2008 TNT Geospatial Analysis Products

MicroImages is pleased to provide you a hardcopy summary and your DVD release of version 2008:74 (hereafter called 2008) of the TNT desktop products. Attached are illustrated introductions to 32 important new capabilities in TNTmips, TNTedit, and TNTview. Your copy of the 2008 New Features is also enclosed and lists all the hundreds of new features added to the 2008 release of all the TNT products.

Google Connections

- render map layouts to KML
- synch Google Earth with 2D/3D view
- view WMS and ArcIMS layers

Edit

- use stylus
- simpler tool interface
- shapefiles without import

View

- stereo for any image
- smooth panning
- easy repositioning
- sharpened images
- interactive mask design
- Internet maps and images

Processing

- geometric element buffering
- mosaic into a tileset
- advanced watershed geomorphology

System Level

- native 64-bit Intel Mac/Windows
- terabyte raster tileset object
- pipeline coding in SML

Technical Guides

The features summarized in the attached plates and other significant changes are discussed and illustrated in detail in the 81 pages of new 2008 Technical Guides and 13 new Quick Guides that you can access at www.microimages.com/documentation/CP7401.htm. These materials are not being printed and included here to avoid increased shipping and other related costs. The 2008 Help menu of your TNT product can also be used to directly access and a search these new materials and the other 1184 earlier Technical Guide pages and 180 Quick Guides. As web-based documents they are available to you anywhere you travel, can conveniently be searched from the microimages.com home page or directly from within your TNT product, and can be updated in place by MicroImages.

TNT product DVDs

The enclosed Windows or Mac DVD contains all the versions of the TNT products currently available. The Windows DVD can be used to install for 2000, XP, and Vista and has separate native versions for 32-bit and 64-bit processors. The Mac DVD can be used to install for 10.4.x or 10.5.x versions for Intel or G4 or G5 processors and has separate native versions for 32-bit and 64-bit processors.

NOTE: Your TNT product has been improved and updated each week since the weekly edition published in August and used to reproduce the enclosed DVD. Each new weekly release edition is a complete new version, not a patch. The latest weekly edition of your TNT product can be downloaded from www.micoimages.com/downloads/tntpatch/DV2009.htm.

Global and USA Elevation DVDs

The enclosed global (DVD-DL) and United States (DVD) elevation rasters are provided for use in your 2008 TNT product. Use these rasters to view any accurately georeferenced image in stereo using the cardboard anaglyph glasses provided or your stereo viewing device. The 30-meter USA elevation raster object was assembled into a 1 arc-second tileset from the USGS's National Elevation Data (NED). The 90-meter global elevation tileset is referenced to latitude/longitude coordinates with 3 arc-second cell size (WGS84 datum). The elevation data was derived primarily from the recently reprocessed SRTM release with corrected georeferencing. All holes in the SRTM data have been filled and the elevation coverage has been extended beyond the northern limit of the SRTM data (60 degrees latitude) to include all of Arctic Canada (derived from the Canadian Digital Elevation Data) and Alaska (resampled from 2 arc-second Alaska NED data).

TNTserver

TNTserver 2008 now supports Web Feature Services (WFS) in addition to Web Map Services. A WFS responds to web clients that query the attributes of a geometric layer and return the elements and their associated attributes in the Geography Markup Language (GML).

USA High Resolution Imagery

MicroImages has published 1- and 2-meter United States Department of Agriculture (USDA) imagery of the lower 48 states for each year 2003 through 2007 (~80% coverage in 2006). The first of the 2008 coverage is being released now by USDA. It will be published for your use in your TNT product as each state's coverage becomes available. You can directly add any of these images to your view by choosing the state and year from the list automatically provided when you choose to add a WMS layer to your view. Contact MicroImages to discuss providing similar access to free high resolution imagery for other nations or provinces for public viewing as a WMS for direct use in the TNT products.

TNTmips for a Geospatial Web Service

TNTmips can now be added to your intranet or Internet server to provide a 24 hour geospatial analysis or provisioning service (i.e., process, prepare, and notify or send). Your custom web application or other remote program selects the activity, provides user interface, collects the input, and communicates it to your web server. The web server hands the task off to a script written in MicroImages' geospatial scripting language (SML). The scripts that you publish for your application can be used to provide any result of a TNT script. MicroImages will soon provide an example Geospatial Web Service to demonstrate this new TNTmips application. The demonstration will permit any Internet user to visually select and obtain a raster of limited size in a format of their choice. For more information on this topic contact MicroImages.

TNT Web Clients

MicroImages has developed a selection of FREE web-browser-based products for your use or modification for viewing the images and maps from any ArcIMS or any WMS service including TNTserver. These range from an iTNTmap viewer for the iPhone and iTouch to TNTmap that is in effect both a WMS browser and client. You can even project these layers into Google Earth or view them in Google Maps. WFS browser applications are available and more are being prepared including examples that provide public users with provisioned geodata.

TNT version 2009

The next full official release of these TNT products will be in March 2009. A development version of this release (DV2009) is already available and new, complete editions will be released weekly at micoimages.com/downloads/tntpatch/DV2009.htm. If you download DV2009, it will install as a completely separate product from your 2008 release of the TNT products. It can be installed by anyone currently using version 2008. Installing this separate DV2009 will enable you to participate in the design of the new features added to it weekly. The Windows version of 2009 will be built using Visual Studio 2008.

TNT System Improvements

- Native 64-bit versions for Windows and Mac (Intel and PowerPC)

- Windows Vista and Mac OS X 10.5 support provided through updates during 2007

32 and 64-bit processing for
Mac OS X 10.4 and 10.5
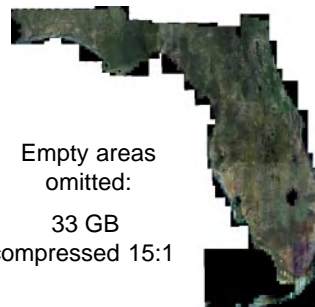**Windows XP and Vista**

- Empty areas are omitted from raster objects and tilesets
  (e.g., big file size savings for an orthoimage mosaic of Florida)

24-bit color orthoimage mosaic
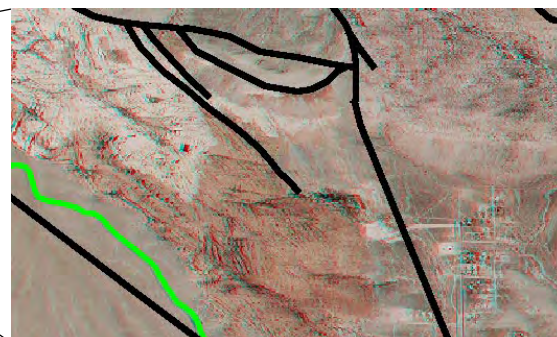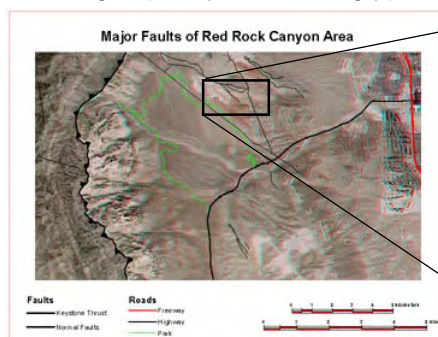739,738 x 744,133 cells
JPEG2000 compression

Full rectangular
extent stored:

110 GB
compressed 15:1
(1.65 TB uncompressed)

Empty areas
omitted:

33 GB
compressed 15:1

- Print high-quality color anaglyph image maps and posters

- JPEG2000 raster operations are all multi-threaded to:

  read and write lossless or lossy raster objects and *.jp2 files

  exploit multiple cores in 32-bit or 64-bit Mac or Windows
    (task is allocated about evenly to all cores)

  compress and decompress much faster if multiple cores are available
    (with 4 or 8 cores it's a low-level background task for each core)

  automatically apply lossless JPEG2000 compression in pyramid layers

  provide fastest hierarchical tileset raster performance if tile files are *.jp2
    (compression of tiles from DVD or USB drive is very fast)

- Automatically select all useable objects/formats in a directory structure

Add all (including subfolders) icon button adds
all selectable files/objects at the current
directory level and in any subdirectories

Viewing Geospatial Data

Many expanded capabilities have been added for your use in viewing geodata in the commercial TNT products and via the FREE network-oriented TNT viewers. Nine of these new features require separate introductory pages to cover the many new capabilities they introduce. See the pages listed below for these major changes to viewing geodata in your commercial TNT product.

- Real-Time Panning
- Locator View
- Inline Image Filtering
- Render to Geospatial PDF
- Viewing WMS and ArcIMS Layers
- Locating WMS and ArcIMS Layers
- Using MicroImages' WMS and ArcIMS Catalogs
- View Any Georeferenced Image in Stereo
- Interpret/Draw/Edit Directly on Screen with Tablet PCs and Pen Displays

In addition to these major features, the following miscellaneous new features have been added.

