name is the primary key field, the entries cannot be in upper and lower case in one table and all capitals in the other.

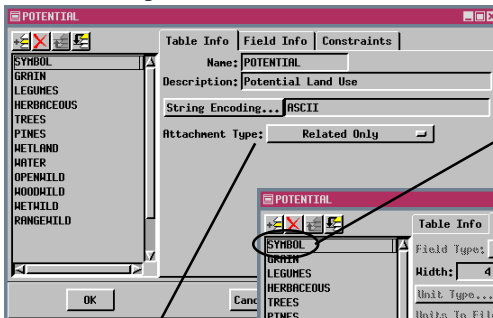
## STEPS

- right click on the box for the POTENTIAL table and choose Edit Definition from the popup menu
- confirm your answer to the first question in the previous exercise (Field Info panel)
- highlight a field other than the SYMBOL field in the list at the



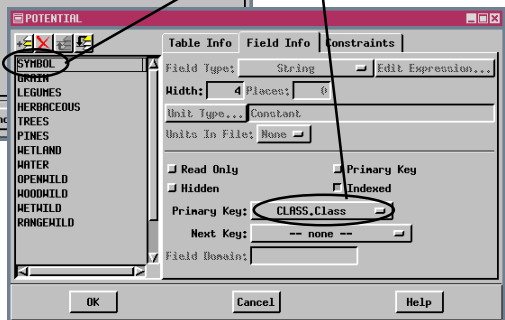
left of the window and note that the Primary Key option menu is set to None

- click and hold the Primary Key option button to view all the primary keys designated in the tables of the polygon database
- click [Cancel] in the definition window, then choose Close from the File menu in the Database Editor window




These fields relate the POTENTIAL and CLASS tables to one another.

When the Attachment Type is set to Related Only, selecting elements identifies records with the same attribute values as records selected in the table with the chosen primary key. Attachment types are explored further in later exercises.



# Attributes in LegendView

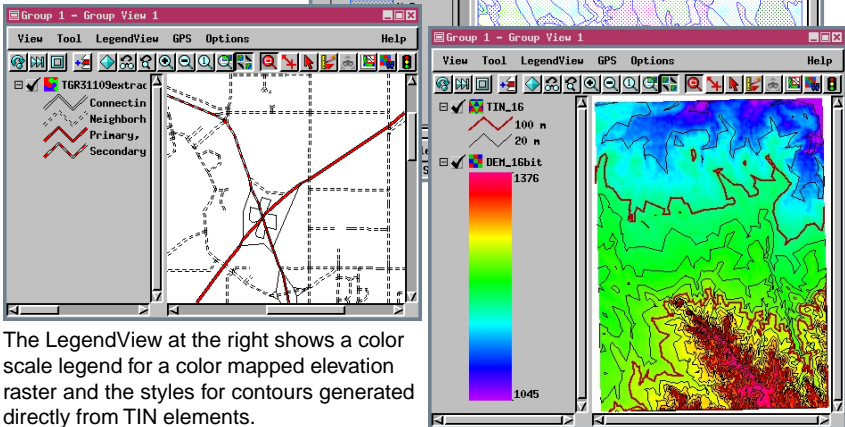
## STEPS

- ☑ choose Spatial Data from the Display menu and open a new 2D group
- ☑ in the View window set LegendView / Show to Left (or Right)
- ☑ click on the Add Vector icon, choose  Quick-Add Vector and select CBSOILS\_LITE from the C BUTTE Project File in the ATTMGT folder (keep this object open for the next exercise, but you may want to look at additional LegendViews by opening other groups)

Layers may have so many attribute values that you need to scroll to view them all in Legend View, as with the soil map shown at right. Note also that lines are shown in the assigned drawing style (All Same). In the vector below only lines are selected for drawing and there are only five attribute values. You can change the legend label to be the text from any related field.

When LegendView is turned on, you get an automatic legend for each layer that shows the style assigned to elements selected for drawing (vector, CAD, TIN). A variety of automatic legend types are available for raster layers (area sample, continuous color scale, color scale range, and color sample). The legend display can be turned off for individual layers or for all layers.

LegendView also features drag-and-drop reordering of layers. You will probably want to hide the legends for layers with many attribute values before using this feature.








The LegendView at the right shows a color scale legend for a color mapped elevation raster and the styles for contours generated directly from TIN elements.

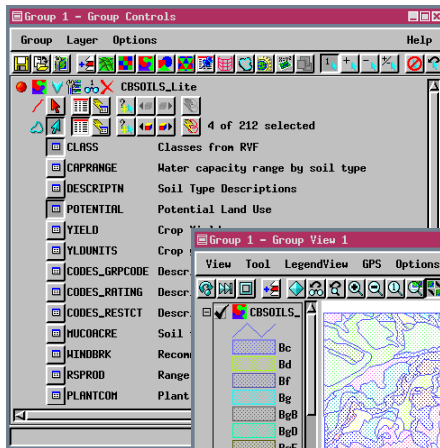
# Viewing Objects and Attributes

The Select tool must be active to select elements with the mouse, but elements can be selected by query when any of the tools are active. When selecting multiple elements, you probably want to view database records in tabular view so that you can see the information for all selected elements. Single record view only has knowledge of the active element when retrieving related records.

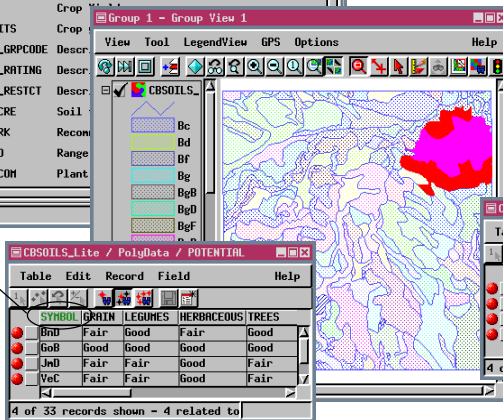
Tabular view has three viewing modes: View Active Element Records, View Selected Element Records, and View All Records. View Active Element Records is most useful when you are selecting single elements with more than one record attached. View Selected Element Records is best suited for viewing attributes when you are selecting multiple elements with a single record attached. The View All Records mode is most useful for viewing attributes without regard for which elements are attached or when using the attributes to select elements.

## STEPS

- starting with CBSOILS\_LITE added in the last exercise, click on the Show Details  →  icon in the Group Controls window
- click on the Show Tables icon for the polygon elements 
- click on the View Table icons for the CLASS and POTENTIAL tables 
- click on the Select / Deselect icon in the polygon icon row and choose Select By Query 
- choose File / Open / RVC Object and select the SELECT4 object in the CBUTTE Project File
- click on [Apply] and view attributes for selected elements



Continue directly to the next exercise with CBSOILS\_LITE displayed.



View records for selected elements.

Foreign key field

SYMBOL	GRAIN	LEGUMES	HERBACEOUS	TREES
BnD	Fair	Good	Fair	Good
GoB	Good	Good	Fair	Good
JnD	Fair	Fair	Good	Fair
VeC	Fair	Fair	Good	Fair

4 of 33 records shown - 4 related to

Style	CLASS
BnD	
GoB	
JnD	
VeC	



4 of 48 records shown -

Primary key field



# Single Record and Tabular Views

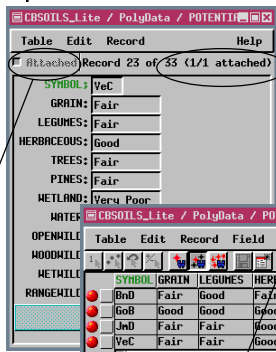
## STEPS

- choose Single Record View from the Table menu in the POTENTIAL tabular view window
- turn on the Active Element Information toggle (below the element rows and tables in the Group Controls window), and click on the Next Selected icon in the Active Element Information panel with the Polygon icon on 
- continue clicking on the Next Selected icon until you have stepped through the records attached to the four selected elements 
- click on the View Table icon for the POLYSTATS (standard polygon attributes) table
- change to single record view, alter the units for some of the fields, and observe the differences

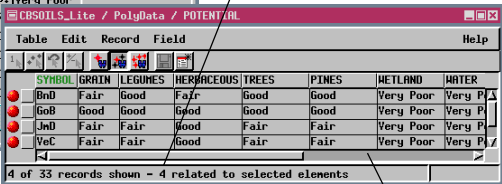
If Attached is dimmed, the table is either read only (POLYSTATS) or the record is indirectly related to the active element (POTENTIAL).

You can view tables as single records or in a tabular presentation. More selection and viewing features are available from a tabular view window, such as statistics and substatistics, XY plots of selected fields, element selection from attributes, and attribute information for multiple selected elements.

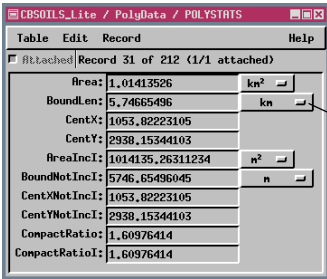
Single record views may be more convenient for viewing or entering attribute values for individual elements in tables with a large number of fields. The number of records attached to the active element is immediately apparent in single record view, as are the current units for individual fields. (You can also change the units used for display in tabular view, but they aren't shown because of the tabular structure.) You can step through the records attached to a set of selected elements in single record view using the Previous and Next Selected buttons in the Active Element Information panel to change the currently active element.



The total number of records and the number of records related to the active element are shown here. Tabular view reports the total number of records related to selected elements.



The length of the scroll bar tells you that only about half of the fields are currently visible.



You can change the units used for viewing fields to any of those available for the designated type of unit (area, distance, angle, time, temperature, or volume). Whether a field has units, the type of unit, and the units in which existing field values were entered are all designated in the table definition.



