EXPORTING

Tutorial

Exporting Geodata

with

TNTmips® and TNTedit™

Before Getting Started

This booklet introduces the procedures used to export geospatial data from TNTmips to file formats compatible with other software packages. The Export process allow you to export raster, vector, CAD, TIN, and database objects to a variety of geospatial data formats. Attribute data attached to vector or CAD elements can be exported along with the parent object for output formats that support attribute linkage. This booklet leads you through a series of exercises to familiarize you with the basic export procedures for the different types of spatial objects.

Prerequisite Skills This booklet assumes that you have completed the exercises in the tutorial booklets entitled *Displaying Geospatial Data* and *TNT Product Concepts*. Those exercises introduce essential skills and basic techniques that are not covered again here. Please consult those booklets for any review you need.

Sample Data The exercises presented in this booklet use sample data that is distributed with the TNT products. If you do not have access to a TNT products DVD, you can download the data from MicroImages' web site. In particular, this booklet uses sample files in the EXPORT data collection.

More Documentation This booklet is intended only as an introduction to exporting geodata. Details of the processes discussed can be found in a variety of tutorial booklets, Technical Guides, and Quick Guides, which are available from MicroImages'web site.

TNTmips® Pro and TNTmips Free TNTmips (the Map and Image Processing System) comes in three versions: the professional version of TNTmips (TNTmips Pro), the low-cost TNTmips Basic version, and the TNTmips Free version. All versions run exactly the same code from the TNT products DVD and have nearly the same features. If you did not purchase the professional version (which requires a software license key) or TNTmips Basic, then TNTmips operates in TNTmips Free mode.

The Export process is not available in TNTview or TNTatlas. All the exercises can be completed in TNTmips using the sample geodata provided.

Randall B. Smith, Ph.D., 3 September 2013

You can print or read this booklet in color from MicroImages' web site. The web site is also your source for the newest Getting Started booklets on other topics. You can download an installation guide, sample data, and the latest version of TNTmips Free.

http://www.microimages.com

Welcome to Exporting Geodata

TNTmips allows you to develop, process, and analyze geospatial data using raster, vector, CAD, shape, and TIN spatial data structures, each of which can have associated attribute information in database tables. The TNTmips Export process allows you to export any of these spatial object types and associated (or standalone) database information to file formats compatible with many other software packages.

The export procedures offer options that allow you to tailor the export process to best accomodate the characteristics of your data and the structure of the target file format. For example, some spatial data formats used by other GIS software packages are based on a CAD data model and do not maintain the topological structure found in vector objects in TNTmips. When you export a polygonal vector object to one of these formats, you can choose whether a closed shape formed by intersecting lines is treated as a polygon or as separate lines in the output file. You can also choose which type of spatial element has associated attribute data.

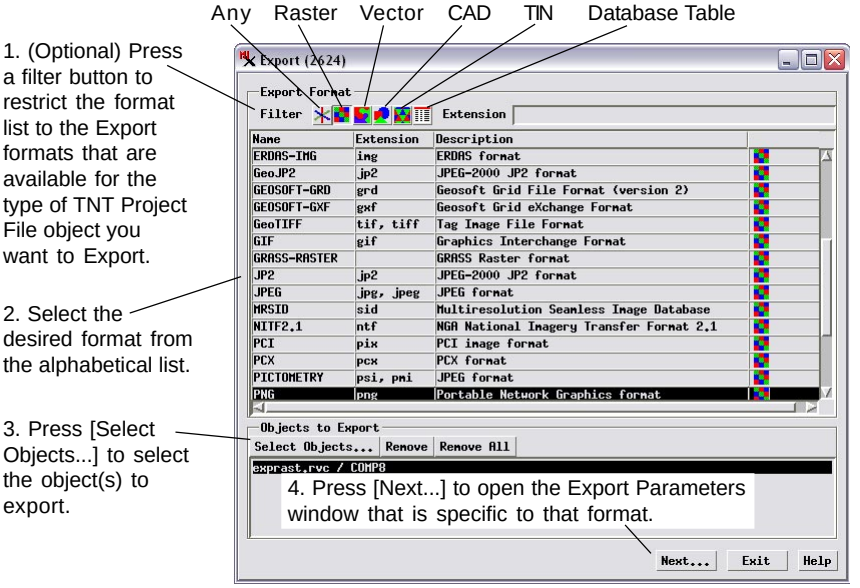
The exercises in this booklet lead you through the export process using a sampling of the supported external file formats. The procedures you learn here should enable you to follow the steps required to export data to other formats.

In addition to the Export process, TNTmips offers several other means for transforming data for use with other software packages. You can use the Quick Snapshot and Render to Raster options in the Display process to make a raster image of the contents of a View in one of several external file formats. You can also use the *Render to* operations in Display to transform a layout to a PDF, KML, or SVG file. These and other related capabilities are discussed in the tutorial booklet entitled *Sharing Geodata with Other Popular Products*.

STEPS
- ☑ launch TNTmips
- ☑ choose Main / Export from the TNTmips menu

Procedures common to all export operations are introduced on page 4. The exercises on pages 5-16 lead you through the standard procedures for exporting raster objects. Export of geometric objects (Vector, CAD, and shape) is introduced on pages 17-20. Page 21 covers database table export. Page 22 provides some general export tips. A complete list of currently supported export formats can be found on page 23.

Common Export Procedures



STEPS

- ☑ on the Export window, click the Raster filter button 
- ☑ select PNG from the scrolled file format list
- ☑ press [Select Objects...] on the Export window
- ☑ use the standard Select Objects window to select object COMP8 from the EXPRAST Project File in the EXPORT data collection
- ☑ click [Next...] on the Export window to open the Export Parameters window

If you wish, you can use the standard Display process (Main / Display) to view any of the objects used in these exercises prior to exporting them.

The large scrolled list on the Export window shows the external file formats that are available for the object type you have specified using the Filter icon buttons. The list is ordered alphabetically by the file format acronym and also shows the file extension and a brief description for each format. If you compare the listings for different object types, you will find that you can export to certain file formats from more than one object type (vector or CAD, for example). You can choose the desired format by left-clicking on its entry in the list or by entering its file extension in the Extension text field at the top of the window.

After you have selected the format and the objects you want to export, press the Next button to open an Export Parameters window that allows you to set options that are specific to that particular format. (If you haven't selected objects to export, pressing [Next] prompts you to select the objects, then opens the Export Parameters window.)