2D Views

- Optionally set contrast of all rasters to be the same
- Quick-add multiple RGB raster layers simultaneously
- Create theme-mapped displays of rasters
- Render anaglyph stereo View to anaglyph stereo raster object or file.

3D Views

- Show geometric layers of any type in 3D
  (i.e., CAD, vector, shape, and database pinmap layers)
- Layers can be in any linked file format
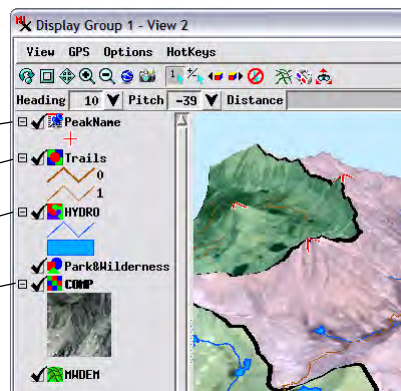- Raster layers can be flat or hierarchical tilesets

3D View with different types of geometric overlays:

Database pinmap

Shape layer

Vector layer

CAD layer

Regions-of-Interest using GeoToolbox

- Create and save in any View
- Use interactive tools to draw multiple points, lines, or polygons
- Assemble a region from multiple points, lines, and polygons

Brand New in TNTmips 2008!
Real-Time Panning

Over the 22 years of TNT products development there has been a continuing trade-off in viewing of your geodata. Your desktop computer display, memory, and computing resources can be devoted to [1] real-time panning of the view of a layer or perhaps several layers with limitations (for example, same CRS, cell size, data type) or [2] efficiently preparing a static view from a large number of widely varying geodata sources and characteristics (for example, varying CRSs, cell sizes, data types, formats). Most other commercial and free geodata viewing capabilities have focused on the former [1]. A few have compromised and allowed panning of composite geodata views, not just images, but with severe limitations (for example, same CRS, only 2 or 3 layers). MicroImages chose to emphasize the second objective [2]—to automatically display a static view of many diverse geodata layers, handle progressively larger layer sizes, and to do this as fast as possible without requiring you to prepare your geodata in advance. Your requests to pan this complex composite view have always been answered by using your resources to further the latter objective [2] (for example, automatic links to other formats).

A trade-off in the use of your desktop resources is no longer necessary. Multi-threading, multicores, fast display chips, better operating systems, and other modern desktop computer features can be used to meet both objectives. These changes in computer technology have permitted MicroImages to efficiently exploit new software developments such as multi-threaded layer management and JPEG2000 compression, raster pyramiding, tilesets, pipelining (for example, pipelining permits the new inline spatial filtering). Now you can pan your view with the cursor while still meeting your past expectations for the easy use of a complex composite view.

local layers

ArcIMS layer

WMS layer
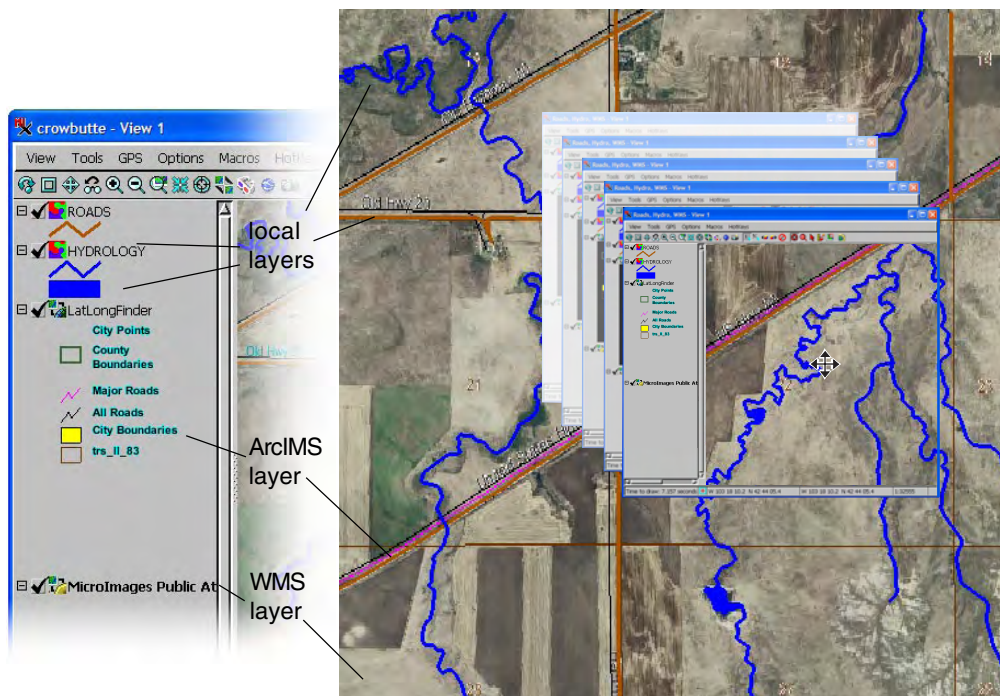
You can slide your view around in real time with any combination of local and web layers. Drawing of local layers and web layers are handled by separate threads so that a slow web response does not delay your real-time panning.

There are 3 general kinds of panning:

      <u>On-Demand Panning.</u> Specific user action to pan (icon, scroll bars, …)
          (only panning available in your TNT 2007 products and earlier)

      <u>Backfill Panning.</u> Cursor pans view, blank area automatically fills after movement
          (common in many products, such as ArcView)

      <u>Real-Time Panning</u>. Cursor pans view without blank areas
   (Google Maps and TNT 2008 use real-time panning)

TNT 2008 products provide real-time panning in all 2D views in TNTmips, TNTedit, TNTview, and TNTatlas. You can also pan 90% of the view in any direction using the arrow keys. If your computer cannot sustain real-time panning, your TNT view will appear to use back-fill panning. This condition may result when you attempt to pan too fast (use the Locator to jump your view), use vector objects that are not optimized, direct display of slow historical formats such as JPEG, using a network or Internet sourced layer, and other similar factors. If your real-time panning of local layers is slow and automatically reverts to backfill panning, you may wish to consider a more powerful computer and/or await further developments from MicroImages.

Internet or other network map and image layers published by Web Map Service (WMS) or Arc Internet Map Server (ArcIMS) for your use can now also be included in any TNT 2D view. You can even pan a view with one or more of these Internet layers combined with any local layers. As you know from your use of your browser, web sites can be fast or slow in responding to your requests and the same is also the case with these map and image services. When you pan a TNT view containing an Internet layer(s), the local layers will pan in real time as expected. Separate independent threads manage the panning of the layers requested from these slower and indeterminate Internet services and will add them to the view when they are available.
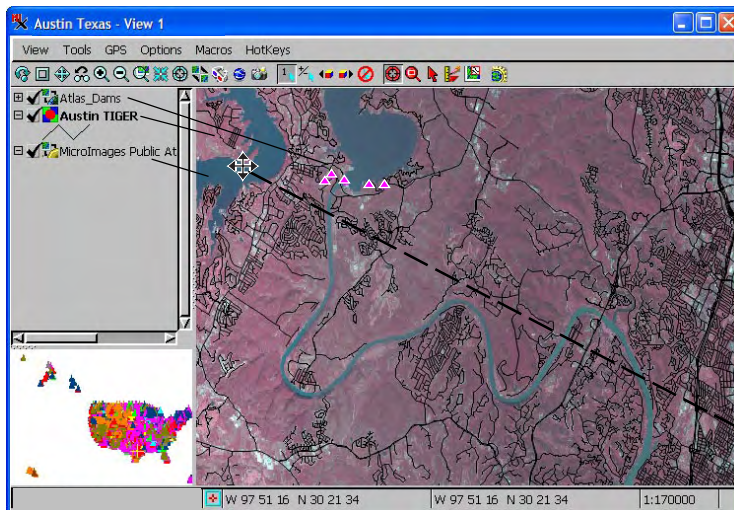
An ArcIMS layer is overlaid on a WMS layer and local vector layer, which together can be readily repositioned in the TNT products. Whether real-time or backfill panning appears to be used when panning depends on the web services' speed of response.

• WMS layer is 1-m Texas NAIP color-infrared imagery from 2004 (see microimages.com/TNTmap/StateOrtho2.htm).

• The ArcIMS layer is the Dams layer available from geographynetwork.com. (This layer covers the entire United States and sets the extents of the Locator view.)