# Selecting Elements to View Attributes

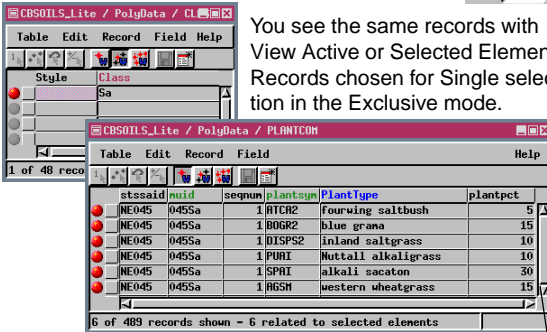
The selected set for the previous two exercises was determined by query, which can be used when details are shown for the layer so you can choose Select By Query. Selecting elements with the mouse or by region requires that an element selection icon be turned on (table / selection icon row) and that the Select tool (View or GeoToolbox window) is active.

The tool used to select elements is chosen in the GeoToolbox window while the mode in which the tool operates is set on the Group or Layout Controls window. The single Select tool is found in both the View and GeoToolbox windows. In Exclusive selection mode, which is the default, each new selection action deselects the previously selected element(s). A single selection action selects one (or more) of each element type that has the Select icon turned on in its table / selection icon row.

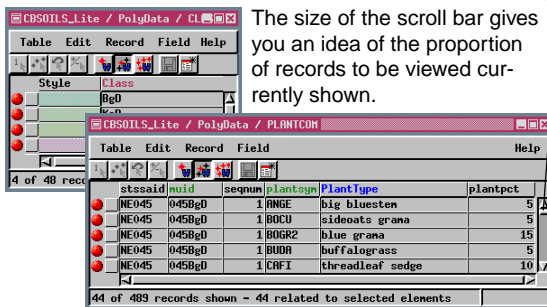
Polygons but not lines available for selection.



You see the same records with View Active or Selected Element Records chosen for Single selection in the Exclusive mode.

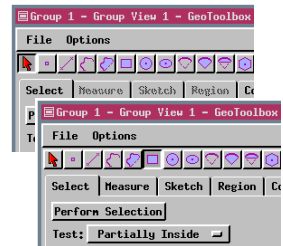


The size of the scroll bar gives you an idea of the proportion of records to be viewed currently shown.



## STEPS


- close the POLYSTATS and POTENTIAL tables
- click on the Geo-Toolbox icon (View window) then the Select icon (Geo-Toolbox window)
- click on the upper left polygon
- open the PLANTCOM table
- switch between viewing active and selected element records and note any differences in records shown
- click on the Rectangle selection tool, outline a small area in the upper left as shown, and click [Perform Selection]
- switch between viewing active, selected, and all records noting the differences in the numbers of records shown

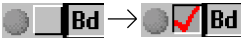



Note that all other panels in the GeoToolbox are available when a tool other than Select is chosen.

# Using Attributes to Select Elements

## STEPS

- ☑ close the PLANTCOM table and open the POTENTIAL table in tabular view
- ☑ click on the View All Records icon 
- ☑ click in the Select Record box (tabular view) of the record with Bd as the Symbol value



- ☑ click on the Exclusive icon in the POTENTIAL table 

- ☑ note the polygons selected in the View window and the number of elements selected reported in the polygon row of the Controls window



The number of polygons currently selected and the total number of polygons are shown here.

Perhaps you are looking for an area suitable for wetlands as part of an exchange for wetland acres you want to use for farming on nearby property. The Crow Butte area has only one soil type suitable for wetlands and wetlands wildlife. If there were multiple soil types, you would simply click in each Select Record box for the records to use to identify related polygons.

You need to turn on View All Records unless the elements you want selected are a subset of those already selected. There are four methods you can use to select elements once the attributes for selection are identified: Exclusive (deselects previously selected before selecting related elements), Select

Elements (add to current selected set), Deselect Elements (remove from selected set), Toggle elements (select if not currently selected, deselect if in selected set).

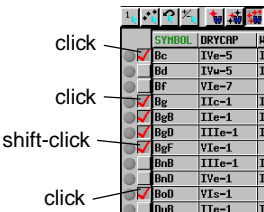
CBSDIIS\_Lite / Polydata / POTENTIAL

Style	SYMBOL	GRAIN	LEGUMES	HERBACEOUS	TREES	PINES	WETLAND	WATER
<input type="checkbox"/>	Bd	Good	Good	Good	Fair	Poor	Fair	Good
<input type="checkbox"/>	Bg	Good	Good	Good	Good	Good	Very Poor	Very Poor
<input type="checkbox"/>	BgB	Good	Good	Good	Good	Good	Very Poor	Very Poor
<input type="checkbox"/>	BgD	Good	Good	Good	Good	Good	Very Poor	Very Poor

33 of 33 records shown - 1 related to selected elements

A series of records can be selected by clicking on the first (or last) then

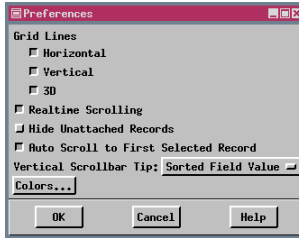
holding down the shift key and clicking on the Select Record box at the other end of the series. Selecting multiple consecutive records can be mixed with selecting individual records in the table by making single click and click / shift-click combinations.



You can quickly choose the desired records for selecting elements using a combination of clicks and shift-clicks.

# Table Viewing Preferences

You can change a number of settings that affect the appearance of your tabular view. The default settings are initially applied to all tabular views. The changes you make are saved with the individual tables. The first group of toggle buttons lets you choose whether or not to draw grid lines between field and record values and how the lines appear if drawn. Turning off the 3D effect for grid lines saves one pixel per row or column, and turning off the line altogether reduces the height or width by one more pixel. If your monitor space is limited, such as on a portable, this space savings may outweigh having cells clearly divided. The color interleave capability can compensate for lack of row separation by grid lines.



The Realtime Scrolling option lets you see records fly by as you drag the scroll bar (or click and hold in the trough). The tabular view is not updated until you release the scrollbar when the option is turned off. There is no difference between on and off when you scroll using the up and down arrows. You can choose to have a Scrollbar Tip, which reports the designated value for the current top row in the tabular view while scrolling. The choices for the Scrollbar Tip are the value of the sorted field, the record number, the row number, or none.

The same area of a tabular view was captured for the three illustrations below. Note how the fifth entry is barely visible with 3D grid lines, mostly visible with 2D lines, and fully shown with horizontal lines off.

SYMBOL	GRAIN	LEGUMES
Bc	Fair	Fair
Bd	Good	Good
Bg	Good	Good
BgB	Good	Good
BeD	Good	Good

3D horizontal and vertical

SYMBOL	GRAIN	LEGUMES
Bc	Fair	Fair
Bd	Good	Good
Bg	Good	Good
BgB	Good	Good
BeD	Good	Good

3D off, horizontal only

SYMBOL	GRAIN	LEGUMES
Bc	Fair	Fair
Bd	Good	Good
Bg	Good	Good
BgB	Good	Good
BeD	Good	Good

3D off, vertical only

## STEPS

- in the POTENTIAL table, choose Preferences from the Table menu
- turn off the 3D toggle, click [OK] and note the difference in appearance
- drag the vertical scrollbar slider (POTENTIAL); watch the DataTip change
- return to the Preferences window, change the Vertical Scrollbar Tip option menu to Record Number, turn off Auto Scroll to First Selected Record, and click [OK], then scroll through the table again
- click on the Select icon in the View window, turn on the Show All Records icon in the POTENTIAL tabular view
- select a series of polygons; note the selected indicator only appears if you happen to select a polygon with a record already shown
- return to the Preferences window, turn on Auto Scroll to First Selected Record, set the Scrollbar Tip back to Sorted Field Value, and click [OK]
- select a series of polygons and note how the table scrolls



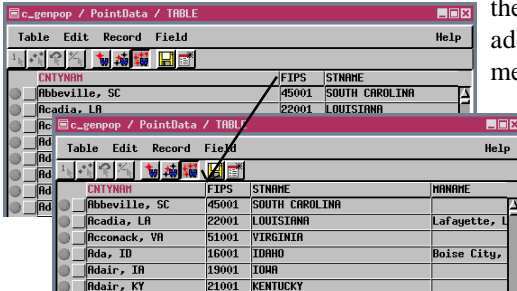
# Field Options

## STEPS

- with the POTENTIAL table still open, pause the cursor over the divider between the GRAINS and LEGUMES columns, click the mouse when the cursor is the double arrow and pull the divider left (example shows even more unused area)

You set the width of each field in the Table Definition window, but you can choose a different width for display in tabular view. You change column width in tabular view by dragging the divider between columns. (This divider remains when you turn off vertical grid lines.) The cursor becomes a double-headed arrow when over the divider and active for changing column width. If you click when the cursor is the left arrow shape instead, you select

the column heading and activate additional choices on the Field menu.

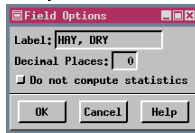


There are three ways to get at the Field Options window: left click on the column heading and choose Options from the Field menu or right-click on a column heading or over

- open the YIELD table, click on the HAYDRY column heading, and choose Options from the Field menu

a cell in the table and choose Field Options from the popup menu. The Label field lets you change the column heading from the field name assigned in the table definition. This label is not restricted to 15 characters and may contain spaces.

- add a comma and a space between HAY and DRY in the Label field, and change the number of decimal places to 0, then click [OK]



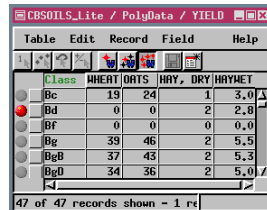
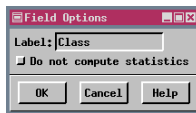
The Decimal Places field only appears in the window if a numeric field is selected. Changing the setting in the Decimal Places field changes the number of

- note the new column heading and that the dry hay yields have been rounded rather than truncated

places shown without changing the number calculated, which is set in the Table Definition window. You can set the number of decimal places for integer fields because they may have units assigned and unit conversion can create non-integer values.