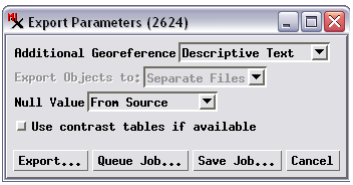
Export a Raster Object to PNG

Let's begin by exporting a raster object to the PNG (Portable Network Graphics) format. PNG is a format designed for the transmission of image data through computer networks. It can accomodate 8-bit or 16-bit grayscale images, true-color images (up to 48 bits per pixel), and indexed color images (with a color palette). The PNG format also incorporates an efficient form of lossless data compression.

The raster you export in this exercise is an 8-bit color composite image. When this raster is displayed, the numerical values stored in the raster are merely used as index values to an associated color palette subobject, allowing a color to be mapped to each cell. When you export a color-mapped raster to an external file format that supports color palettes, such as PNG, BMP, GIF, TIFF, and others, the color palette is transferred to the external file along with the raster to produce an indexed-color image file.

STEPS

- ☑ choose Descriptive Text from the Additional Georeference menu of the Export Parameters window
- ☑ press [Export...] on the Export Parameters window
- ☑ in the Select File window, navigate to the desired destination drive and directory
- ☑ enter PNGCOMP in the New File Name text field and click [OK]
- ☑ when the export process is complete, press [OK] on the Status window
- ☑ press [Remove] on the Export window



The Export Parameters window provides options appropriate for the selected external file format.

Input raster COMP8, an 8-bit raster with a color palette.

Job Processing in Export

The Export process and TNTmips Job Processing system let you efficiently manage large batch exports of dozens or hundreds of spatial objects, exploiting your computer's multiple cores for fast concurrent processing.

Use the Queue Job or Save Job button on the Export Parameters window to use Job Processing for your batch export. The Export process creates a separate job file for each file or object you are exporting. You can manage and monitor the progress of these jobs using the TNT Job Manager (Tools / Job Manager).

For more information see the Technical Guide entitled Export: Concurrent Exports Using Job Processing.

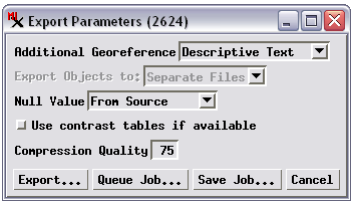
Export a Raster Object to JPEG

STEPS

- ☑ press the Raster filter button
- ☑ select the JPG format
- ☑ press [Select Objects] and select object COMP24 from the EXPRAST Project File in the EXPORT data collection
- ☑ press [Next...]
- ☑ choose Descriptive Text from the Additional Georeference menu of the Export Parameters window
- ☑ press [Export...]
- ☑ use the Select File window to name the output JPEG file
- ☑ when the export process is complete, press [OK] on the Status window
- ☑ press [Remove] on the Export window

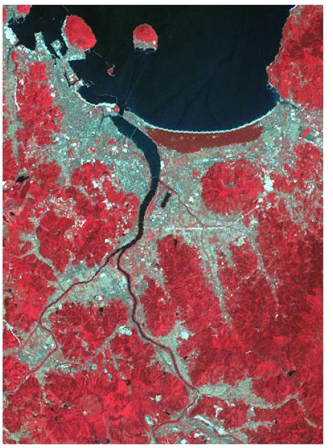
The JPEG File Interchange Format is commonly used for the transfer of compressed "true-color" raster images. You can export RGB raster sets, color-composite rasters (8-bit or 24-bit), or grayscale rasters to this format. In this exercise you export a single, 24-bit color composite raster.

The JPEG file format incorporates JPEG (Joint Photographic Experts Group) image compression. This is a lossy compression scheme that can achieve compression ratios of 20:1 for photographic-quality images without a noticeable degradation in quality. The fidelity of the compressed output file is governed by the Compression Quality parameter, which varies from 25 to 100 with a default value of 75. Maximum image quality (and minimum compression) is achieved with a Compression Quality value of 100. Reducing this value results in a smaller, more compressed output file that may show visible compression artifacts at low quality settings.



Lossy compression schemes achieve high compression ratios by adjusting raster values during compression, which results in some loss of the original data.

Lossless compression schemes do not discard any cell values during compression. When an image is compressed and then decompressed, the original data in the image is completely preserved.



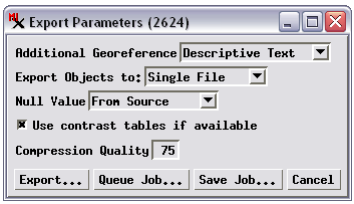
Raster object COMP24, a 24-bit color composite image.

JPEG files can only store color images as 24-bit rasters with separate red, green, and blue color values for each image pixel. They cannot store indexed-color images. If you export an 8-bit or 16-bit color composite raster to JPEG, the image is automatically converted to 24-bit color during export.

Export an RGB Raster Set

You can select multiple raster objects for export to separate files of the same format. During the export you are prompted to select or create a folder (directory) in which to save the output files, which are automatically named using the raster object names.

The export procedures for certain raster file formats allow you to choose a set of three grayscale rasters to export to a single file as an RGB image. Applicable formats include PNG, JPEG, TIFF, JP2, MrSID, and ECW. The Export Parameters window for these formats has an Export Objects to: menu that becomes active if exactly three grayscale raster objects were selected for export; use this menu to choose whether to export the rasters to separate files or to a single file. When you choose to export to a single file, the first raster you selected is used for the red color component of the RGB image and the last one is used as blue. During the export you are prompted to name a single file for output. If you choose to export the rasters to separate files, the files are automatically named in the destination folder as outlined above.



Select Separate Files from the Export Objects to: option menu when you want to export each input raster to a separate output file.

You also have the option to apply contrast enhancement during export to these formats. When you turn on the Use contrast tables toggle, contrast-adjusted values are written to the output file (rather than the raw raster values) for any raster that has a saved contrast table. If there is more than one contrast subobject for an input raster object, the last one you have used is applied during export.

STEPS

- ☑ press [Select Objects...]
- ☑ select objects RED, GREEN, and BLUE (in that order) from the EXPRGB Project File in the EXPORT data collection
- ☑ press [Next...]
- ☑ choose Descriptive Text from the Additional Georeference menu of the Export Parameters window
- ☑ select Single File from the Export Objects to: option menu
- ☑ turn on the *Use contrast tables if available* toggle button
- ☑ press [Export] and name the output file CBTM742
- ☑ when the export process is complete, press [OK] on the Status window

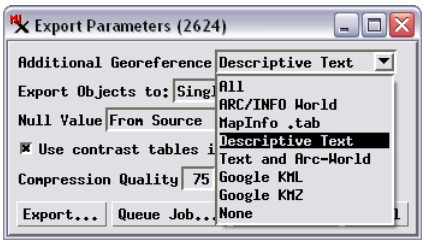
RGB display of rasters RED, GREEN, and BLUE.