• The local layer shows direct display of a TIGER roads shapefile for Travis County, Texas.
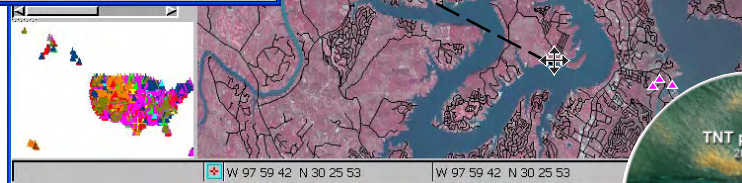
View Any Georeferenced Image in Stereo

View, pan, sketch, interpret, or edit while viewing your imagery in 3D

A 90-meter global elevation raster object and a 30-meter USA elevation raster object are provided on DVDs as part of the TNT 2008:74 product release. Use either of these to automatically convert any accurately-georeferenced image you have into stereo. Stereo viewing is available in every 2D View in any TNT process and the results are almost instantaneous, so you can pan and zoom the stereo View just as you do with any 2D View. In the TNT edit process you can modify the elements in a 2D or 3D geometric layer while viewing your reference imagery in stereo. If you are editing a 3D layer, the z coordinates of the elements you edit can be automatically updated from the elevation raster used for the stereo view. These z values for the new vertices and nodes are computed using bilinear interpolation of the elevation cells. You can also create a sketch layer using the GeoToolbox in any View to interpret, draw, and attribute 2D features over a stereo image. Subsequently this sketch layer can be converted to a 3D object using the same elevation raster.
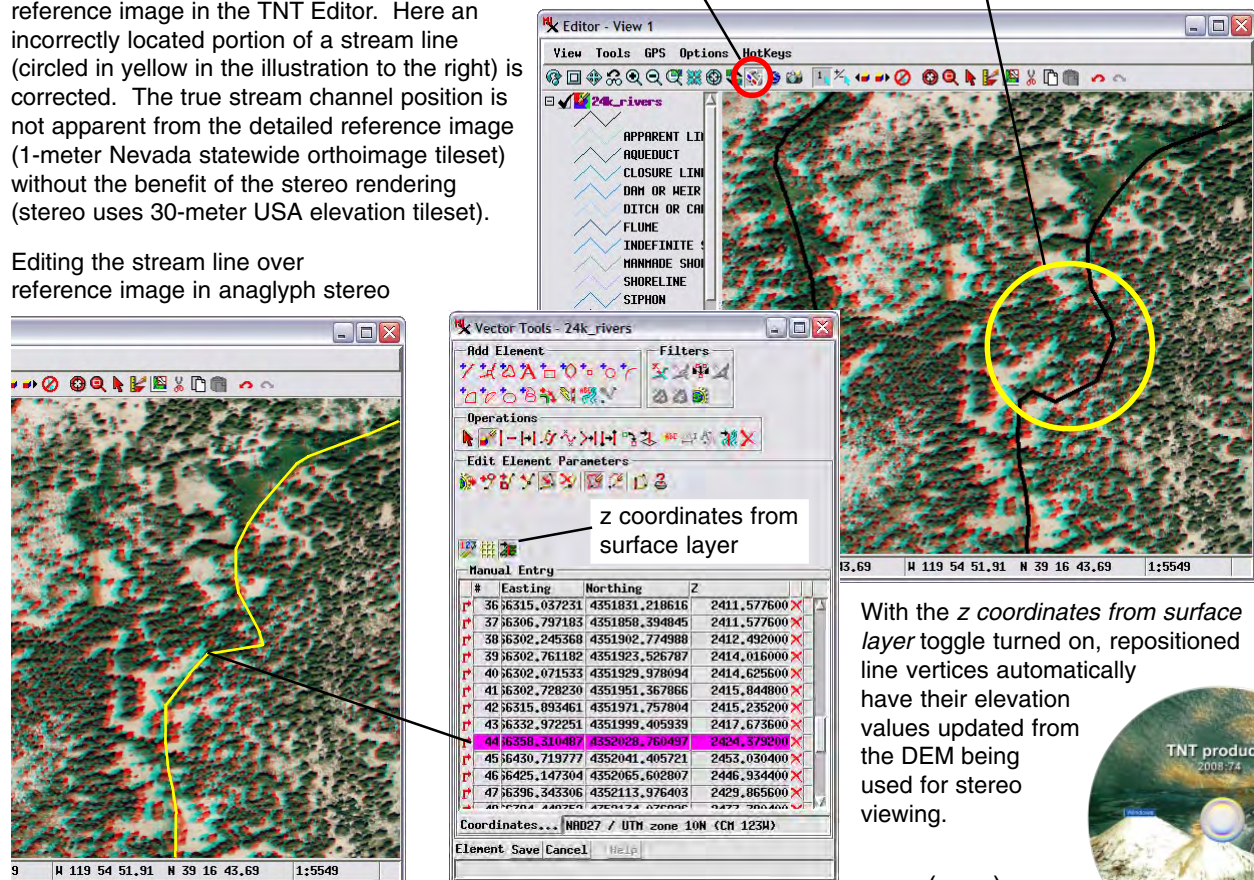
To convert any View into stereo simply select the Stereo icon from the View toolbar in any TNT process and select either the global or USA elevation raster object provided by MicroImages. The imagery in the View will be converted almost instantly to anaglyph stereo or the stereo format selected for your viewing device. The elevation raster object you select automatically becomes the default for any other stereo viewing you choose to use in any new TNT View.

Edit in Stereo View

You can edit 3D geometric objects over a stereo reference image in the TNT Editor. Here an incorrectly located portion of a stream line (circled in yellow in the illustration to the right) is corrected. The true stream channel position is not apparent from the detailed reference image (1-meter Nevada statewide orthoimage tileset) without the benefit of the stereo rendering (stereo uses 30-meter USA elevation tileset).

Stereo icon button   Incorrectly located portion of stream line.

Editing the stream line over reference image in anaglyph stereo

z coordinates from surface layer
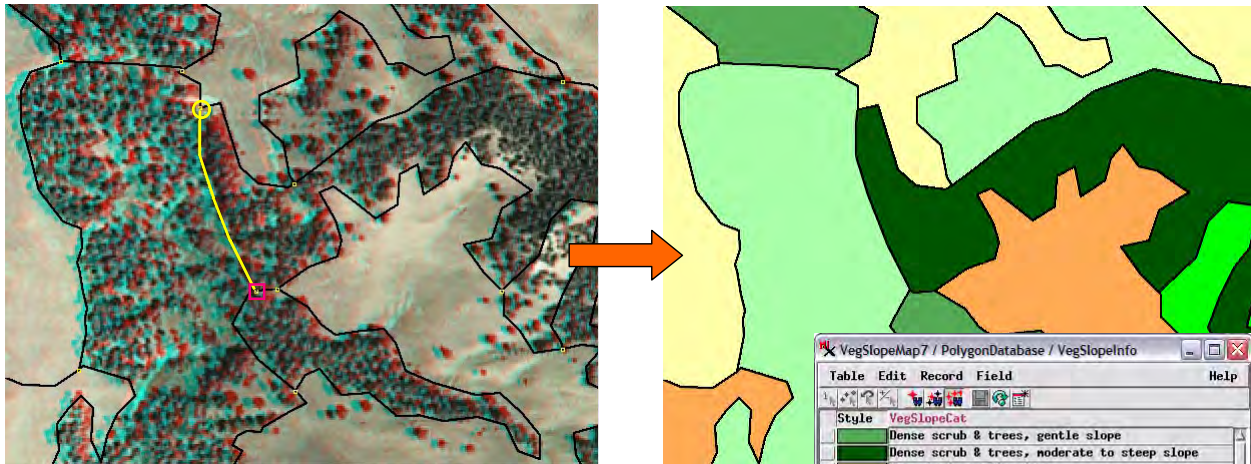
With the *z coordinates from surface layer* toggle turned on, repositioned line vertices automatically have their elevation values updated from the DEM being used for stereo viewing.

(over)

Interpret in Stereo View

Stereo viewing is useful when you are interpreting terrain-related aspects of an image. Here vegetation categories in different slope settings (e.g., dense scrub and trees on gentle or steeper slopes) are being delineated in the TNT Editor for fire hazard assessment. The line is being drawn in the illustration above left to separate similar vegetation types in different slope categories that can be differentiated in anaglyph stereo. The reference image is the 2006 Nebraska 1-meter orthoimage tileset with the 30-meter USA elevation tileset used for stereo rendering. You can also use the GeoToolbox in any View to sketch over an image rendered in stereo.

Your 90-meter global elevation raster tileset supports good stereo conversion for imagery of 10 meters or larger resolution; it can even be used with 1-meter satellite imagery. The 30-meter USA elevation tileset supports viewing of images of 1-meter or more detailed resolution*. If you have a more accurate DEM of the area you are working with, simply select it for even more accurate stereo rendering.

Inexpensive anaglyph glasses are provided for good stereo views of your color or black and white images, or you can substitute any stereo viewing device supported by the TNT products. Anaglyph stereo can be projected by any digital projector for group viewing with these disposable glasses. Large color anaglyph image maps can also be printed and distributed for viewing with these disposable anaglyph glasses.

Each elevation DVD (global and USA) provides a single hierarchical raster object that can be used directly from the DVD provided or copied to your hard drive. If you try the DEM directly from the DVD you will observe the benefits of using MicroImages' exclusive tileset raster object, even for these small raster objects that each fit on a DVD. The tileset raster object structure has been designed not only for instant access from fast media such as a hard drive, but also for media with slow access such as a DVD or a network or Internet connection.