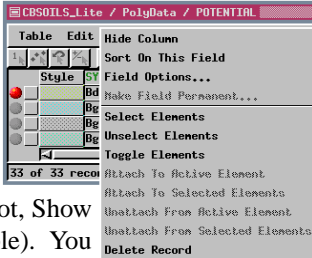
- open the Field Options window for the SYMBOL field, change the name to Class, and click [OK]

After three changes, the YIELD table appears as at the right.

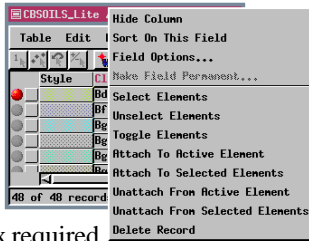


# Right Mouse Button Menus

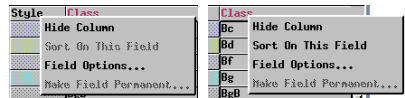
Many of the functions available from the Record and Field menus are also available from right mouse button popup menus over a tabular view. If you right click over an individual cell in a tabular view, you get all the Record menu choices, except New, and all Field menu choices that deal with the field you click on (not Plot, Show All, or Show Style Sample). You get only Field menu choices if you right-click on a column heading and only the Record menu options if you right-click over a Select Record checkbox.



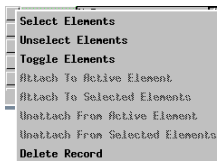
These right mouse button menus are provided as a convenience to reduce the number of clicks needed to accomplish a task. (The click on the column heading or Select Record checkbox required before selecting from the Field or Record menu, respectively, is eliminated.)






Choices on the popup menu may be dimmed because they are inappropriate for the selected field (Make Field Permanent is dimmed for all but computed fields) or record (see Step 2). The attach and unattach options are also dimmed if no elements are selected. If the tabular view window is sized or viewing options are set such that blank lines appear in the table, only the field menu options are active in the blank portion of the table.



\* The attachment type for the POTENTIAL table is Related Only; records are indirectly related to elements through the Symbol field and, thus, cannot be attached nor unattached.



## STEPS

- click on the Select icon in the View window, then click on any polygon 
- right-click over any of the fields (except the Style field) in the POTENTIAL table for CBSOILS\_LITE polygons; why are the choices concerned with attaching and unattaching records dimmed?\*
- right-click on the Class field in a record showing values in the CLASS table; note that all menu choices except Make Field Permanent are active
- click on the Deselect All icon in the Group Controls window 
- repeat step 3 showing all records, and note the choices that are no longer active
- right-click on the heading of the Style column, note the inactive entries on the menu, then right-click on the Class heading and note the same
- right-click on the Select Record button of a record with values showing
- click on the Remove icon in the layer row (Group Controls) and choose Remove Layer 

# Sorting by One or More Fields

## STEPS

- Quick-Add the WESTERNUS vector object in the STATES Project File and open the CITIES table in the point database
- right click on the CITYCODE heading and choose Hide Column
- scroll until the POP field becomes visible, left-click and hold on the column heading, then drag the heading outline to the left; release the mouse when the box is between the STNAME and DIVNAME fields
- click on the STNAME heading, press and hold the <shift> key and click on the CITYNAME heading
- choose Sort from the Field menu
- notice the new order of records
- repeat step 4
- choose Sort from the Field menu again, and note the result
- you will probably want to sort on these two fields one more time unless you are comfortable working in reverse alphabetical order

CITYNAME	CITYCODE	STNAME	DIVNAME
ABERDEEN, WA	5300100	WASHINGTON	PACIFIC
ADOLENTO, CA	0600296	CALIFORNIA	PACIFIC
AGOURA HILLS, CA	0600394	CALIFORNIA	PACIFIC
AIR FORCE ACADEMY, CO	0800870	COLORADO	MOUNTAIN
ALAMOGORDO, NM	3501780	NEW MEXICO	MOUNTAIN
ALAMOSA, CO	0801090	COLORADO	MOUNTAIN
ALBANY, OR	4101000	OREGON	PACIFIC
ALBUQUERQUE, NM	3502000	NEW MEXICO	MOUNTAIN
ALHAMBRA, CA	0600884	CALIFORNIA	PACIFIC
ALPINE, CA	0601192	CALIFORNIA	PACIFIC
ALTA SIERRA, CA	0601360	CALIFORNIA	PACIFIC

click at the right, drag and drop at the left

STNAME	DIVNAME	LAT	LONG	POP
WASHINGTON	PACIFIC	47133563	-123796873	1654
ALBANY, OR	PACIFIC	44299627	-117601640	96

are placed in ascending order (smallest first). If a field has been sorted in ascending order and you elect to sort it again, it appears in descending order.

Sorting on more than one field lets you introduce additional organization in your tabular views. The

CITYNAME	STNAME	POP	DIVNAME
APACHE JUNCTION, AZ	ARIZONA	18100	MOUNTAIN
AVONDALE, AZ	ARIZONA	16169	MOUNTAIN
BISBEE, AZ	ARIZONA	6288	MOUNTAIN
BUCKEYE, AZ	ARIZONA	5038	MOUNTAIN
BULLHEAD CITY, AZ	ARIZONA	21951	MOUNTAIN
CAMP VERDE, AZ	ARIZONA	6245	MOUNTAIN
CASA GRANDE, AZ	ARIZONA	19082	MOUNTAIN
CHANDLER, AZ	ARIZONA	90553	MOUNTAIN
CHINLE, AZ	ARIZONA	5059	MOUNTAIN
COOLIDGE, AZ	ARIZONA	6927	MOUNTAIN
COTTONWOOD, AZ	ARIZONA	5918	MOUNTAIN

each state. If you select the city name field first, each record is unique (because the state abbreviation is also included), so no further sorting would occur for any other selected fields. In the western states example, you could take the sorting one step further by selecting the division name field (DIVNAME) first, then state, then city. All of the cities in all of the states in the mountain division would then be listed before any of the states in the Pacific division (Wyoming would come before California).

Before actually sorting fields in this exercise, let's rearrange the table to make the sorted results more easily viewable (and demonstrate more features of tabular view). Sorting lets you put records in a new order for viewing in either numeric or alphabetical order. The first time you sort on a field, its values

order in which you select the fields is important. The first field selected needs to have multiple records with the same value, such as in this example where there are many records for

# Raster Attributes

A variety of methods are available for viewing raster attributes, which may simply be the cell value or may be the results of a classification or statistical process. Attributes associated with raster cells can be viewed as DataTips, in LegendView, or in database form using the selection tools in a manner similar to viewing vector, CAD, and TIN attributes.

The classification processes automatically create a table that lists the classes identified by the process (with either their default numeric name or an altered name you provided). You can calculate statistics for these classes based on some other raster's values, such as a yield map or elevation raster.

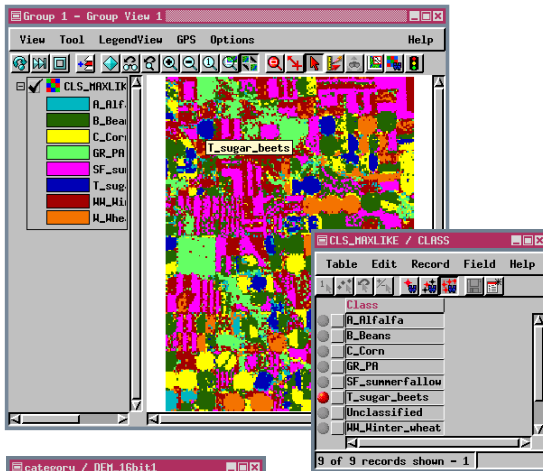
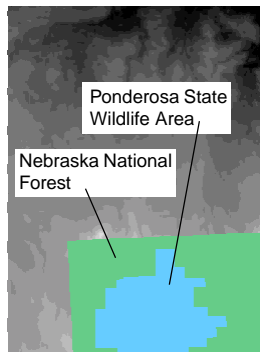


Table	Edit	Record	Help
Attached		Record 1 of 2 (1/1 attached)	
Min:		1197,00000000	
Max:		1376,00000000	
Mean:		1283,69019654	
Mode:		1240,00000000	
Median:		1281,00000000	
StdDev:		45,44598675	
CellCount:		16943,00000000	
NormalizeFactor:		0,98036722	

This record provides the minimum and maximum elevation in the Ponderosa State Wildlife Area, as well as other statistical information about elevation in this area.






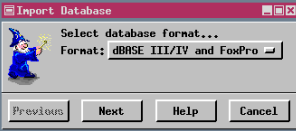





## STEPS

- open a New 2D Group, click on the Add Raster icon, choose Quick-Add Single and select CLS\_MAXLIKE from the CROP MAP Project File; note how the attributes are displayed in LegendView
- open the CLASS table, click on the Select icon (View window), then click on different areas in the image and view the associated attributes
- choose Process / Vector / Attributes / Raster Properties from the main menu
- click on [Rasters] and select DEM\_16BIT from the RASTPROP Project File
- click on the Raster tab then on [Category Raster] and choose CATEGORY from the same Project File
- click on [Run] and accept the default database table name
- click on the Layer Controls icon in the View window if the Layer Controls window is not already open
- click on the Select icon in the View window
- click anywhere over the Category raster, choose Single Record View if not shown that way (Table menu) in the table that opens, then click on the category areas to view the statistics



# Raster Attributes from External Files

## STEPS

- open a New 2D Group, click on the Add Raster icon, choose Quick-Add Single and select ALASKA from the RASTERDB Project File
 
- show details for the layer, then click on the Make Table/Form icon and choose Edit Relations
 
- select Import from the File menu in the Database Editor window that opens
 
- confirm that the format selected is dBASE III/IV and FoxPro, then click [Next] in the Import Database wizard
 
- click on [Select Files] and select FRAGSTAT.DBF from the ATTMGT folder
 
- click [Next], confirm that the Copy radio button is on, click [Next], check that the string encoding is set to ASCII and the attachment type is Related Only, and click [Next] again
 
- click on [Field] and select Patch\_Type
 
- turn on the *points to* radio button then click on [Primary Key] and select Internal.Value, then click on [Next] and [Finish]
 
- choose the Select tool and click on the various colors in the raster to view the associated FRAGSTATS information for each class
 

Some TNTmips processes create database tables associated with the raster's cell values. You may have other database information you would like to associate with the raster, such as the FRAGSTATS class statistics used in this exercise. You can use the standard import process for tables in formats not supported by the Import wizard used in this exercise.