External Georeference Options

STEPS

- ☑ keeping the same input rasters and format as the previous exercise, press [Next...] on the Export window
- ☑ open the Additional Georeference menu on the Export Parameters window and examine the options
- ☑ press [Cancel] on the Export Parameters window
- ☑ press [Remove All] on the Export window

Some raster file formats have no internal structure for directly storing georeference information. For these formats (and for others as well), the Additional Georeference menu on the Export Parameters window lets you save georeference information in an accompanying file. The georeference file created has the same root name as the associated image file but has a distinctive file extension that varies depending on the output type you select: Arc/Info World (.tfw), Map Info (.tab), Descriptive Text (.txg), or Google (.kml). You can also choose to create both ArcInfo World and Text files, none, or all.



The Map Info and Descriptive Text georeference files identify the coordinate reference system and store map coordinates for the four image corners. The Arc/Info World file contains the map coordinates for the upper left corner of the image along with x- and y-scale parameters used to compute map coordinates for the remaining cell locations. However, since the World file format was originally designed for exclusive use with unprojected latitude/longitude coordinates, it does not store the coordinate reference system. Therefore it is a good idea to choose the Text and Arc-World option whenever you need a World file, as the text file identifies the coordinate reference system.

The Google KML and KMZ (compressed KML) options are available for most raster export formats, and create KML code enabling the exported image to be viewed as a ground overlay in Google Earth. (At this writing Google Earth requires rasters in PNG, JPEG, or TIFF format.) This option should be used only for relatively small images (2048 by 2048 cells or less). Larger images can be exported as Google Earth tilesets using the Export to Tilesets process (Tileset / Image / Export).

Google Earth and KML support georeference coordinates only in the WGS84 / Geographic (latitude/longitude) coordinate reference system. If the raster you are exporting uses a different coordinate reference system, the export process shows a warning message with details suggesting you resample the raster to geographic coordinates before exporting. You can also create raster files suitable for viewing in Google Earth using the Render to KML option in the Display process.

Export a Raster Object to TIFF

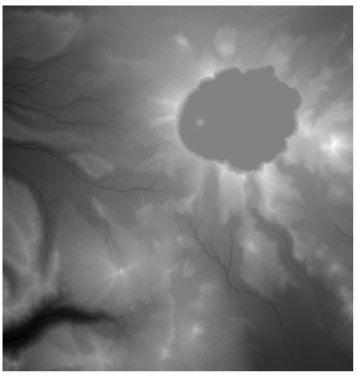
TIFF (Tag Image File Format) is one of the most flexible and widely supported raster file formats. TIFF files can store color or grayscale images at various bit-depths as well as bilevel (binary) images. For full-color TIFF images, you can export either an RGB composite raster or select three grayscale rasters (8- or 16-bit) for assignment to Red, Green, and Blue components. TIFF files can also store color-mapped data, so you can export an 8-bit composite color raster with its color palette.

The Planar Configuration menu determines how the TIFF file stores a full-color image. The Pixel interleaved option defines a single raster with three values (Red, Green, and Blue) per cell. The Band Sequential option creates a separate grayscale raster structure in the TIFF file for each of the Red, Green, and Blue values. Most modern software should be able to read TIFF files in either format.

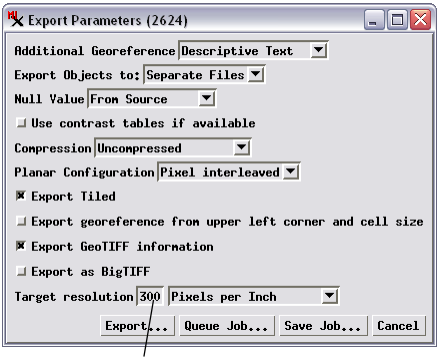
The Export Tiled toggle, which is enabled by default, controls whether the data for each raster is stored in rectangular tiles or as strips extending the full width of the image. Tiling should definitely be used for large images to increase the speed and efficiency with which software reads, buffers, and decompresses the image data.

STEPS

- ☑ select the TIFF format
- ☑ press [Select Objects] and select object CLKDEM from the EXPRAST Project File in the EXPORT data collection
- ☑ press [Next...]
- ☑ choose Descriptive Text from the Additional Georeference menu of the Export Parameters window
- ☑ turn off the *Use contrast tables if available* toggle
- ☑ turn on the *Export GeoTIFF information* toggle
- ☑ press [Export...]
- ☑ use the Select File window to name the output TIFF file
- ☑ when the export process is complete, press [OK] on the Status window



Signed 16-bit elevation raster CLKDEM.



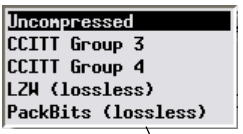
The target resolution is the intended resolution of the image when printed. This information is stored in the TIFF file for the use of graphics and page-layout software to determine the size of the image on the page.

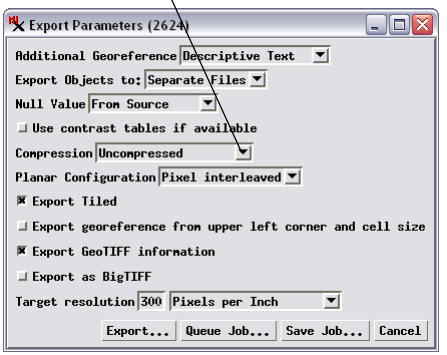
TIFF and GeoTIFF

STEPS

- ☑ keeping the same input raster and format as the previous exercise, press [Next...] on the Export window
- ☑ open the Compression menu on the Export Parameters window and examine the options
- ☑ press [Cancel] on the Export Parameters window
- ☑ press [Remove] on the Export window

The TIFF format incorporates several types of image compression that you can choose from the Compression option menu. The CCITT compression options are designed for binary (black and white) images. The LZW and Pack Bits (a type of Run Length Encoding) can be used for higher bit-depth images.