MicroImages has assembled hierarchical tileset color images of most of the US states for the years 2003, 2004, 2005, 2006, 2007, and 2008 (pending). These state-wide tilesets of 1- or 2-meter resolution can be viewed at www.microimages.com/TNTmap/StateOrtho2.htm and used as WMS reference layers in any TNT view. Modifications are planned to enable to you to view and interpret these WMS layers in stereo in your TNT product using the elevation rasters shipped with version 2008:74.

   * MicroImages has also created a 10-meter resolution hierarchical tileset raster object of the lower 48 states and a 23-meter hierarchical tileset raster object of Canada (both with lossless JP2 tiles). These can be purchased separately from MicroImages for use in stereo viewing.
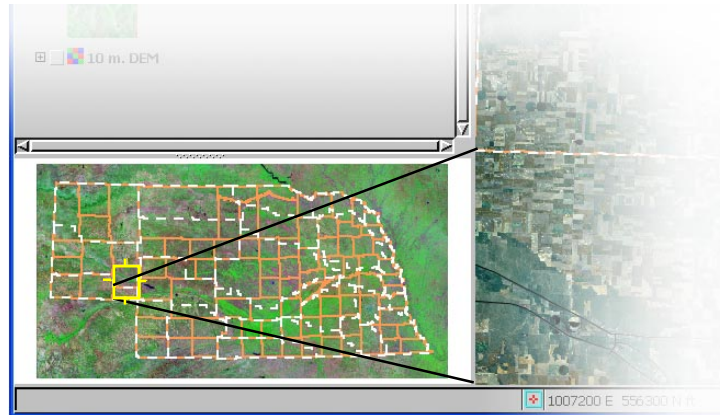
Locator View

The geographic extent and detail of the layers you acquire or create and view in your TNT products continues to grow. For example, you may view a one-meter image of a county or province or a very high resolution image or geometric map of a city. As the size of layers being viewed increases, the scroll bars representing your view become narrow and ineffective for repositioning it. The Legend portion of your TNT display now provides a Locator, or reference, view to replace the use of scroll bars. It can be used to visually reposition and resize the contents of your main view to any feature of interest. Scroll bars were useful for making local adjustments of the position of a view, but now these can be made using the panning feature also introduced in this version of the TNT products. The space bar can still be used to recenter the view at the cursor position when the key is pressed.
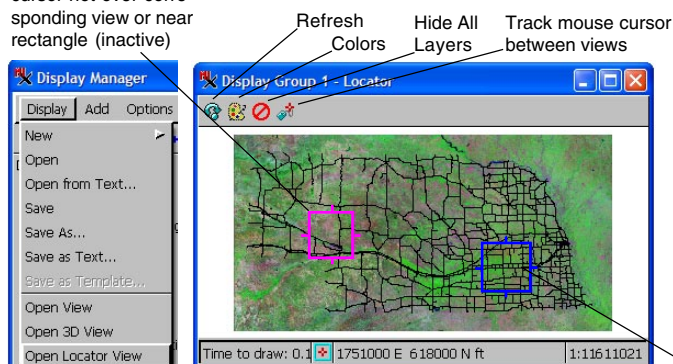
- Locator view of layers in main view
- Inserted into bottom of Legend
- Shows outline matching extents of each open view
- Resize and/or move outline to zoom or pan active view
- Control the visibility of layers exposed in the Locator

Locator Window

The Locator window serves the same repositioning and zoom in objectives as the Locator view. However, it is a separate window and can be open and used even if you have elected not to include the Legend and the Locator view in your display window(s). One Locator window is used to independently manage the position and scale of the contents of multiple display windows, or views, of the same group or layout. Since it is a separate window, it has its own independent control icons, such as Refresh, and features, such as display of cursor coordinates.

cursor not over corresponding view or near rectangle (inactive)

Refresh Colors

Hide All Layers

Track mouse cursor between views

- One Locator window shows position and scale of all open views for each group or layout
- Move cursor over each outline box to reposition or zoom that view's contents
- Choose which layers in the selected group or layout will be shown
- Independently change position and scales of several views

cursor over the corresponding view or nearest this rectangle (active)

If you have more than one View open for the active display, one rectangle indicating the extents currently in each View is shown. In the illustration, the blue rectangle indicates which of the Views the cursor is in when you have it in a View window or which of the Views will be resized/repositioned if over the Locator.

TNT products
2008·74

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# Thumbnail Images in Legends

Each raster in a view can now be shown in the Legend as a synoptic, or thumbnail, view of the raster along with its name. This little view of the shape, color, and null areas of the raster can help you determine if it is the correct layer and its contribution to your current composite view. Raster null areas are transparent in the legend thumbnail if they are transparent in the view. The use of this thumbnail view is now the default for raster layers added to a view. The former use of a selected sample at the full resolution of the raster can still be chosen for the legend if desired using the Raster Layer Controls.
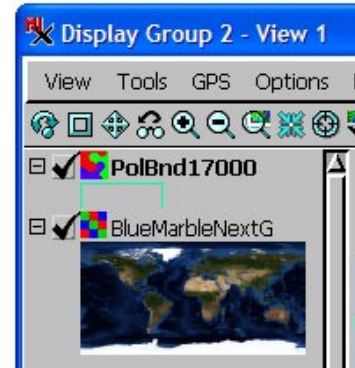

Automatic Style Assignment

For some projects you may have particular styles in mind for use in drawing your geometric elements. For other projects you just need to be able to visually distinguish between elements with different attributes although the exact style in which they are drawn does not matter. The TNT products provide automatic style assignment for the attributed points, lines, and polygons in geometric objects. You can even apply these techniques to elements in shapefiles you are using directly whether or not they have their own style information. After styles are assigned using the automatic features, they will appear on the Manual tabbed panel for additional manipulation the next time the window is opened. If manually created styles already exist, the automatically generated styles will be added to the existing list.

- Automatically assign styles to each attribute value for any element type in geometric objects (vector, shape, and CAD)

- Select from five color assignment options for points, lines, and polygons: All Same, Random Color, Random from Palette, Palette Progression, and Color Spread

- Assign point size and line width to increase incrementally within designated size spread

- Assign point size and line width randomly within designated size spread

- Edit individual styles after automatic assignment if desired
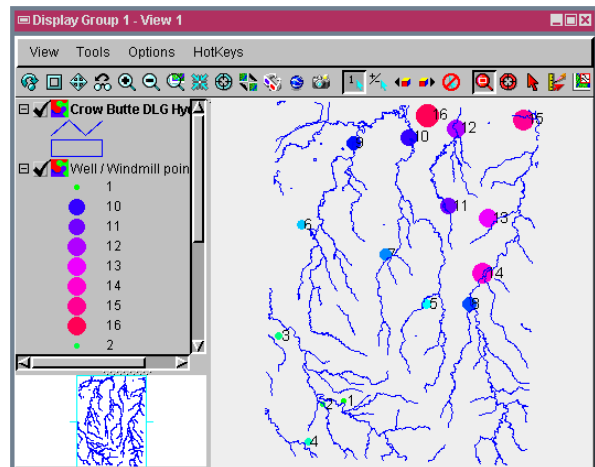
These illustrations show the point elements (above) and polygon elements (below) that are automatically styled by attribute. The point elements are assigned styles using color and size spreads and polygon elements are styled using random colors from a color palette and assigning 50% transparency.
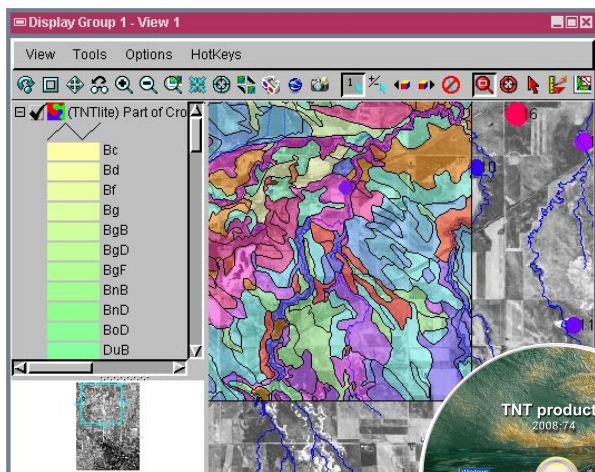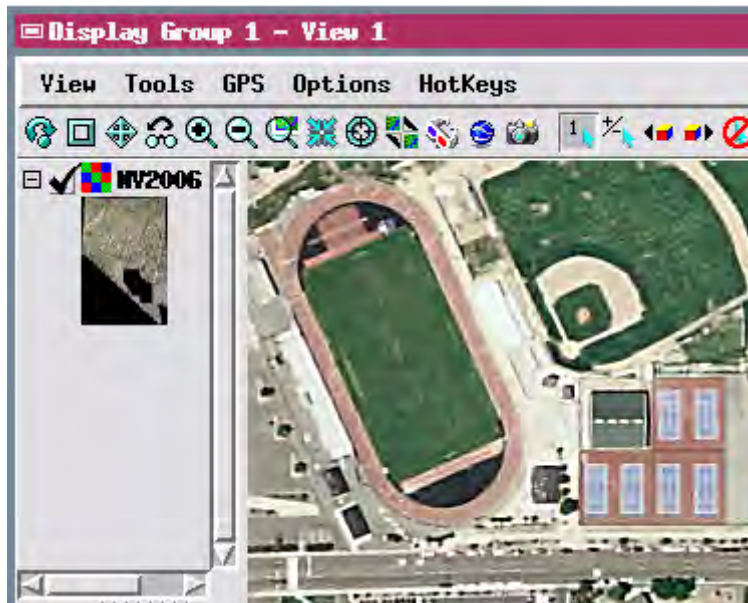
Inline Image Filtering