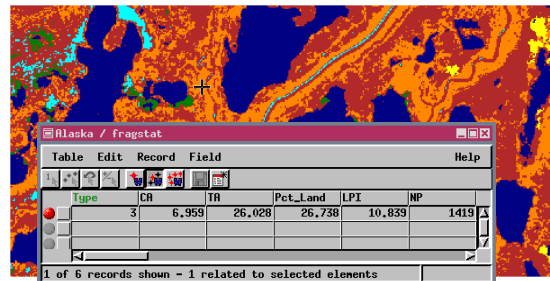
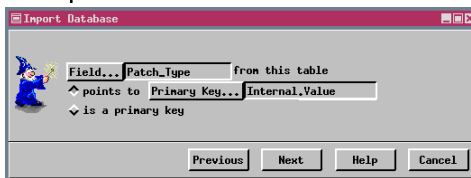
FRAGSTATS is used by landscape ecologists and other scientists to quantify landscape structure for the purpose of studying function and change. The basic unit for these fragmentation statistics is the patch, which is a piece of the area of interest, or landscape, that is considered homogeneous at the scale of a

particular study. Patch type is equivalent to a class. You can run FRAGSTATS in TNTmips using one of the SML

scripts provided with TNT. One of these scripts is a tool script and one runs in the main SML process.

The only means of associating database information with rasters is by cell value. So although you could import the more detailed individual patch information, all the records having the same patch type

would be associated with any cell of that patch type.

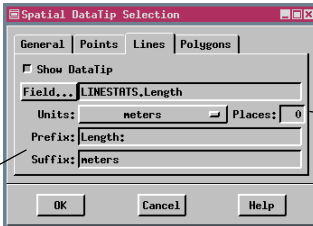


# Viewing Attributes by DataTip

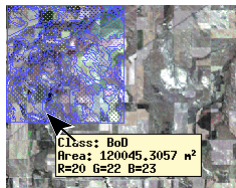
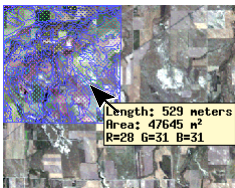
DataTips are similar to the ToolTips that appear when you pause over an icon except *you* control what information is presented on a layer by layer and element by element basis. DataTips present the value from a selected database field for the element or cell nearest the cursor when paused. You can specify the DataTips you want in the Object Display Controls (except CAD currently) or from the Setup DataTips option on the Tool menu for each layer. When accessed in the latter manner, you can set CAD DataTips and also set the delay time before a DataTip appears and the number of pixels that the cursor must move before a DataTip will be updated.

You control whether DataTips are turned off or whether you see them for all layers or only the active layer using the DataTips cascade on the Options menu in the View window. You can have one DataTip for each raster, CAD, and database pinmap layer. You can have one DataTip for each element type in vector and TIN layers.

You can enter any text you want in the Prefix and Suffix fields.



This field sets the number of places shown to the right of the decimal.

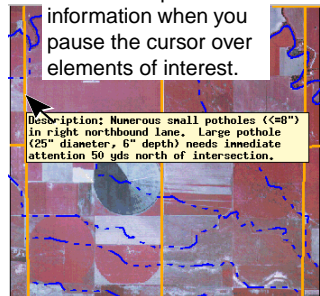


DataTips are turned on for lines and polygons in the vector layer and for cell values in the raster layer (above left). The vector layer was selected a second time (hidden, above right) to give two different polygon attributes in the DataTip. (The line DataTip is off.) You can also create multiline DataTips with a string expression field without adding an object multiple times.

## STEPS

- open a new 2D group in Spatial Data Display
- click on the Add Layer(s) icon and choose 16BIT\_RGB and CBSOILS\_LITE from the C BUTTE Project File
- click on the Tools icon for the CBSOILS\_LITE layer and choose Setup DataTips from the drop down menu
- on the Lines panel check that LINESTATS.Length is selected (click on [Field] and select it if it's not) and Show DataTip is toggled on
- on the Polygons panel check that POLYSTATS.Area is selected and Show DataTip is on
- choose Options / DataTips / All Layers in the View window
- move your cursor to various positions in the View window, pause, and note the DataTips that appear

Selecting a memo field for DataTips can provide much specific information when you pause the cursor over elements of interest.

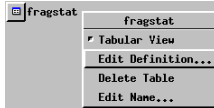


# Multiline DataTips

## STEPS

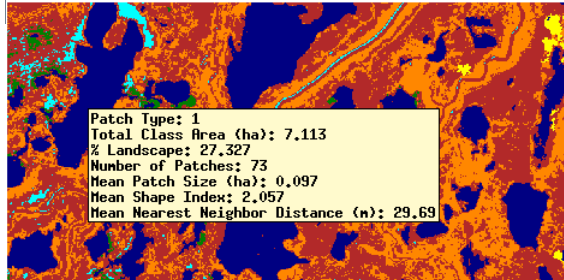
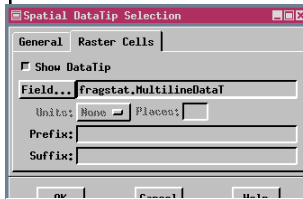
- ☑ open a new 2D group (or use the one from the exercise on p. 16 if still open) with the ALASKA raster in the RASTERDB Project File
- ☑ with database tables shown, right-click on the fragstat table listing in the Group Controls window, and choose Edit Definition
- ☑ scroll to the bottom of the field list, select the last entry in the list, then click on Add Field
- ☑ edit the field name to be MultilineDataT
- ☑ on the Field Info panel, change the Field Type to String Expression and the width to 300
- ☑ click on [Edit Expression], choose File / Open / \*.QRY File, and select MULTILIN.QRY from the ATTMGT folder
- ☑ examine the query and note the various components described in the text at the right
- ☑ click [OK] in the Query Editor window and [OK] in the Edit Definition window
- ☑ click on the Tools icon and select Setup DataTips
- ☑ click on [Field], and choose FRAGSTAT for the table and MULTILINEDATAT as the field, then click [OK]
- ☑ delete the text in the Prefix field, click [OK], and view DataTips for various classes

You may want to view the information from a number of different fields for a single layer. You could add the layer multiple times and specify a different field for the DataTip in each layer. But this is tedious and potentially confusing if the information is to be used by anyone else, such as distributed as an atlas on CD-ROM. You can get DataTips from multiple fields in the same table by adding a string expression field that specifies the fields to include.



This expression needs to include the label you want for each value (in quotes), identification of the corresponding field (converted to a string if numeric), new line instructions, and have each term concatenated. The width specified for this field is not the width of the longest line but the length of the entire DataTip. If the value entered is too small, the DataTip will end when that number of characters is reached. Setting the width too high has no effect on the appearance of the DataTip but requires more storage space than necessary. The function used in the query provided to convert numeric values to strings for use as DataTips (NumToStr) will produce numbers in scientific notation if the values are

too large. You can get around this limitation and specify the number of decimal places using the sprintf function.

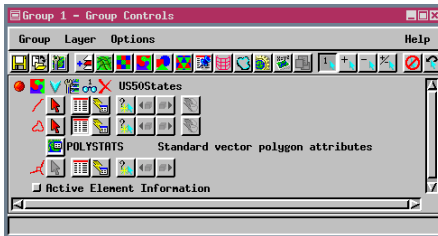


# Attaching Records by Coordinates

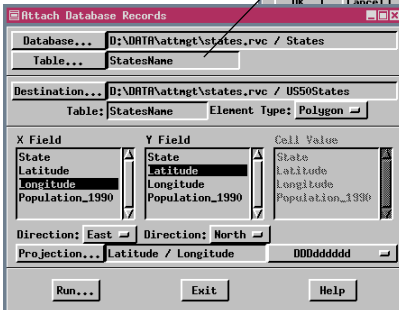
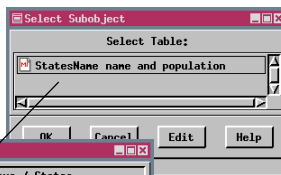
Attributes in any database table (linked or in TNTmips' internal format) can be automatically attached to elements provided each record contains coordinate information. You simply select the table that contains the attributes to attach and the vector object and element type that you want the attributes attached to.

For lines or points, records are attached to the element nearest the coordinates provided. For polygons, the coordinates must fall inside a polygon for the record to be attached. When the process completes, it reports how many records had elements found for them and the total number of records. Any unattached records remain in the table and can be attached in the Display process if appropriate.




Before running Database Attach, the polygon database for the selected vector object has only a standard attributes (POLYSTATS) table.



All of the tables in the database are listed for you to choose from. The selected database has only one table.