The TIFF file format uses internal data structures called tags to convey information about the image in the file. GeoTIFF is an extension of the TIFF file format that uses a specialized set of tags to embed geographic information directly within the TIFF file structure, removing the need for additional supporting georeference files. The geographic tag structure in GeoTIFF is open and non-proprietary, so the GeoTIFF format is widely supported by software packages designed to work with geographic data. You can export an image to GeoTIFF using either the GeoTIFF or TIFF format options, which use the same Export Parameters window. The Export Parameters window for TIFF includes an "Export GeoTIFF information" toggle button that is turned on by default.

An image that you have georeferenced in TNTmips using control points may not have its lines and columns parallel to the referenced map grid, so the transformation from image coordinates to map coordinates may involve rotation and shear. TNTmips handles these conversions transparently, and the GeoTIFF and ArcWorld formats also can accomodate them, but some other software packages may compute incorrect map coordinates from rotated TIFF or GeoTIFF images. To ensure that your exported GeoTIFF files are utilized accurately in other software packages, use the Automatic Resampling process (Image / Resample and Reproject / Automatic) to reproject any image with control point georeference to align with its coordinate reference system before you export it. For more information on resampling rasters see the tutorial booklet entitled *Rectifying Images.*

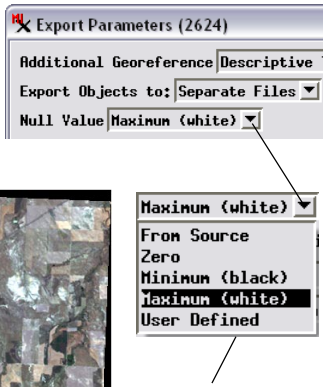
Export a Raster Object with Null Areas

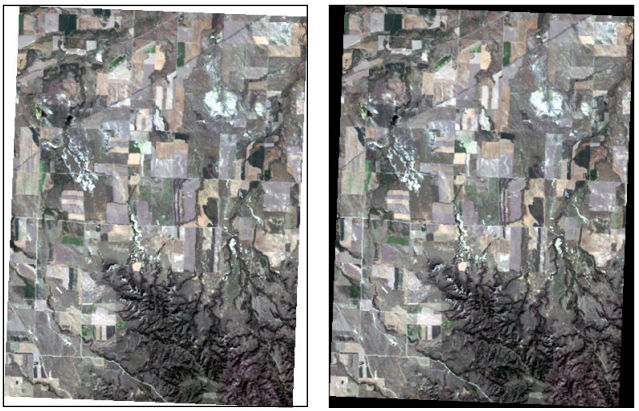
When you resample a raster to align it with its coordinate reference system, or you mosaic a set of rasters, the raster that results may contain areas not covered by the image data. Non-image areas created by these or other processes are flagged as "null" (in a null mask or by a null value set for the raster), allowing them to be rendered transparently when displayed in the TNT products.

However, external raster file formats generally do not support the concept of a null value. The Null Value menu on the Export Parameters window allows you to determine what numerical value is written to the "null" areas of the external file, which then determines the appearance of these areas when the file is displayed in TNTmips or other software. The "From Source" option transfers values from your source raster to the external raster without modification. The value transferred using the "Maximum (white)" option [and for the Minimum (black) option] depends on the datatype of the raster you are exporting (for example, 255 for 8-bit unsigned and 32,767 for 16-bit signed). If you need to assign a particular value not otherwise provided, use the User Defined option.

STEPS

- ☑ press [Select Objects...] on the Export window
- ☑ select raster object REPROJ from the EXPRAST Project File
- ☑ press [Next...]
- ☑ choose Maximum (white) from the Null Value menu on the Export Parameters window
- ☑ choose LZW from the Compression menu
- ☑ press [Export] and name the output file
- ☑ when the export process is complete, press [OK] on the Status window
- ☑ press [Remove] on the Export window





Exported TIFF files with appearance of non-image area set using Export Parameter window's Null Value menu: left using Maximum (white), right using Zero.

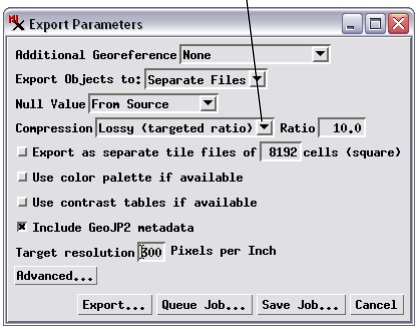
Export a Raster Object to JP2

STEPS

- ☑ press the Raster filter button 
- ☑ choose the JP2 format
- ☑ press [Select Objects...] on the Export window
- ☑ select raster object VOF from the EXPRAST Project File
- ☑ press [Next...]
- ☑ choose Lossy (targeted ratio) from the Compression menu on the Export Parameters window
- ☑ set the Ratio value to 10.0
- ☑ turn on the Include GeoJP2 metadata toggle button
- ☑ press [Export] and name the output file
- ☑ when the export process is complete, press [OK] on the Status window

The JPEG2000 format (.JP2) is designed to store large images while overcoming many of the limitations of the original JPEG image format. JP2 allows either lossless or lossy compression and provides better image quality at high levels of compression. You can export color (single composite or RGB raster set), integer grayscale (1- to 32-bit), or binary images to JP2. The exported files can be any size up to the limit imposed by your operating system.

JP2 uses a wavelet transform to provide the initial image compression (following color conversion for RGB images). Different versions of the wavelet transform are used to produce lossless or lossy compression. If you choose *Lossless* or *Lossy (best quality)* from the Compression Type menu, the appropriate wavelet transform is applied with no further compression. Either choice provides modest compression with no or essentially no visible impact on the image. For greater compression, choose *Lossy (targeted ratio)* and specify the numerator of the ratio (e.g., 50 for 50:1). The lossy wavelet transform is applied, then additional compression (and accompanying data loss) is achieved in the quantization and coding stages.



GeoJP2 is an extension of the JP2 format that embeds georeference and coordinate reference system information within the JP2 file. The Export Parameters window for JP2 includes a toggle (on by default) to include GeoJP2 metadata in the exported file. A separate GeoJP2 format entry is also available in the Export process to automatically embed the GeoJP2 information.

The wavelet transform produces a series of reduced-resolution versions of the image that are similar to the raster pyramids used internally in TNTmips to speed display at different zoom levels. You can specify the number of resolution levels created in the JP2 file by pressing the Advanced button to open the Advanced Settings window and select ing a value from the Resolution Levels menu.