You are familiar with TNT viewing that provides fast, on-the-fly application of contrast enhancements, color palettes, CRS reconciliation, cell-size resampling, and other transformations independently to each raster layer. Using the raster pipeline processing introduced in 2008, standard or custom spatial filters can now also be applied on-the-fly to any or all raster layers in a View in Display and in other TNT processes. In addition, using pipelining, multithreading, and multiple cores, this image sharpening and the other transformations can even be efficiently applied when you pan the View.

- Sharpen or smooth (remove noise from) any raster layer in any View
- Apply edge enhancement to any raster layer in any View
- Independently filter each raster layer in the View
- Apply to grayscale, color composite, and tileset raster layers
- Toggle to turn filtering on/off while preserving settings
- Fast response as filtering is applied only to the portion of the raster in the View
- Choose from a range of filter kernel sizes
- Add filter result to original image in View in any proportion
- Optional direct editing of filter kernel coefficients
- Filter settings automatically saved with each layer
- Use separate Spatial Filter process to permanently modify raster objects

View using orthoimage tileset for the State of Nevada, zoomed to 1X with inline sharpening filter applied. Filter is 5 x 5 high-pass; this screen image merges the filter result with the input source image (shown at right) in equal proportions.

Unfiltered image being viewed.

Interactive Mask Creation

Storage, analysis, and viewing of georeferenced rasters now routinely require management of complex non-rectangular areas. For example, the outer boundary of a farm image could be defined by the boundaries of disjoint farm parcels. You might also wish to exclude ponds and tree stands within these parcels. During processing activities you might also want to exclude edge effects within a certain buffer distance inside the parcel boundaries and outside the ponds and tree stands. Your objective is to confine your viewing, enhancement, classification, and other analysis activities to just the desired area (e.g., cultivated area of the farm).

Binary null masks stored with your raster objects are used automatically by TNT processes to define these complex areas of interest. A null mask is stored as a subobject of its raster object (including rasters linked to files in other formats such as tileset raster objects). A new process is now available that allows you to interactively create or edit a null mask for any raster object.

- Create new or edit existing null mask of a raster object
- Available as tool in any View or as separate process
- Define transparent colors for the areas masked out or included when viewed
- Modify overlay colors and transparency as needed
- Use drawing tools to directly draw areas to include/exclude
- Define areas using existing region (e.g. from marked polygons, buffer zone, basin, ...)
- Value Range tool marks areas based on a range of cell values
- Use Flood Fill tool to mark contiguous areas with uniform or nearly uniform value
- Exclude all cells, include all cells, or invert mask
- Save to unique null mask subobject or to a separate mask raster object
- Unique null mask subobject is applied automatically by default
- Select and apply any mask raster object to View or TNT process

Color orthoimage of farm field.

Null mask interactively created to eliminate farm buildings, tree stands, pond, and surrounding areas.

Image of masked farm field used in any subsequent TNT analysis.

Links to Google Earth

Publishing a KML or KMZ file of your geospatial analyses is an effective means of distributing them for public use. KML/KMZ files can be layouts containing and describing a combination of raster, geometric, and simple database tables. Version 2008 of the TNT products now provides a variety of methods for moving these layouts to and from internal formats for creation, revision, analysis, or viewing.

Any TNT object (vector, CAD, shape, or raster) or any linked file format can be exported to a KML/KMZ file. A KML/KMZ layout can be imported into TNT objects. Since you are selecting a layout format the import may create separate raster, CAD or vector objects, and one attribute table per element type depending upon the complexity in the KML/KMZ file. Your TNT product can create complex display layouts for reuse or map and image layouts for printing. These layouts can be rendered into KML/KMZ, SVG, and PDF/geospatial PDF layouts.

To "Render" in the TNT products means to convert the contents of your map layout or the components of a complex view into some other layout format. Rendering a TNT map or display layout to other layout formats such as KML/KMZ is more complex than simply exporting a single layer and you must have more control that also varies with the destination layout format. When you render your current view (i.e., display layout) you can choose that the rendering represents only the layers in the displayed area of the view or match the bounding extent of all the layers in the view which can be very large. You can also select the layers that are rendered as there are some advanced capabilities in a TNT layout that have no equivalent in a simpler layout format. For example, you may need to decide how large and detailed the destination
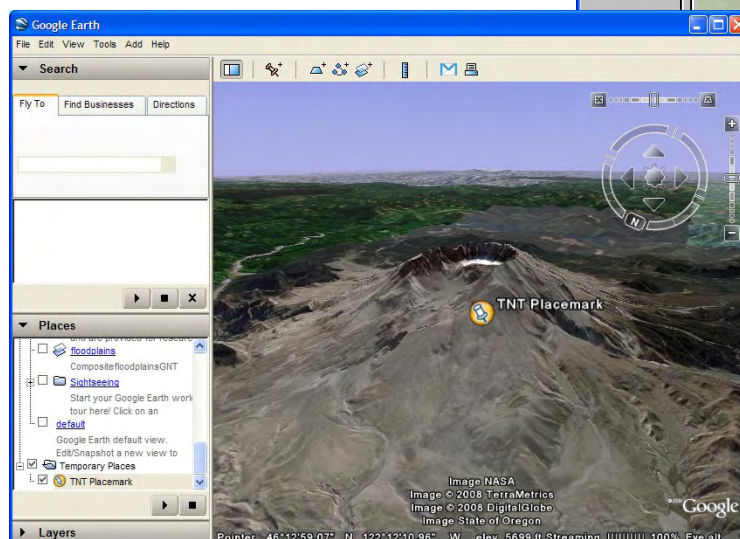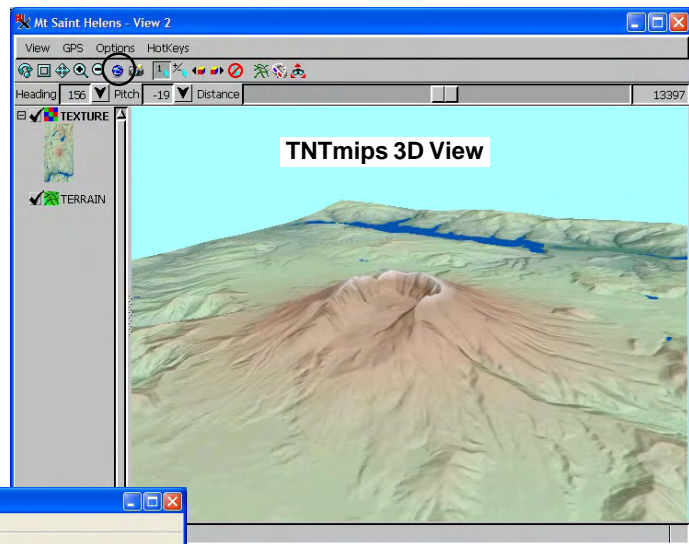
You can open Google Earth to match the position of your TNT 2D or 3D view by clicking on the Zoom Google Earth to Match View icon. Your Google Earth view will pan and zoom to match your movements in TNT while this icon is on. You can also render the contents of your view to appear as overlays in Google Earth (see illustration on back).

file will become as some layout formats limit some kinds of data types such as the raster size or the precision of geometric elements. If TNT enhanced fonts are used how will they will be represented in the destination layout and so on?