## STEPS

- click on the New 2D Group icon in Spatial Data Display 
- click on the Add Vector icon, choose Quick-Add Vector, and select US50STATES from the STATES Project File 
- click on the Show Details icon then on the Show Tables icon  for Polygons and note that POLYSTATS is the only table in the database, then choose Group / Close
- choose Process / Database / Attach
- click on [Database] and select the STATES database object from the STATES Project File, then select the StatesName table
- click on [Destination] and select the US50STATES vector object from the same file
- set the Element Type to Polygon
- choose Longitude as the X Field and Latitude as the Y Field
- check that the direction for the X field is set to East and the Y Field is set to North (option buttons below field lists), and that the Projection is Latitude / Longitude
- set the format option button to the right of the Projection field to millionths of a degree (DDDddddd)
- click on [Run]

# Transferring Vector Attributes

## STEPS

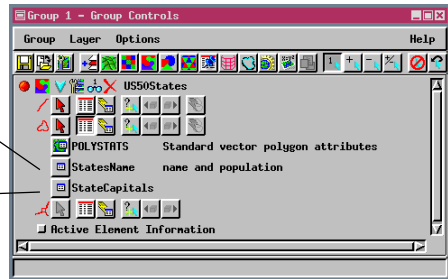
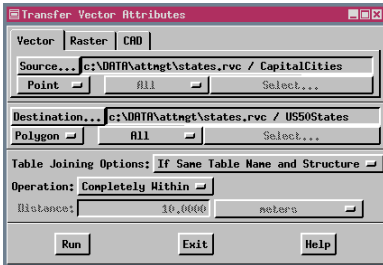
- ☑ choose Process / Vector / Attributes / Transfer Attributes
- ☑ click on [Source] on the Vector panel, and select the CAPITALCITIES vector object from the STATES Project File
- ☑ click on [Destination] and select the US50STATES vector object
- ☑ check that Polygon is selected as the destination element and that All is selected for both the source and destination elements
- ☑ click on [Run]

The attributes transferred to vector objects can come from a raster, vector, or CAD object.

Just as you had to close the display group in which you verified the number of tables in the US50STATES vector polygon database, you need to exit the Attach Attributes process before you can start this exercise because of the file locking system in TNTmips that protects your data (one process cannot open an object for writing when another has it open for reading or writing).

In the last exercise, you associated attributes with vector elements using the coordinates in each record. You can also transfer attributes from one vector object to another using element position rather than explicitly stated coordinates. You can transfer attributes from points, lines, polygons, or labels to the polygons that contain them entirely or in part. You can transfer attributes from points or lines in one object to the points or lines within a designated radius or the closest point or line in another object. Point attributes can also be transferred to the closest polygon if the points don't fall within a polygon.

Attributes are transferred from points to the polygons that contain them in this exercise. The number of records transferred is reported when the process completes.



The stars are the points from which the attributes are transferred to the state outlines. These points represent the capital cities for the continental USA, while the state outlines are for all 50 states.

# Manually Attaching Attributes

You can assign attributes in any process where you have a View window and a layer / group / or layout controls window. The method is the same in all display processes although it is described in terms of the Spatial Data Display process in this exercise. You can also use these methods in the Spatial Data Editor, but additional features are present to assist you in assigning attributes as you are creating and / or editing objects.

The table viewing mode to use when assigning attributes depends on the attachment type. If the attachment type is one element per record, single record view makes attaching attributes easier because every time you click on an element without an attached record, you are presented with a new blank record. Tabular presentation is easier to work with when you are frequently returning to existing records for attachment or when you want to select multiple elements and attach a single record.









The vector object used for this exercise has a table in the polygon database that does not yet contain any records. The attachment type for the table is One Record Per Element.

The screenshot shows a map with various crop fields labeled: Corn, Beans, Wheat, Farm Yard, and Trees. A context menu is open over the map, showing options for attaching records. The menu items are: New (No Attachment), Delete (Attach To Active Element), Select (Attach To Selected Elements), Unselect Elements, Toggle Elements, Attach To Active Element, Unattach From Active Element, Attach To Selected Elements, and Unattach From Selected Elements. The 'Corn' option is checked in the menu.

unlabeled corn










Attach elements to previously added records by selecting the record and choosing the desired attachment option.

## STEPS

- open a new 2D group 
- click on the Add Vector icon, choose Quick-Add Vector, and select the CROPMAP vector object in the CROPMAP Project File 
- show details for the layer then click on the Show Tables icon for the polygon database, and the View Tables icon for the LandUse table   

- click on the Select tool in the View window and the Select mode icon in the Group Controls window   

- click on all the polygons labeled Corn, then choose Record / New / Attach to Selected Elements, and type Corn into the field by the red related indicator
- click on the Deselect All icon, then repeat step 5 substituting Wheat for Corn 
- repeat step 6 substituting Beans, Trees, Farm Yard, and Unclassified (?) for Wheat
- click on the Deselect All icon, click on the View All Records icon, click in the unlabeled corn polygon (shown right), then on the Select Record box for Corn, and choose Record / Attach to Active Element 

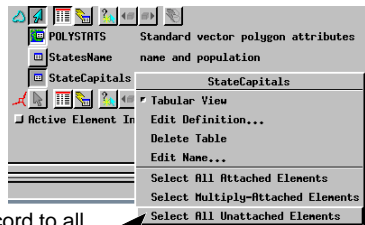
# Finding Elements without Attributes

## STEPS

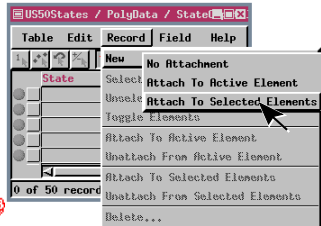
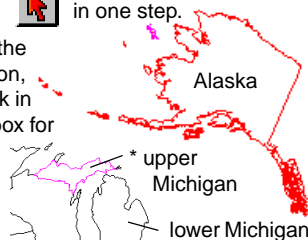
- open a new 2D group, click on the Add Vector icon, choose Quick-Add Vector, and select US50STATES from the previous exercise
 
- click on the Show Details icon in the Group Controls window
 
- click on the Show Tables icon for the polygons, click on the View Table icon for StateCapitals
 

- click on the GeoToolbox icon, then click on the Rectangle tool, inscribe the cluster of polygons that represents Alaska, and click on [Perform Selection] on the Select panel in the GeoToolbox
 

- click on the New Record icon and choose Attach to Selected Elements in the State Capitals table and enter Alaska for the State and Juneau for the Capital
 
- use the Rectangle to select the Hawaiian islands, then repeat step 5 but enter Hawaii and Honolulu in the State and Capital fields
 
- click on the Select tool, click on upper Michigan\*, click on the View All Records icon, scroll down and click in the Select Record box for Michigan, then choose Record / Attach to Active Element
 

When working with a polygonal vector object, such as a soil map, you generally expect that all polygons will have a soil type attached when you are done assigning attributes. There are many methods to assign attributes, such as transferring from another element type, attaching by geographic location in a database, or direct attachment in the display or editing process (all of which are described in this booklet). Regardless of the method, the question remains the same: how do you know when attributes have been assigned to all polygons (or other elements)? You simply view the object in the Spatial Data Display or Spatial Data Editor process and choose the (right mouse button) menu option that selects all elements that lack an attached record in the table you right-click on.

After the elements without attributes have been selected, you can view each using the Previous Selected and Next Selected buttons and assign the appropriate attributes as you go. That isn't necessary in this exercise because it is obvious there are two clusters of polygons without attached records in the StateCapitals table (Alaska and Hawaii). You should also have noticed that only lower Michigan has a record attached in this table, since the capital falls in that part of the state.



You can attach a record to all 34 separate Alaska polygons in one step.





# Finding Multiple Attached Attributes

It is also a good idea to look for elements with more than one record attached in an effort to identify attachment errors or to provide additional information about the structure of the table. If only one record should be attached to each element, the table definition should reflect this requirement (more on this topic in later exercises). You may, however, need to clean up data brought in from other sources before enforcing this restriction. Knowing that elements intentionally have multiple attachments is important for selection queries and style scripts because you need to introduce statements that look for values in all attached records rather than just the first attached record, which is the default.





All hydrological features that are intermittent in nature have multiple records attached in the imported DLG vector used in this exercise, one record identifies the feature type and one identifies intermittency. You need a query statement that looks at all attached records to assign a different style based on intermittency. The necessary script statement to determine if any of the records attached have a specified value (Intermittent) is:

```
if ("Intermittent" in Table[*].Field).
```

The necessary statement for assigning style based on the number of records attached (<1) is:

```
if (SetNum(Table[*]) < 1).
```

## STEPS

- click on New 2D Group, click on the Add Vector icon, choose Quick-Add Vector, and select HYDROLOGYGI3F08 from the DLG\_HYDR Project File 
- click on the Show Details icon in the Group Controls window 
- click on the Show Tables icon for the lines, click on the View Table icon for ATTRIBUTES 
- right-click on the ATTRIBUTES table in the table list for the line database and choose Select All Multiply-Attached Elements from the menu
- click on the Vector icon in the layer icon row (Group Controls window) and examine the script used for line styles (click on the Lines tab then on [Specify] for Style By Script) 

No elements selected.

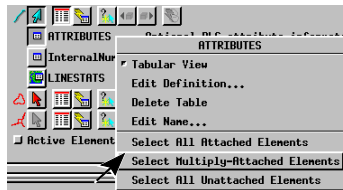
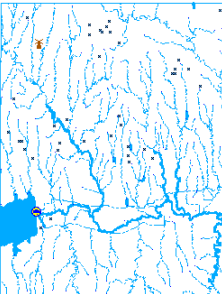
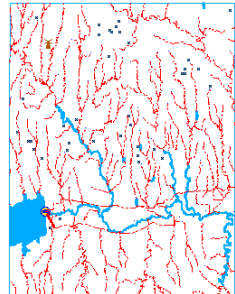


Table	Edit	Record	Field	Help
1				
Major_Code	Minor_Code	Description		
50	610	Intermittent		
50	412	Stream		
2 of 7 records shown - 5 relat				




Records attached to active element.