Export a Raster Object to Tiled JP2 Files

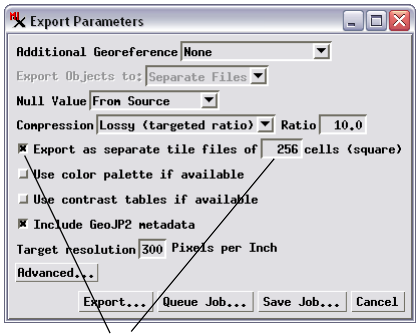
JP2/GeoJP2 export offers the option of breaking the exported image into a regular array of separate files with uniform size. This option is especially appropriate for very large images (gigabytes in size), which can tax the decompression and viewing performance of some other software packages. The smaller individual JP2 files that make up the tiled array can be viewed or processed more efficiently in these products. TNTmips can directly use the individual JP2 tiles and also allows you to create a single TNT tileset raster object that is simultaneously linked to the entire array of JP2 tiles, offering the convenience of working with the tiled files individually or in aggregate.

The tiled export creates square image files with the size (in number of cells) you specify. If the dimensions of the source raster are not evenly divisible by the specified tile size, blank cells are added to the tiles along the right and/or bottom edge of the array to achieve the correct tile size. The export prompts for a single JP2 file name, then creates unique names by appending the row and column number in the array to the end of each file name.

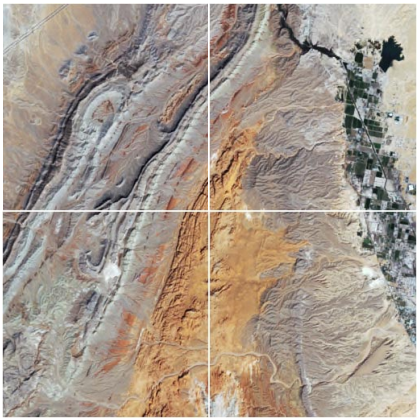
STEPS

- ☑ keeping the same input raster and format as the previous exercise, press [Next...] on the Export window
- ☑ turn on the toggle *Export as separate tile files*
- ☑ enter 256 in the numeric field for tile size
- ☑ press [Export] and provide a root name for the output files
- ☑ when the export process is complete, press [OK] on the Status window

The Export to Tilesets process (Tileset / Export to) is optimized to convert large images to TNT tileset raster objects or to standard web tilesets (Google Maps, Bing Maps, Google Earth, and NASA World Wind).



To export a tiled set of separate JP2 files, turn on the toggle and set the desired size of the square tiles.



Four tiled GeoJP2 files, each 256 cells square, exported from the VOF raster (512 cells square).

Export a Raster Object to MrSID

STEPS

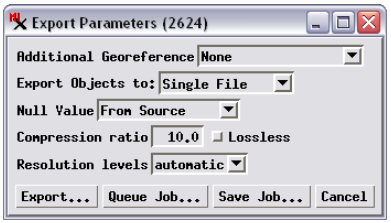
- ☑ keeping the same input raster as in the previous exercise, choose the MrSID format
- ☑ press [Next...]
- ☑ turn off the Lossless toggle and enter 10 in the Compression Ratio field
- ☑ press [Export] and name the output file
- ☑ when the export process is complete, press [OK] on the Status window
- ☑ press [Remove] on the Export window

NOTE: the Export process can create MrSID files up to a maximum compressed size of 500 MB. This limit on free export is imposed by LizardTech's MrSID library.

LizardTech's MrSID format uses a wavelet-based image compression technology similar to that used by JPEG2000 to compress large images. The MrSID export offers a choice of lossless compression or lossy compression with a compression ratio that you specify.

Wavelet compression embeds into the compressed file a series of reduced-resolution versions of the image that TNTmips can use just like raster pyramid tiers to speed display of the image at different zoom levels. The Resolution Levels menu sets the number of resolution tiers that are produced. The default Automatic option sets the number based on the size of the image, with more resolution levels for larger images. You can also choose to set the number of levels manually to any value between 1 and 12.

Georeference information, including the coordinate reference system parameters, are automatically embedded in the MrSID file during export. MrSID supports several thousand coordinate reference systems provided by the European Petroleum Survey Group (EPSG) database. The TNT products support a number of coordinate reference systems in addition to those in the EPSG database. Before exporting an image to MrSID, make sure that it uses an EPSG-supported coordinate reference system.



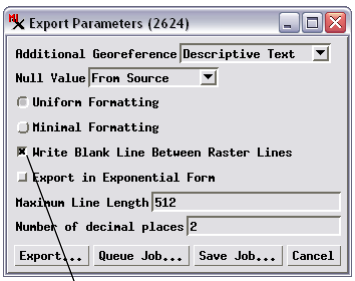
Export a Raster Object to Text

Choose the TEXT-RASTER option to export a raster object to an ASCII text file that can be viewed, reformatted, or edited using a text editor or word processing program. The raster values are written line by line into the text file, which is assigned a .txt file extension. When you choose one of the Descriptive Text georeference options, the georeference parameters are inserted at the beginning of the text file, before the raster values.

The default Minimal Formatting option places a single space between values, or you can choose the Uniform Formatting option to align the cell values in columns. The Maximum Line Length parameter has a default value of 512 characters; you can adjust this value to accomodate the constraints of your text editing program or for ease of editing. If the number of characters required for a single raster line exceeds the Maximum Line Length value, then each raster line is written to a sequence of contiguous text lines. A new text line is created for the start of each raster line. You can also choose to have a blank line written between each raster line for clarity when editing.

STEPS

- ☑ choose the TEXT-RASTER format
- ☑ press [Select Objects...]
- ☑ select raster object AERIAL from the EXPRAST Project File
- ☑ press [Next...]
- ☑ on the Export Parameters window, choose Descriptive Text from the Georeference option menu
- ☑ turn on the Uniform Formatting radio button
- ☑ turn on the Write Blank Line Between Raster Lines toggle button
- ☑ click [Export] and name the output file
- ☑ when the export process is complete, press [OK] on the Status window
- ☑ press [Remove] on the Export window



To provide a clear separation between raster lines in the text file, turn on the Write Blank Line Between Raster Lines toggle button. See the accompanying illustration of the sample output text file.

```
 5  5  5  6
 5 10  9  8
 9  9  9  8

 5  5  5  5
 7  9  9 10
10  9  9  8

 4  4  4  5
 5  6  9  9
 7  5  5  5
```

Sample of output text file with Uniform Formatting, multiple text lines for each raster line, and a blank line between each pair of raster lines.

Raster object AERIAL.