- Manually or automatically open Google Earth showing layers in 2D/3D view
- Google Earth view tracks position changes in 2D or 3D view
- Import KML or KMZ layout as objects
  (creates raster and CAD or vector objects with element attribute tables)
- Import or export tables using schema tags
  (schema tags and associated tables are only used in Google Earth Pro)
- Rendering a complex display or map layout to KML/KMZ renders

  all local layers used in the layout

  (vector, CAD, shape, raster, and any linked file formats)

  point symbols to placemark icons with scaling specified

  other associated layout design components

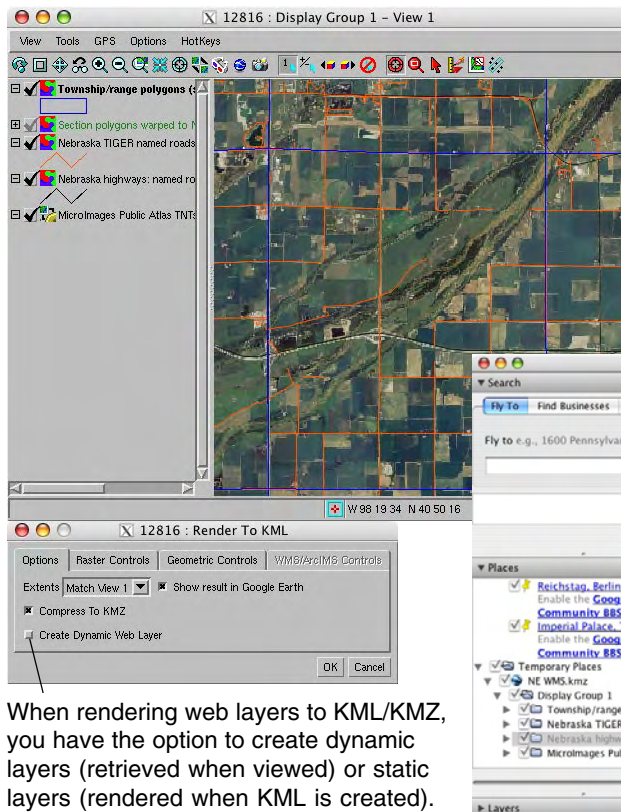 (legends, text, style tables, logos, scale bars, …)

  ArcIMS or WMS layers within the extent limits that their service will permit

  ArcIMS layers captured as local *.png or *.jpg files and linked to KML file

  (use for web layers that you want to physically preserve)

 as dynamic links to ArcIMS and WMS web layers that may change

  (use for web layers that are updated and change, such as weather maps)

You have the option to render the full extents of the layers in your view or to render only the extents visible in an individual View window. In the illustrations, the extents of the view were chosen for rendering.

- Four vector layers are from local hard drive; layer off by map scale (green text in legend) is not rendered
- WMS (image) layer is from MicroImages' Public Atlas TNTserver

When rendering web layers to KML/KMZ, you have the option to create dynamic layers (retrieved when viewed) or static layers (rendered when KML is created).
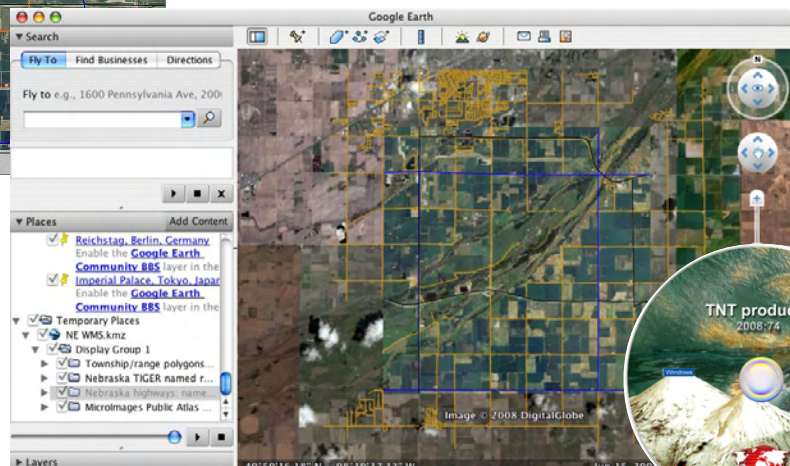
Syncing with Google Earth

The TNT products provide a variety of ways to communicate with Google Earth. The newest method in your TNT product lets you synchronize Google Earth to view the same area as your 2D and 3D views. When you reposition or zoom your view, the new view information is sent to Google Earth and its position and zoom are adjusted to match. This method is activated by turning on the *Zoom Google Earth to Match View* icon in the View window. This method lets you see Google Earth's representation of the area you are viewing in TNT. To view your TNT layers in Google Earth, use the Render To KML feature in the TNT Display process or the Export to KML process (see the Technical Guides entitled *Spatial Display: Render Raster Objects to KML* and *Export: Geometric Objects to KML* among others).

- Google Earth icon launches matching Google Earth 2D nadir view of same area
  (view Google Earth's coverage of area of current TNT 2D view from any orientation)
- Google Earth icon in 3D view will open a matching 3D view in Google Earth
  (view Google Earth's coverage of area of current TNT 3D view from any orientation)
- Google Earth Synchronization window controls optional relationships between views
- Slider zooms observer's eye in/out for vertical Google Earth view
  (i.e., moves in and out along vertical axis while maintaining a matching center point)
- Toggle on/off marker in Google Earth representing the common center point of both views
  (useful reference point when you independently reorient Google Earth View)
- Show outline of geoextents of group of layers in view as Temporary Place in Google Earth
  (i.e., manipulate Google Earth to show view of current TNT project from any position)
- Show outline of geoextents of current view as Temporary Place in Google Earth
  (i.e., manipulate Google Earth to examine area of current TNT view from any position)
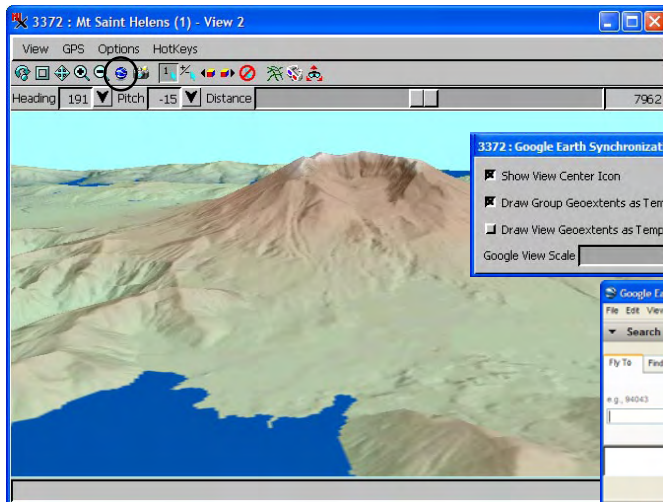
Google Earth Synchronization window is open while the Zoom Google Earth to Match View mode is active. You choose whether to show extents of current view and/or group, the color of these boxes if shown, and the relative zoom in Google Earth.

Google Earth 3D view of Mount St. Helens (right) with a Temporary Place showing the extents of the group displayed in the TNT 3D view (above). Any change in the viewpoint in the TNT 3D view will automatically cause the corresponding change in the synchronized view in Google Earth.
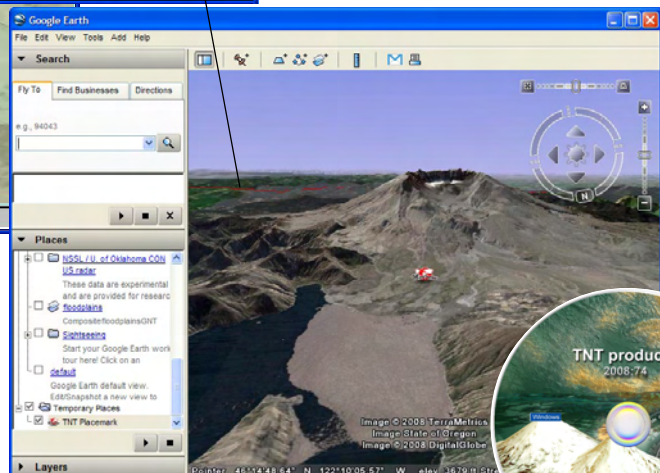
(over)

Google Earth 2D view of north central Nebraska (below right) with a Temporary Place showing the geoextents of the TNT 2D view (below left). The Google Earth view has been zoomed out using the slider and any translation in the center point in the TNT 2D view will be matched.