Multiply-attached elements selected.



# Direct or Indirect Attachment

## STEPS

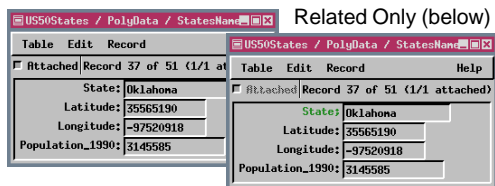
- remove the HYDRO-LOGYGI3F08 layer, then click on the Add Vector icon, choose Quick-Add Vector, and select US50STATES
 
- click on Show Details and the polygon Show Tables icon
 
- right-click on the States Name entry in the polygon table list, choose Select All Attached Elements, and note that the smaller Alaska and Hawaii polygons and upper Michigan are not highlighted
- click on the View Table icon for StatesName and change to Single Record View
 
- note that the Attached button at the upper left is pushed in and the option is active (text is dark)
- choose Table / Edit Definition, click on the Field Info tab, and pick State Capitals.State from the Primary Key option menu
- click on the Table Info tab, change the Attachment Type to Related Only, and click [OK]
- note that the Attached button is now dimmed and the State field name is shown in green
- click on the Select icon, then click on upper Michigan or one of the Alaskan or Hawaiian islands that were previously unattached

Relational databases in association with spatial data objects minimize the amount of work required to attach attributes to the appropriate elements. The exercises on pages 19–22 all produced direct attachments to elements. It is one thing to have these attachments established automatically, and quite another to have to do it yourself on an element by element basis repeated for each table in the database. A relational database can use the direct attachments established with one table for all other tables that are related by a primary key / foreign key relationship.

One table, at least, must be directly attached to elements and one must have a primary key field established before you can have a functioning relational database. The Related Only attachment type is for tables that make use of a primary key / foreign key relationship to find related records. All other attachment types apply to tables with records directly attached to elements. You should make some effort to understand attachment types and set them appropriately because they not only affect the number of records you can have attached to elements but how tables behave when objects are merged, extracted, or otherwise manipulated. These topics are discussed in the next few exercises.

The action taken in this exercise to change the attachment type of a table from One Record Per Element to Related Only (using the primary key in another table) increased the number of polygons that show related database information when selected. However, all direct attachments were lost when this setting was changed.

One Record Per Element

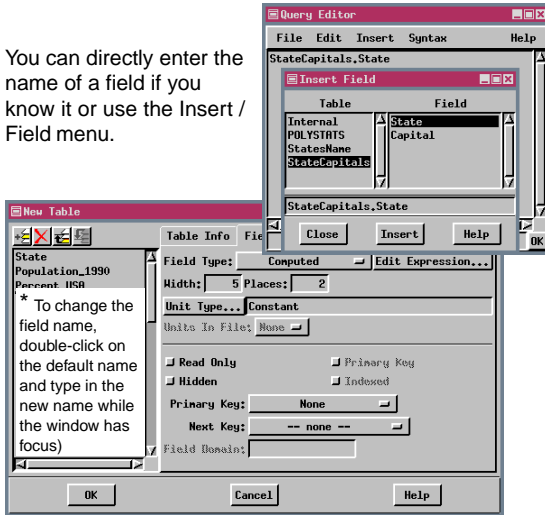


# Implied One-To-One Attachment

Implied One-To-One attachment is designed for tables that consist entirely of string expression and computed fields so that you can gather and manipulate information related to an element from other tables without having to manually enter any information (other than the expressions for the fields). You can, of course, include fields that require manual entry if desired.

There is always one record and one record only for every element with implied one-to-one attachment. As a result, the Select All Attached, Multiply-Attached, and Unattached Element options found for other table types are not on the right mouse button menu in the table list for this table type.

You can directly enter the name of a field if you know it or use the Insert / Field menu.



```
(StatesName.Population_1990 / SetSum(StatesName[@*].Population_1990)) * 100
```

You don't have to enter any information to have the records filled in for selected elements using implied one-to-one attachment and computed fields. (There will be blank lines in this table if you view all records, see page 29.)

State	Pop_1990	Pct_USR
Nebraska	1578385	0.63

1 of 145 records shown - 1 re

## STEPS

- click on the Make Table / Form icon in the polygon row, choose New Table, and name the table PopulationPct
- set the Attachment Type to Implied One-To-One
- click on the Add Field icon, change the field name\* to State, set the Field Type to String Expression and the Width to 16
- click on [Edit Expression], choose Insert / Field, click on the State Capitals table and State field, then on [Insert], and on [OK] in the Query Editor window
- click on Add Field, change the name to Pop\_1990, set the Field Type to Computed, and the Width to 9
- repeat step 4 except click on StatesName for the table and Population\_1990 for the field
- click on Add Field, change the field name to Pct\_USA, set the Field Type to Computed, and the Width to 7 with 2 decimal places, then click on [Edit Expression] and enter the expression shown (left)
- click [OK] in the Query Editor and in the Table Definition window
- click on the Select icon, then open the table and select elements and view records

# Other Attachment Types

## STEPS

- choose Edit/Spatial Data
- click on the Open Object for Editing icon and select the CBSOILS\_LITE object from the C BUTTE Project File
- click on the Polygon icon in the Attributes panel of the Vector Tools window and choose Show Tables
- right-click on the CLASS table in the list, choose Edit Definition, and check that the Attachment Type is set to One Record Per Element, then click [OK]
- click on the View Table icon for the CLASS table, and note the number of records
- click on the Add Line icon, then click at the upper left and lower right to produce a diagonal line across the object, and click on [Add]
- note the number of records in the table after the line is added then click on the Remove icon for the layer and discard the changes
- repeat steps 2–6 except in step 4 set the Attachment Type to No Restriction
- note the number of records in the table after the line is added
- choose File / Exit and discard the changes

The No Restriction attachment type lets you attach multiple records to multiple elements. The One Element Per Record attachment type prevents you from attaching a record to more than one element and tells you that the first attachment will be broken if you proceed with attachment of a second element. Thus, when all elements have attributes assigned, you will have at least as many records as elements (more if more than one record is attached to an element).

The One Record Per Element attachment type lets you set up one record for each attribute value and attach it to all elements with that value, such as polygons of a particular soil type. Trying to attach a second record to an element will break the first attachment. The One To One attachment type lets you have at most one record attached to an element and only one element attached to a record.

You can choose to be prompted to enter attribute values when elements are added or split in the Spatial Data Editor. You can also choose to have a selected (“default”) record attached without prompting if you are adding multiple elements with the same attribute value.

before adding line to split polygons

The attachment type affects the number of records after any operation that splits elements, such as editing, merging, or combining vector objects.

One Record Per Element

after split

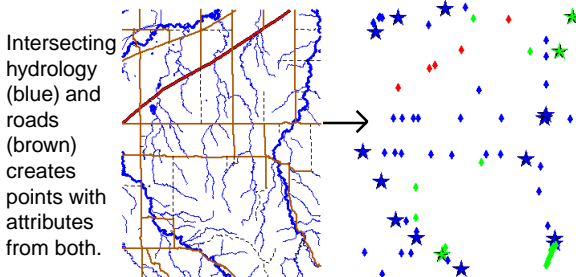
No Restriction

after split

## Demoting Attachment Restrictions



The attachment type established in a table definition determines how element attributes are handled during editing and other object manipulations, such as merging and different types of combinations. The No Restriction attachment type may cause unexpected results when editing or combining objects because you can end up with many more records than you started with, which can be disconcerting. If such results were not what you intended, you can delete duplicate records in the Database Editor.

The one record per element attachment type is generally used for tables with a single, categorical field that is a primary key or with a number of fields that provide summary data for all members of the named class. In such tables you have one record for each attribute value that is attached to all elements with that value. The number of records in the table tells you how many different attribute values you have for the elements in an object (provided there are no unattached or duplicate records). Some vector combinations, such as line-to-line intersect (which creates an output vector of points at the locations the lines in the input vectors cross) produce the most useful results when the attributes from both input vectors are maintained. To produce such a result when tables are joined, the attachment type of the output table must often be demoted to No Restriction from the more stringent One Record Per Element of the input tables. If you do not want the attachment type automatically demoted, choose not to join the tables when the output object is produced.




Intersecting hydrology (blue) and roads (brown) creates points with attributes from both.

### STEPS

- choose Process / Vector / Combine
- set the Operation menu to Intersect (AND)
- click on [Select] in the Source panel and choose HYDROLOGY from the C BUTTE Project File
- click on [Vector] in the Operator panel and select ROADS from the same file
- set the Source Polygons to None
- set the Table Joining Options to If Same Table Structure (2nd option)
- set the Operator Element Type to Line
- click on [Run]
- name the output object INTERSECTPOINTS
- open a new 2D group in Spatial Data Display
- click on the Add Vector icon and choose Add Vector Layer 
- select the INTERSECTPOINTS object, click on [Styles] and choose POINTSTYLE in the C BUTTE Project File
- click on the Points tab, set the style to By Script, click on [Specify], then choose File / Open / RVC Object and select STYLESCRIPT from the C BUTTE Project File
- once displayed, click on the Select icon, then click on points to view their attributes; also note the Attachment Type in the table definition 

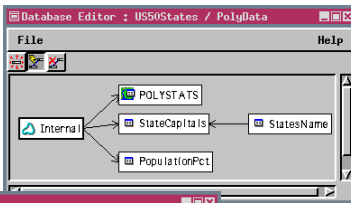
# Building Direct Attachments

## STEPS

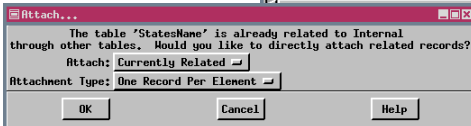
- choose Edit / Attribute Databases from the main menu\* and select the us50states object when prompted
- choose Polygon in the Select window and click [OK]
- click on the Relate icon 
- place the cursor over the Internal box, click the left mouse button, drag the cursor to the StatesName table, and release
- set the Attach menu to Currently Related and the Attachment Type menu to One Record Per Element, then click [OK]
- exit the process

Database tables are often assembled from a number of sources at different times and may have more than the single redundant field needed to establish indirect attachments. At some point you may want to consolidate and eliminate tables or otherwise manipulate your database.