Raster Export Tips

Know Your Raster Data Type

TNTmips allows you to work with a very wide range of raster data types, including binary, signed and unsigned integer, floating point, complex, and color-composite. The bit-depth of grayscale rasters can range from 4 to 32 bits per pixel and you can work with 8-bit, 16-bit, and 24-bit color composites. Many of the external raster formats allow only a limited range of data types. Be sure that your selected export format accommodates the type of raster you are trying export. If not you can convert the raster to an allowed data type before export. The bit-depth of grayscale rasters can be converted using the Raster Extract process (Image / Extract). Select all cells for extraction and use the Output Type menu on the Values tab to select the appropriate bit-depth. To create color composite rasters, or to create separate RGB rasters from a composite, use the Raster Color Conversion process (Image/ Combine / Convert Color).

Contrast Enhancement

The TNTmips display process allows you to enhance the contrast and brightness of grayscale rasters as they are displayed without modifying the numerical values stored in the raster itself. You can enhance contrast using an automatic contrast method or by creating a contrast table that is stored with the raster. When you export a raster object, contrast-enhanced values are transferred to the output file **only** if the object has a saved contrast table and only for certain formats . When you export to one of the generic, general-purpose image formats (JPEG, JP2/GeoJP2, TIFF/GEOTIFF, and PNG), a toggle button allows you to apply the last-used saved contrast table during export. When you export to most application-specific formats, only raw raster values are transferred to the output file. You can create a raster with contrast-enhanced values prior to export using the Apply Contrast process (Image / Filter / Apply Contrast).

Orientation to Projection

Some image processing / GIS software products assume that a georeferenced raster is aligned to its map coordinate system. This means that the raster lines and columns must be parallel to the axes of the map coordinate system, enabling the map coordinates for each cell to be computed by the software from the cell size and the position of a single cell (such as the upper left corner cell). TNTmips does not impose this restriction on raster georeferencing. If a raster has been georeferenced in TNTmips using control points, in most cases its lines and columns will not be oriented parallel to the map coordinate system. If a raster you export is not aligned to its coordinate system, external software using this system may compute incorrect coordinates. Check each raster before export and if necessary reproject the raster into its map coordinate system using the Automatic Raster Resampling process (Image / Resample and Reproject / Automatic).

Export a Vector Object to MIF

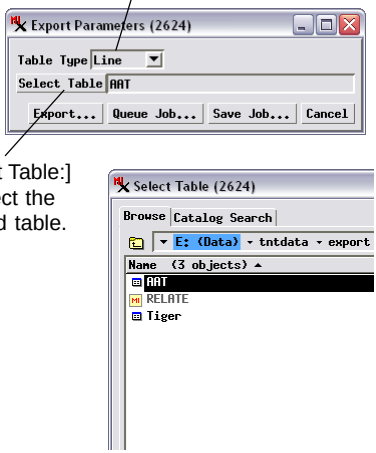
You can export spatial elements in geometric (vector, CAD, and linked shape) objects and associated attributes to a variety of file formats. Export procedures differ only slightly for the different object types. For CAD and shape objects, where all elements are of the same type, you can select a single linked database table to export with the elements. For vector objects, which contain different element types, you can choose one (or more) element types (depending on the format) and a table associated with each type.

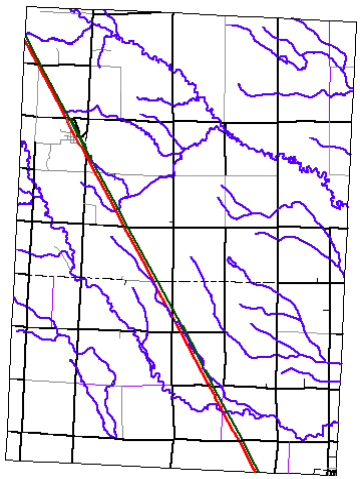
MapInfo Interchange Format (MIF) is representative of formats that allow export of a single element type and an associated table. Map elements are output to a file with a .MIF file extension, which stores them in a nontopological (CAD) format. Attribute information from the selected table is written to an accompanying file with a .MID extension. The lines in the vector object used in this exercise (derived from the U.S. Census Bureau's TIGER / Line files) have attribute links that differentiate roads, highways, streams, and other line types.

STEPS

- ☑ press the Vector filter button on the Export window
- ☑ choose the MIF format
- ☑ press [Select Objects...]
- ☑ select object TIGERBEREA from the EXPVECT Project File in the EXPORT data collection
- ☑ press [Next...]
- ☑ select Line from the Table Type option menu on the Export Parameters window
- ☑ click [Select Table:]
- ☑ choose AAT from the list in the Select Table window that appears and click [OK]
- ☑ click [Export] and name the output file
- ☑ when the export process is complete, press [OK] on the Status window
- ☑ press [Remove] on the Export window

Choose the type of attribute table to be exported using the Table Type option menu...





The TIGERBEREA vector object displayed with line styles determined By Attribute.

Export a Vector Object to Arc Shapefile

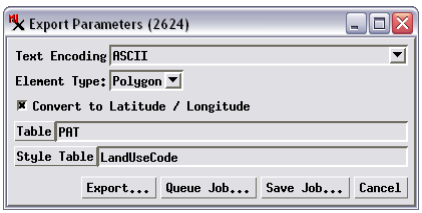
STEPS

- ☑ choose the ARC-SHAPEFILE format
- ☑ press [Select Objects...] and select object LANDUSEBEREA from the BERVECT Project File
- ☑ press [Next...]
- ☑ choose Polygon from the Element Type option menu on the Export Parameters window
- ☑ the Table selection should default to PAT and the Style Table selection should default to LandUseCode; if not, press the buttons and select these tables
- ☑ turn on the Convert to Latitude / Longitude toggle button
- ☑ press [Export] and name the output file
- ☑ when the export process is complete, press [OK] on the Status window
- ☑ press [Remove] on the Export window

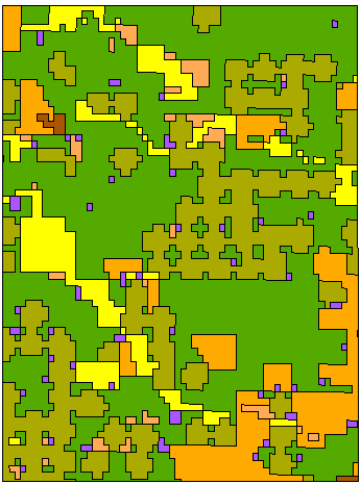
Shapefiles can contain only one type of element (point, line, polygon, or label), so for vector export you must choose the element type to export. The element database is then scanned to identify and automatically select an attribute table that is directly attached to the spatial elements. If there is more than one such table, you can use the Table button to select the desired one. Attribute information from this single table is written to a dBASE file (.dbf) with the same name as the main shapefile (.shp).