Slider values >1.0 open Google Earth zoomed out relative to the TNT view.
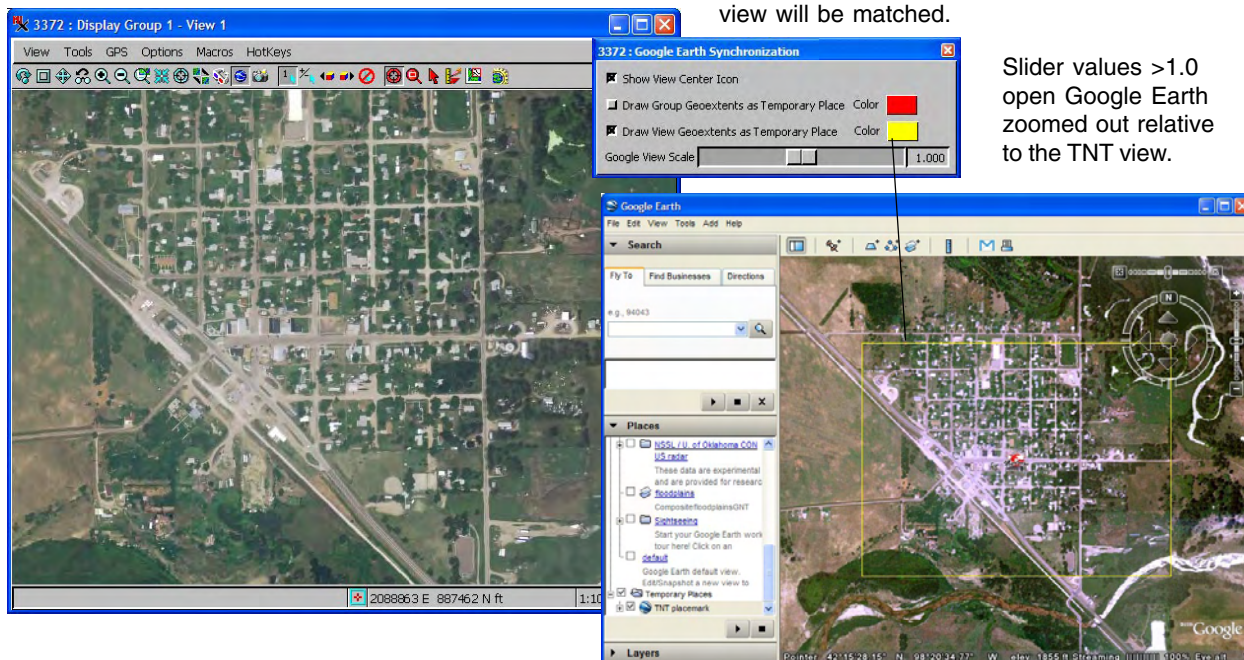
Theme Mapping Rasters

The Raster Theme Mapping feature in the TNT Display process automatically generates interval categories (i.e., themes) from the cell values of a selected raster object and assigns a range of colors to these categories.

- Enter the number of theme or category intervals to be used

- Automatically or manually define upper and lower cell values of each category
- Select how the cell values are assigned to each category (Equal Count, Equal Range, User Defined)
- Select any color for the maximum and for the minimum cell value in the theme map (i.e., define the color range for the theme map)
- Choose a color spread method (e.g., RGB, HIS Clockwise, ...) to define how colors are assigned to intermediate categories
- Show theme colors and ranges in the legend and in map layouts

The illustration below shows a raster theme map that breaks elevation values into 10 categories. The interval categories are displayed in an incremental RGB color spread from light yellow (lowest elevation) to dark brown (highest elevation) as defined in the Raster Theme Map Controls window to the right.
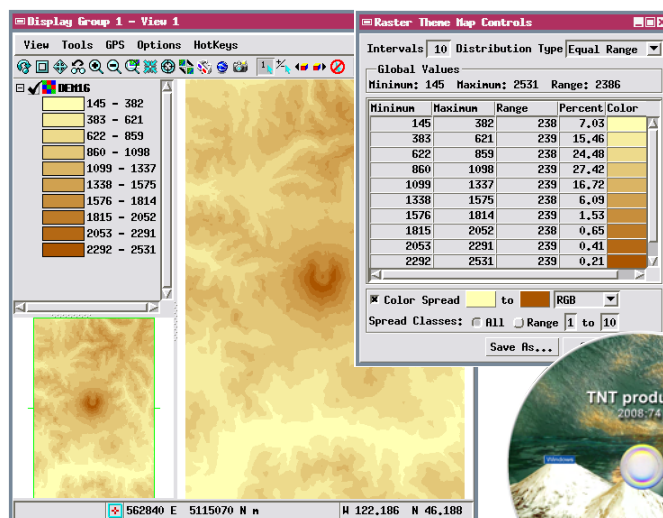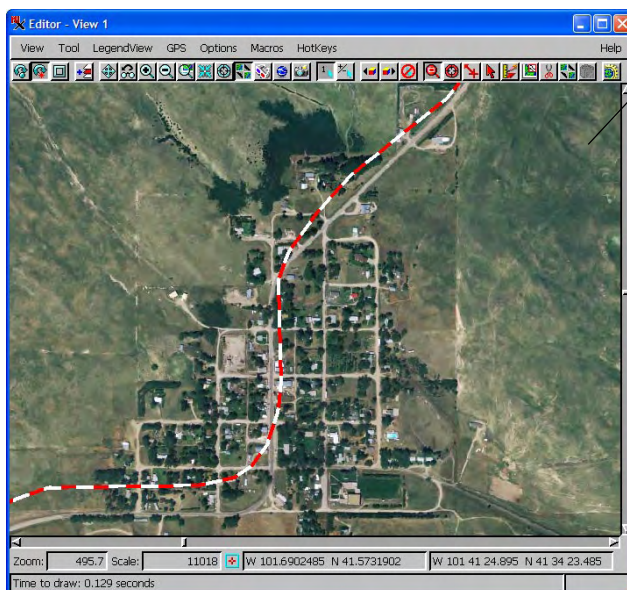
Viewing WMS and ArcIMS Layers

You can add map and image layers from Internet sources to any TNT view in combination with your local geodata layers. Unless you know the complete address of the layer (in other words, its URL), you must first locate the layer of interest using MicroImages' catalogs and search tools. Once you have selected a web layer, its addition and management in your View parallels that used for your local vector, CAD, shape, raster, and other layers. Just as with these other geodata layer types, you use a Web Map Service Layer Controls window or an ArcIMS Service Layer Controls window. Their functions are similar to the layer control windows that are used to set up your local layers.

Once you have added a remote layer from a web service to your View, it behaves similarly to local layers in the View. It pans, zooms, and changes with the rest of the layers. It can be moved up and down in display order, be hidden, is illustrated in the Legend, and so on. However the layers from a web source may react somewhat slower to the changes you make to the view since some changes to this layer must be requested from its remote source. For example, how fast it will pan will depend on many factors such as the remote data type, data structure, site load, and your bandwidth connection to that site. However, your 2008 TNT viewing is now a multi-threaded application. These slower layers from the Internet or other network are managed and updated in the View by separate threads. Thus, your changes to local layers occur as fast or faster than before as they use other processing threads. Your current view is then automatically updated with each remote layer when it has been received from the web service. In other words, using multiple threads gives you a combination of real-time panning for local layers and back-fill panning for slower, remote layers.

A WMS or ArcIMS site may provide access to maps and images stored in all or some of the common data types (raster, vector, shape, CAD, RDBMS, …). It is important to realize that a WMS is enabling you to view these map and images layers, not to have them. The publisher is not publishing map and image layers via a WMS for you to download, analyze, or alter except in generic ways such as warping the view of their layer to match a specific CRS. Adding ArcIMS layers to a TNT view has the same limitation.
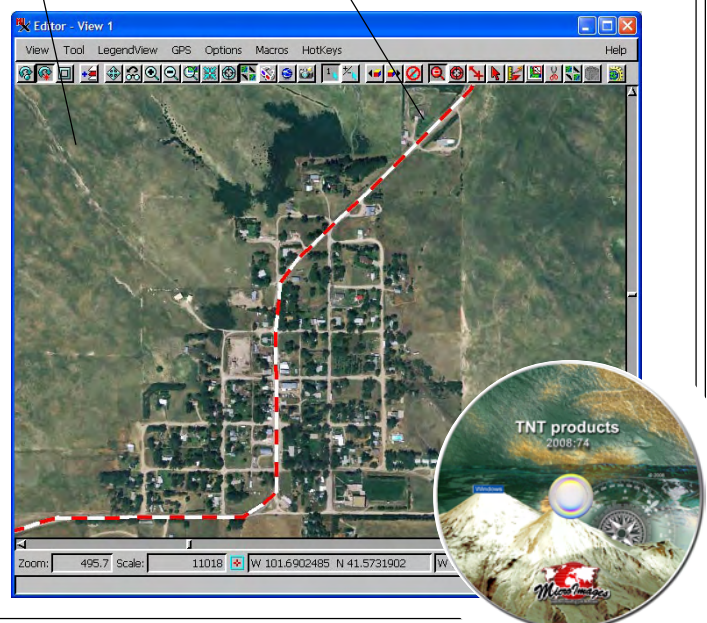
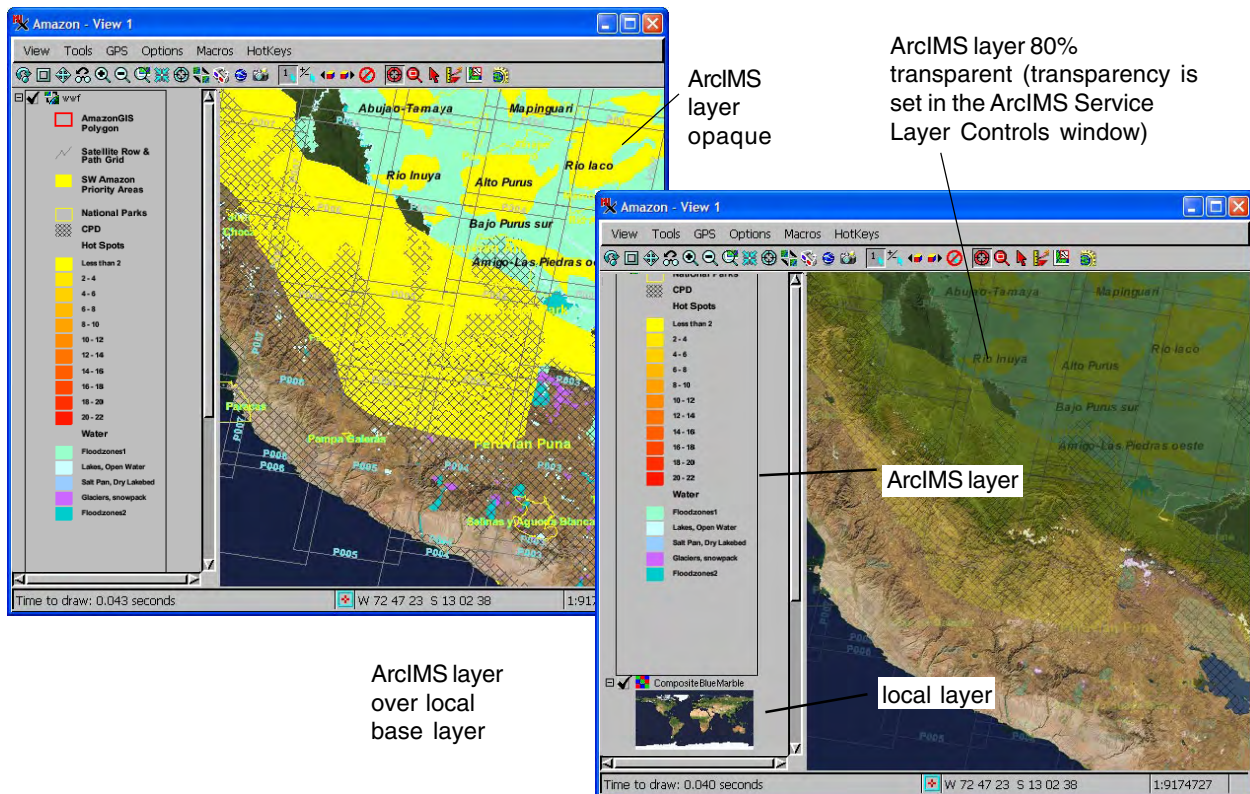(over)