You can use the Database Editor to build direct attachments for you rather than having to establish them manually if the attachment type is Related Only or if the table contains X-Y coordinate fields. Direct attachment by X-Y coordinate fields with the Database Editor provides an alternative method to that used in the exercise on page 19 for attaching records. (You first have to use the Add Table function on the Make Table / Form icon menu if you don't use the Attach Database process.)

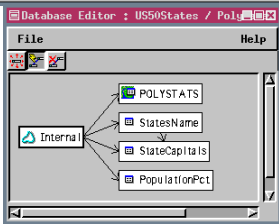


Even though the records have X and Y coordinates in this example, you want



to use the Currently Related option for establishing attachments or you will once again find that only the largest polygons remain attached for Alaska and Hawaii and that upper Michigan will no longer be attached to a record.

after direct attachment



In general you would not take the steps in this exercise unless you intended to delete a related table. You might want to delete tables

\* If using TNTedit or TNT-view, you need to launch the Spatial Data Display process, select the us50STATES object, show details for the layer and choose Edit Relations from the Make Table / Form icon menu.

for a variety of reasons, such as those already mentioned or public distribution of an object with some proprietary tables in its database that should be deleted before distribution. You can delete tables from the right mouse button menu for the table in the Database Editor or a display Controls window or from the Table menu in the table itself.

# Making Computed Fields Permanent

Computed fields are a powerful database feature that lets you combine the information in one or more tables to provide a new slant on the data. For example, raw population data can become percent population data, as in the table you created on page 25. In cases where the fields used in the expression for the computed field are continually updated, you want them to be recalculated every time you view the table. In other cases, the fields that feed into the computed field expression are unchanging and the value may as well be frozen once the computation is made.

The computed fields in the PopulationPct table are based on 1990 population data, which isn't likely to change, so the values in these fields could be made permanent. However, these fields currently exist in an Implied One-To-One table that has many blank records because of the unclassified island polygons off the coast of Florida and a number of other states. So we'll add this information to the StateCapitals table before making it permanent.

A table with computed fields may pull together all the information of interest to you from a variety of other tables, which may no longer be needed once you have the computed values. You need to make the computed fields permanent before deleting any tables used in their expressions. Most field manipulation functions are available only from the Field menu or the right mouse button in tabular view. If selecting from the Field menu, you need to first select a field by clicking on the field label so the menu items are active.

## STEPS

- choose Display / Spatial Data if not already open and add the US50STATES object to a new 2D group
- open the StateCapitals table in the polygon database and choose Table / Edit Definition
- highlight Capital in the fields list then follow steps 5–8 on page 25 (instead of entering the expression in step 8, enter PopulationPct.Pct\_USA or use Insert / Field to enter it for you)
- in tabular view of the StateCapitals table, right-click on the field name button for Pop\_1990, choose Make Field Permanent, then click on [Yes] in the Verify window
- click on the Pct\_USA field label, choose Field / Make Permanent, and click on [Yes] in the Verify window
- note that the field names are no longer blue
- return to the Edit Definition window and note that the field type for these two fields has changed from Computed to Floating-Point
- click on the Select icon, open the

A Verify window opens for you to confirm you want to make this irreversible change.



PopulationPct table, select some elements and note that the computed and permanent values agree



# Default Record in the Spatial Data Editor

## STEPS

- ☑ choose Edit / Spatial Data
- ☑ click on the Add Reference Layer icon and select the CIR\_4 object from the DAWSON Project File, click on the Create New Object icon, choose Vector, and click [OK] in the New Object Values window
- ☑ click on the line Attributes icon and choose Default Record
- ☑ click on [Make Table], enter FEATURES as the name, and click [OK]
- ☑ set up the table so it has a single string field (Width 18) that is the primary key with One Record Per Element as the Attachment Type
- ☑ click [OK] in the table definition and Select Table for Prompt windows
- ☑ type *county road* into the field in the Default Record window and click [OK]
- ☑ click on the Add Line icon and add one horizontal and three vertical lines that follow the roads as shown
- ☑ click on the line Attributes icon, choose Default Record, select FEATURES table, and change the field entry to *intermittent canal*
- ☑ add a line for the canal as shown (turn snapping off)
- ☑ change to the Select tool, open the Features table, and view the line attributes

You can set a “default” record for each element type in the Spatial Data Editor. The default record is attached to every element of that type added until you set the default to no record or turn on the tabular view default record option. Assignment of a default record is best suited for adding a number of vector elements of the same type, such as when photointerpreting county roads. Assignment of a default record from the Attributes panel of the Vector Tools window is the method of choice for new vector objects when you will be creating a new table for attribute assignment. Setting the default record in tabular

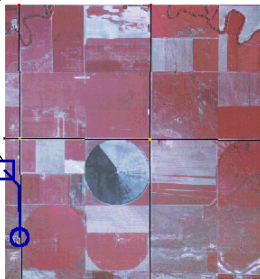
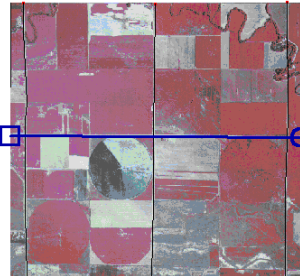


view (next exercise) is a better choice when the records you want to attach already exist.

When the attachment type is One Record Per Element, only one record will be created for each attribute value entered. One record will be created for each element added for any other attachment type.



Entering a new attribute value creates a new record when the next element is added.

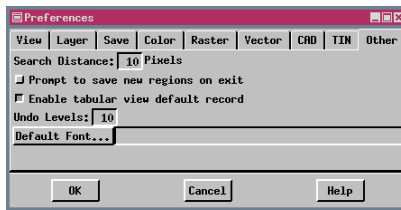


Open the table and select elements to confirm attachments are as expected.

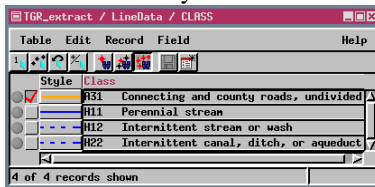


# Setting Tabular View Default Record

There are two different ways to set up a default record for attachment, so you need to have some means of specifying which you want to use. The act of setting up a default record from the Attributes panel (previous exercise) is sufficient to turn on that method. You need to turn on a toggle button in the Preferences window to use the tabular view default record. Once this option is turned on, it attaches the selected record to each element added. Selecting a different record changes the default record attached to elements when added. Any record selected prior to choosing an add element tool is cleared when you initially choose to add elements, but persists as you change elements added if still applicable (default line attributes are assigned to polygon lines).

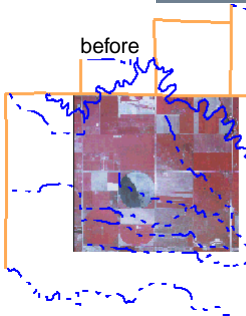


When elements are displayed by attribute, you can tell immediately if added elements have been assigned to the expected class because they are drawn in the assigned style as soon as they are added.

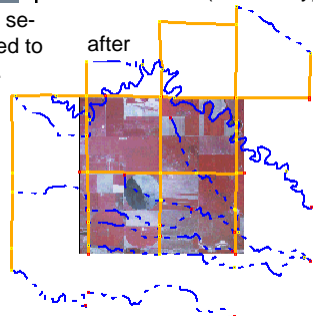


## STEPS

- remove the New Vector layer created in the previous exercise (keep the reference layer open)
- click on the Open Object for Editing icon and select the TGR\_EXTRACT object in the DAWSON Project File; open its Object Display Controls and set the lines style to By Attribute
- choose Setup / Preferences (Spatial Data Editor window), click on the Other tab, and toggle on the *Enable tabular view default record* option
- click on the Line icon in the Attributes panel of the Vector Tools window, choose Show Tables, and open the CLASS table from the list in the Spatial Data Editor window
- click on the Add Line tool then, with all records showing, click in the Select Record box for the A31 class
- add lines just as in the last exercise (roads only)














The record currently selected will be attached to the elements added.



# Nodes with Attributes

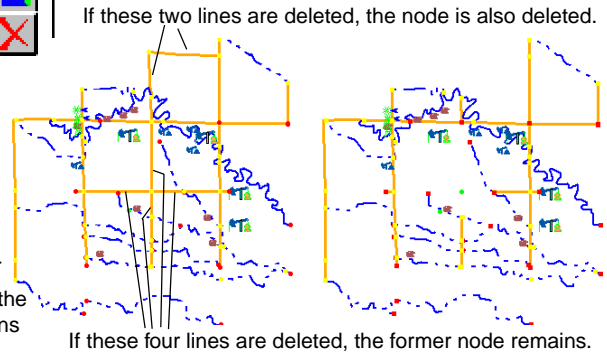
## STEPS

- still in the Spatial Data Editor, remove the layer from the last exercise (saving changes if desired), then open the MERGED object in the DAWSON Project File
 
- show details for the layer and show tables for points and nodes
 
- click on Make Table/Form in the node table/selection icon row, and choose New Table
 
- name the table OWNERSHIP, and add a single string field (width 20); note the new table appears under both points and nodes
 
- open the new table, choose the Select tool, and click on the node at the intersection in the middle of the object
 
- click on the New Record icon, choose Attach to Active Element, and enter Klopping in the new record
 
- click on the Edit icon, then on the Delete Element icon in the Operation panel of the Element Selection window
 

- delete each of the four lines that emerge from the new point
 
- delete the two lines that emerge from the node at the top center
 
- note what remains at the former line intersections
 

Polygonal and planar vector topology require a node at every line element intersection. Nodes serve an important topological function, but their existence depends on the line elements. Thus, as you delete adjoining line elements, the node may become an “excess node” and be subject to deletion by the Remove Excess Nodes filter. If all lines emerging from a node are deleted, the node is automatically deleted. You can protect a node from such automatic deletions in one of two ways: attach one or more database records or use the Convert Node to Point tool. After attributes are attached, nodes draw in the designated point style. Note that in this exercise, the new point is redrawn in the all same style.