Georeference and coordinate reference system information is written to a .prj file. The export provides the option of converting projected map coordinates to Latitude / Longitude coordinates.

The element database is also scanned to identify an internal style table associated with the elements. The table found (if any) is shown in the Style Table field. The styles are written to an accompanying .avl file. Basic point symbols, solid lines, and solid polygon fills are supported.



When the Convert to Latitude / Longitude toggle button is turned on, vector map coordinates are automatically converted to latitude and longitude during export (if necessary). Turn this toggle off if you want to preserve the input object's coordinate reference system.

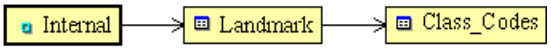


The exported shape file displayed with polygon styles saved in the accompanying AVL file, depicting different land use categories.

Export a Vector Object to Arc E00 Vector

You can export more than one type of vector element and their associated attributes to the Arc E00 Vector format (though a single file cannot contain both point and polygon attributes). You choose the primary table for each element type you want to export; this should be a table that is directly related to the elements and that contains a field designated as a primary key field. The Export Other Tables toggle allows you to also export all tables that have relational links to the primary table.

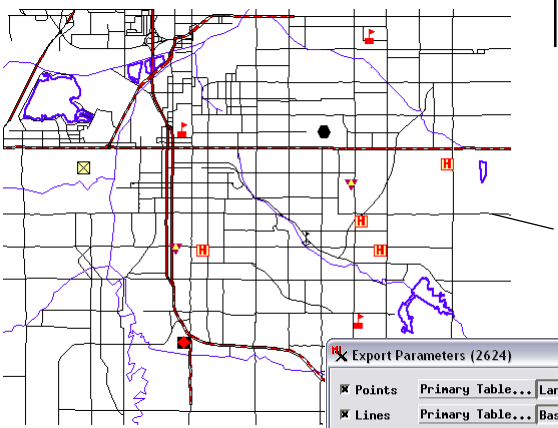
Point elements in the vector object in this exercise mark the locations of landmark features. The Landmark point table is the primary table that is directly related to the elements. It includes a field with an alphanumeric code for the landmark class. The list of landmark codes and their descriptions are contained in the related Class_Codes table. The settings used here export both tables to the E00 file.



Relationships between vector points and their attribute tables in the LincTiger vector object.

STEPS

- ☑ choose the ARC-E00-VECTOR format
- ☑ press [Select Objects...] and select object LINCTIGER from the EXPVECT Project File
- ☑ press [Next...]
- ☑ turn on the Points toggle button and press its Primary Table button
- ☑ select table Landmark in the *Select primary attribute table* window and press [OK]
- ☑ turn on the Lines toggle button and press its Primary Table button
- ☑ select table Basic_Data in the *Select primary attribute table* window and press [OK]
- ☑ turn on the Export Other Tables toggle for both Points and Lines
- ☑ press [Export] and name the output file
- ☑ when the export process is complete, press [OK] on the Status window



Vector object LincTiger displayed with lines (streets and hydrologic features) and points (landmark) styled by attribute.

Export a Vector Object to MySQL Spatial

NOTE: to complete this exercise you must have login privileges on a MySQL or PostgreSQL database server on your network and have permission to create new tables.

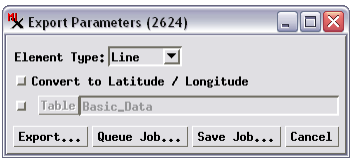
STEPS

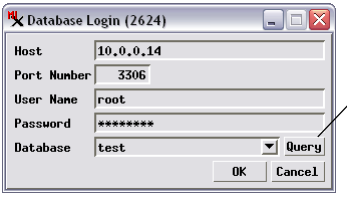
- ☑ keeping the same input vector as in the previous exercise, choose the MySQL-SPATIAL or POSTGIS format
- ☑ click [Next...]
- ☑ choose Line from the Element Type option menu on the Export Parameters window
- ☑ turn on the Table toggle button
- ☑ the Basic_Data table should be automatically shown in the Table text field; if not, press [Table] to open a window to select it
- ☑ press [Export]
- ☑ in the Database Login window, enter the IP address of the host computer and your user name and passsword
- ☑ press [Query] to populate the Database menu, then use the menu to select the desired database
- ☑ press [OK] on the Database login window
- ☑ when the export process is complete, press [OK] on the Status window
- ☑ press [Remove] on the Export window

The Export process allows you to export geometric objects directly to the spatial extensions of several server-based relational database management systems: MySQL Spatial and PostGIS (the spatial extension of the PostgreSQL database system). Export procedures for both of these formats are identical.

Each spatial object is stored in these database systems as a single table with one record for each spatial element. A special geometry column in each spatial table stores the spatial coordinate information for its element. Each table can include only one type of spatial element, so when you export a vector object you must choose which element type to export.

You can also select a single directly-attached table to export along with the geometric elements. The attributes in the selected table are written to the same MySQL or PostgreSQL table that contains the elements. The export prompts you to log in to the database system and choose the particular database object that you want to contain the spatial and attribute data.





Press [Query] to populate the Database menu

NOTE: If the TNT object includes other related tables, you can use the MySQL/ PostgreSQL database format to export these tables to the same database. Keyfield designations and table relationships are not set automatically by the export, so you will need to set these manually in the external database after the tables are exported.

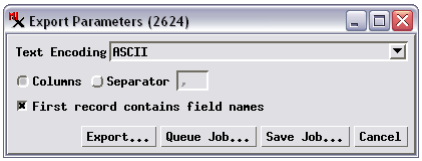
Export a Database Table

A TNT database table can be exported to a database file format such as DBASE or INFO, to a database server such as MySQL or PostgreSQL, or to a text file. You can export tables from a database associated with the elements of a geometric object or from a stand-alone database object. If the database object contains more than one table, each table must be exported separately.

Database export procedures are quite simple for most formats. For all formats you can specify the type of text encoding to use in the output (such as ASCII or Unicode UTF-8). Export to a server-based database system additionally requires logging in to the desired database, as in the previous exercise. The DB-TEXT format used in this exercise requires some additional format-specific settings. Radio buttons allow you to choose between having the database field entries aligned in vertical columns in the output text file or delimited by a separator character (comma is the default). You can also opt to have the field names written to the first line in the text file.

STEPS

- ☑ press the Database Table filter button on the Export window
- ☑ choose the DB-TEXT format
- ☑ press [Select Objects...] and select table CRIME from the CRIME database object in the EXPVECT Project File
- ☑ press [Next...]
- ☑ turn on the Columns radio button
- ☑ turn on the toggle button *First record contains field names*
- ☑ press [Export] and name the output file
- ☑ when the export process is complete, press [OK] on the Status window



Choose the CSV format to produce a comma-delimited text file with a .CSV file extension.

Portion of text file produced in this exercise, with fields aligned in columns.

REPTNO	LAT	LON	CLASSIF	ADDR1	STRT1
15860-89	39.95879	-82.97329	PT	1000	Bryden
39261-89	39.95876	-82.97333	PT	1000	Bryden
60169-89	39.95847	-82.97335	GT	1001	Bryden
16638-89	39.95892	-82.97305	AT	1002	Bryden
16802-89	39.95888	-82.97309	AT	1002	Bryden
31461-89	39.95879	-82.97307	AT	1002	Bryden

NOTE: When you have a database table open in Tabular View, the Save As option on the Table menu allows you to save a copy of the table in one of several forms, including dBASE III, ODBC, CSV, or tab-delimited text format. This procedure provides a quick alternative to the Export process for these file formats.

General Export Tips

When Good Data Goes Bad

If some objects in an exported series of objects show incorrect spatial registration in another software package, check the georeference information for the original objects in your TNTmips Project Files. Make sure that all of the objects use the same coordinate reference system, including the geodetic datum. (An easy way to do this is to use the Extents tool in the Display process.) Since TNTmips can reproject data on-the-fly and overlay objects with different georeferencing, it is easy to forget that other software packages may expect all related objects to use the same coordinate reference system. If necessary, you can use the Geometric Warping process (Geometric / Reproject) and the Automatic Raster Resampling process (Image / Resample and Reproject / Automatic) to reproject all objects into the same coordinate reference system. You should also reproject any objects that have control point georeference prior to export.

When you export geometric objects to ArcView Shapefile format, you can have the objects automatically reprojected to latitude / longitude coordinates (if necessary) by turning on the Convert to Latitude / Longitude toggle button.

Save Metadata for Exported Files

Digital geospatial data can be copied, edited, and transformed with ease, and it can be displayed at virtually any scale. Without metadata, the end user of geospatial data has no way to know the original scale and accuracy of the data and may be unaware of other potential limitations. When you are conveying exported data to a third party, it is a good idea to create a metadata text file to accompany the data.

You can create metadata subobjects and/or text files in TNTmips for spatial objects you plan to export. To create metadata for a spatial object, select the object in the TNTmips File Manager (Tools / File Manager). Click on the Metadata icon button in the File Manager's toolbar, and the Metadata Viewer and Editor window then opens. You can enter any relevant metadata text and save it as a metadata subobject. You can also choose Save as Text File from the File menu to name and save a separate metadata text file that you can then place with your exported file.

Send Data When You Contact Software Support

When you contact MicroImages Software Support to report a problem with export or import, be sure to include copies of your data that illustrate the problem. By doing so you will make it possible for Software Support to diagnose the problem more quickly and to find problems that may be peculiar to your data.

Supported Export Formats

TNTmips allows you to export objects in Project Files to the following external file formats:

Raster Export Formats

ARC-BIL/BIP: Arc/Info BIL/BIP
BigTIFF: Tag Image File Format
BMP: Windows Bitmap
CCRS: Canadian Center for Remote Sensing
CDED: Canadian Digital Elevation Data
DEM: USGS Digital Elevation Model
DOQ: USGS Digital Orthophoto Quad
DTED: Digital Terrain Elevation Data
ECW: Enhanced Compressed Wavelet
ER-MAPPER: Earth Resource Mapper
ERDAS-GIS/LAN
ERDAS-IMG
GeoJP2: JPEG-2000
GEOSOFT-GRD: Grid File Format v.2
GEOSOFT-GXF: Grid eXchange
GEOTIFF
GIF: Graphics Interchange Format
GRASS-RASTER
JP2: JPEG-2000
JPEG
MrSID
NITF2.1: NIMA National Imagery Transfer
PCI
PCX
PICTOMETRY: JPEG format
PNG: Portable Network Graphics
SIMPLE-ARRAY
SUNRAST: Sun Raster Format
TEXT-RASTER: ASCII text
TEXT-XYZ: Text, 3 coordinates per cell
TIFF: Tag Image File Format
USER-DEFINED

Vector/CAD/Shape Export Formats

ARC-COVERAGE: ArcInfo Coverage
ARC-E00-VECTOR: ArcInfo Export
ARC-GENERATE: ArcInfo Generate
ARC-SHAPEFILE: ArcView Shapefile
ATLASBNA: Atlas BNA
DGN: MicroStation/Intergraph
DLG-OPT: USGS DLG Optional
DWG: AutoCAD Drawing Format
DXF: AutoCAD Drawing eXchange
EPANET: EPANET Pipe Network INP
FileGDB: ESRI File Geodatabase
FUSION: Google Fusion Table
GEOCONCEPT: GeoConcept Text File
GeoJSON
GeoRSS
GML: Geographic Markup Language
GMTVECTOR: Generic Mapping Tools
GPSTRACK: GPS Trackmaker
GPX
KML: Google KML
LAS: LAS LIDAR point data
MAPINFO: MapInfo .tab
MIF: MapInfo Interchange
MOSS: Map Overlay and Statistical System
MYSQL-SPATIAL
ORACLE-SPATIAL
POSTGIS

Database Export Formats

ACCESS: Microsoft Jet 4.0 OLE DB
CSV: Comma Separated Values
DB-TEXT: ASCII text
DBASE: dBASE III/IV & FoxPro
INFO database
MIPS-EXTERNAL (DOS MIPS)
MYSQL
ORACLE: Oracle database
POSTGRESQL: PostgreSQL Database

Import / Export Icon Button

The TNTmips Import and Export procedures are also available in TNTedit™. This stand-alone editor allows you to access geodata in all import formats supported by TNTmips, modify the data using the powerful editing functions found in the TNTmips Spatial Data Editor, and export the object to any of the supported export formats.

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

TNTmips Basic TNTmips Basic is a low-cost version of TNTmips for small projects.

TNTmips Free TNTmips Free is a free version of TNTmips for students and professionals with small projects. You can download TNTmips Free from MicroImages' web site.

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 or DVD at low cost. TNTatlas CDs/DVDs can be used on any popular computing platform.

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