A variety of attributes can be associated with nodes. In this exercise, you assign the ownership of the surrounding land to a node. You might also want to identify a feature that happens to occur at a line intersection. Generally, attributes assigned to nodes should identify a property of the node that will remain if the lines are deleted.

Any table you create for nodes becomes part of the point database. When you show the tables for nodes and the tables for points, they are exactly the same. These tables are simply listed twice (once under points and again under nodes) for convenience.







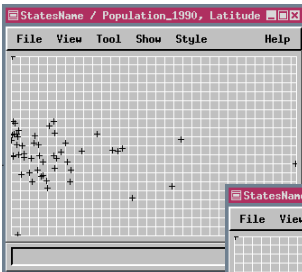
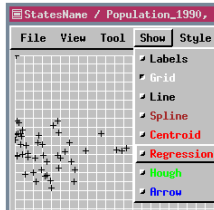
# X-Y Plots

You can select any two numeric fields and plot them against each other. The first selected field becomes the X axis and the second field provides the Y values. Fields are selected by clicking on the field name in tabular view (the second field is selected by holding down the <shift> key and clicking on the second field name).

A variety of statistical tools to assist with interpretation of the plots are also provided. You can add a regression line, draw a line that connects the points in numeric order, spline that line, determine the centroid for all the data points, or add a Hough Transform of the data. Each of these components is color coded on the menu and displayed in that color when selected.

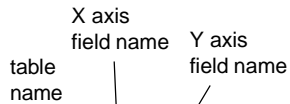
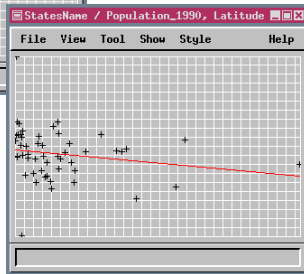
## STEPS

- open a new 2D group 
- click on the Add Vector icon, select Quick-Add Vector and choose the US50 STATES vector object from the STATES Project File 
- show details for the vector layer then click on the Show Tables icon for the polygons and open the StatesName table  
- in tabular view, click on the Population\_1990 field name, then hold the <shift> key and click on the Latitude field name
- choose Field / Plot / XY Plot in the tabular view
- click on the Show / Regression toggle in the XY Plot window

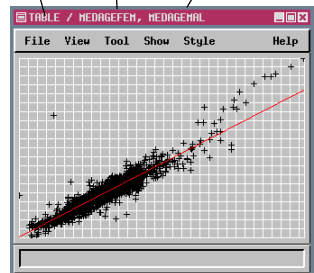


State Population (X) vs Latitude (Y)

Adding the regression line makes apparent the small negative correlation between latitude and state population in the USA.



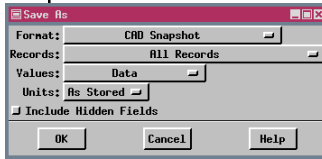
The strong positive correlation between median female age and median male age in cities with populations greater than 5000 in the USA is quite apparent even without the regression line.



# Saving Tables as CAD Objects

## STEPS

- click on the Open icon in Spatial Data Display, choose Open Layout, and select the WesternStates object in the STATES Project File
- show details for the WESTERNSTATES vector in either Group 1 or 2, then click on the Show Tables icon for the polygon database and the View Table icon for the Population table
- in tabular view, choose Table / Save As and set the format to CAD Snapshot, click [OK] and name the output WESTERNSTATES, then click [OK] in the Style Editor window
- click on the Add CAD icon for Group 3, choose Quick-Add CAD, and select the WESTERNSTATES CAD object just created

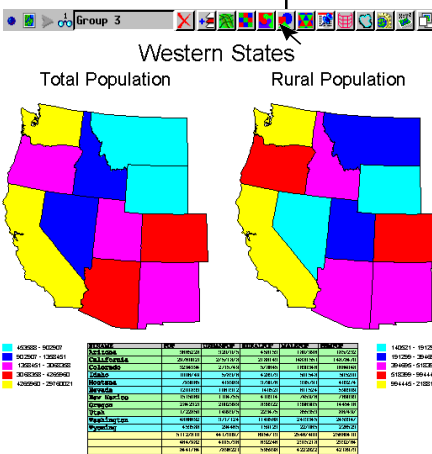


In addition to saving database tables, selected records, or statistics in internal or other database formats, you can save them in CAD format so that database information can be incorporated as part of a layout. Unlike legends, which provide drawing style samples for a single attribute of the object illustrated, you can present the attributes in all fields using this feature. Tables can be used in place of a legend if desired since the style field is included in the CAD object if shown in the table.

When you save a table as a CAD object, you have the option of saving all records or only selected records and including or excluding fields you have hidden. A style object and style assignment table are created so the appearance of the CAD object matches your display options for the database table. Thus, if you have selected interleaved colors, your CAD object will have the same colors and interval as the database tabular view.

You can change the assigned colors and fonts, but the Use Element Size toggle for text must remain on so the text fits the table structure of the CAD object. The size at which the CAD object is inserted in a layout should be controlled by the zoom factor in the Group Settings window, not by trying to adjust the size of individual elements.

You may have to adjust the relative zoom of Group 3 in the Group Settings window if your layout does not appear as shown after adding your CAD object. In this example, you would not want to show the style field in the table because the style would apply only to one of the two theme maps.

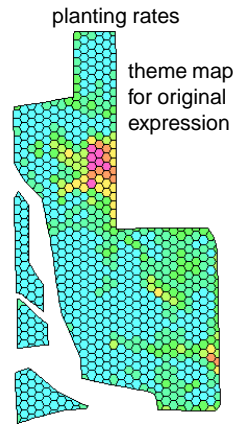


## Sharing Attributes between Applications

The ability to link to .dbf files in all TNT products and to save tables or selected records in .dbf format in TNTmips, TNTedit, and TNTview provides a powerful means of sharing data between applications. For example, consider a vector created in TNTmips that has attributes that include computed fields. You have exported the vector to a shapefile for use by others in ArcView. Circumstances change and necessitate alteration of the expression for the computed field. You can make that change in TNTmips, choose Table / Save As, set the format to dBASE III, and replace the existing .dbf file associated with the shapefile. You do not need to re-export the vector object. This technique requires a one-to-one relationship between elements and records.

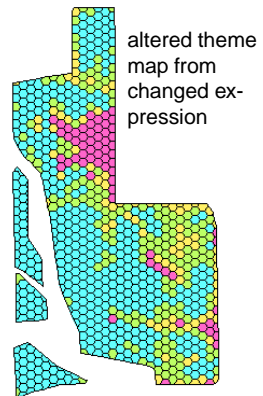
Another possibility is that you have a vector object in any TNT product that has an attribute table linked to a .dbf file that was created from a model in a spreadsheet program, such as Microsoft Excel. You can vary the model in the spreadsheet program, save the results in .dbf format and immediately examine the effect of the alteration in the Spatial Data Display process. For example, you may have a model that determines what areas you should spray for weeds or pests that incorporates severity of the problem, potential return, and the dollars you have to spend. When the amount you have to spend changes, you simply enter the new dollar amount in the model, redetermine the areas to spray, and save the result as .dbf. The next time it is drawn in TNTmips, the areas will be updated.

The Save As Database III (.dbf) feature is found on the same menu as Save As CAD Snapshot, which is described in the previous exercise. Although you can save a CAD snapshot in TNTlite, you cannot save to a .dbf file because it is a form of export. You can link to .dbf files in the Import process or using the Import Wizard with the Database Editor.



```
rate = 0
y99 = 0
y99 = Corn99_Mean
if (y99 < 25) rate = 18000 else
if (y99 < 40) rate = 23000 else
if (y99 < 60) rate = 24000 else
if (y99 < 80) rate = 26000 else
if (y99 < 100) rate = 28000 else
if (y99 < 120) rate = 31000 else
if (y99 < 140) rate = 35000 else
rate = 34000
return rate
```

Change the expression for the theme mapped field based on new information (different recommended rates for the same or a different herbicide).





# Advanced Software for Geospatial Analysis

MicroImages, Inc. publishes a complete line of professional software for advanced geospatial data visualization, analysis, and publishing. Contact us or visit our web site for detailed product information.

**TNTmips** TNTmips is a professional system for fully integrated GIS, image analysis, CAD, TIN, desktop cartography, and geospatial database management.

**TNTedit** TNTedit provides interactive tools to create, georeference, and edit vector, image, CAD, TIN, and relational database project materials in a wide variety of formats.

**TNTview** TNTview has the same powerful display features as TNTmips and is perfect for those who do not need the technical processing and preparation features of TNTmips.

**TNTatlas** TNTatlas lets you publish and distribute your spatial project materials on CD-ROM at low cost. TNTatlas CDs can be used on any popular computing platform.

**TNTserver** TNTserver lets you publish TNTatlases on the Internet or on your intranet. Navigate through geodata atlases with your web browser and the TNTclient Java applet.

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