WMS layer

locally edited vector layer

WMS and ArcIMS layers can be used as reference layers in TNT's spatial Editor. The local vector line shown here was reshaped to match the road shown in the orthophoto.

- Add these Internet or private intranet layer(s) to a composite view
- Layer Controls window is similar to that used for local layers
- Requests layer in CRS used in the TNT view
- Reprojects viewed portion of the layer if CRS requested for view is not available
- Manipulate view using web layers just as if the layers were local
- Separate threads manage requests for remote layers
  (i.e., viewing/actions on local layers are not delayed by this web layer)
- Sketch, edit, or revise local layers over web layers and save results
  use MicroImages' WMS 2006 orthoimage coverage of the USA
    (1- to 2-meter 2006 color coverage of 80% of USA and 2003, 2004, 2005, and 2007
    coverage of many states)
- Render WMS layer as viewed to KML

ArcIMS layer opaque

ArcIMS layer 80% transparent (transparency is set in the ArcIMS Service Layer Controls window)

ArcIMS layer

local layer

ArcIMS layer over local base layer

An Internet site that offers geometric map and image layers via a Web Feature Service (WFS) in combination with a WMS can provide remote access to the geometric and tabular elements that make up a map layer. MicroImages' 2008 TNTserver can also be licensed for use as a WFS for this purpose. MicroImages FREE TNTmap web viewer can already access the elements in geometric layers published by a WFS. Soon TNTmips will be extended to permit the use of WFS layers and exploit the use of remote geometric layers in your view. This will include element selection, querying, and other familiar controls over how local geometric layers from any WFS are viewed. Watch for and try these new capabilities in the 2009 development version of TNTmips.

Brand New in TNTmips 2008!

Locating WMS and ArcIMS Layers

Web sites that publish their map and image materials for you to view may choose from a variety of commercial and open source protocols. Two common, widely used protocols for publishing map and image materials via a network are a Web Map Service (WMS) or an Arc Internet Map Server (ArcIMS). A suitable web application or local program that knows where these services are located on the Internet, VPN, or LAN can request and view them alone or in combination with other layers. TNTmips, TNTedit, TNTview, TNTatlas, and the FREE TNT web products can access and display any map and image layer(s) published using these protocols. For summaries of the commercial and FREE TNT products that can use layers in these protocols, see the enclosed Technical Guide entitled *System: TNT Product WMS and ArcIMS Capabilities*.
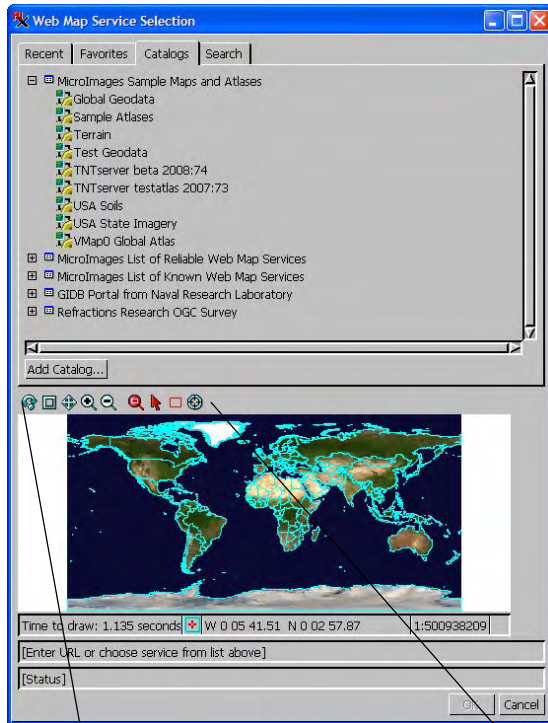
To use these web-centric map and image layers you must first locate them. To successfully publish these layers, WMS and ArcIMS services <u>must respond</u> to a standardized request for their layers. These standardized responses contain the title, geographic extents, and other characteristics of every layer they are publishing. All Internet web sites that will respond to this standard request are locatable by a Google or other search. MicroImages has a web agent program that launches daily web searches to identify and monitor web sites publishing maps and images using a WMS or ArcIMS service. It then interrogates each WMS or ArcIMS and builds a catalog of the map and image layers they are currently publishing. This catalog is updated continuously and maintained online for use in all the TNT products. There are currently 1,400,000 layers indexed in MicroImages' WMS and ArcIMS catalogs. TNT professional products and FREE viewing products download and use this catalog to help you locate maps and images for use in your TNT views combined with your private, local geodata.

- Catalogs are built by an agent program (a web crawler that scrapes the Internet)
    - Runs continuously at MicroImages indexing WMS and ArcIMS services
    - Cycles through all web sites using results of several search engines
    - Detects key words required to publish a WMS or ArcIMS service
    - Interrogates services to determine map and image layers that are available
    - Tries each layer to determine if it responds
    - Records current success or failure of service and each layer
    - Grades reliability of each service and layer to set up return cycle frequency
    - Records technical characteristics of each service, layer, and layer groups
- Features indexed for servers in WMS/ArcIMS catalogs

Title	Geographic extents
URL	Keywords (WMS only)
CRSs offered	Maximum cell dimensions offered
Formats offered	Reliability index based on repeat visits

(over for illustrations)

Choose a catalog of interest.

Server Text search results (Nebraska)

The catalogs panel provides access to a few predefined catalogs that require web access to see their contents. The illustration at the right shows the results of searching servers for the word Nebraska (2 results) while the illustration below shows the results of searching layers for the same text (119 results).

Layer Text search results (Nebraska)

Refresh   Full   Zoom Out   Select   Zoom to Location
      Stop   Zoom In   Zoom Box   Box
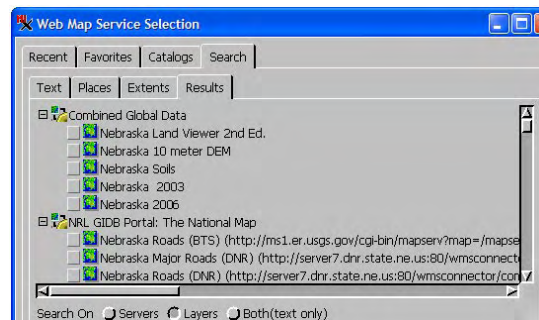
All of these except for Box are standard Display tools and actions. The Box tool lets you interactively size a box to define the desired search extents.

Features cataloged for WMS and ArcIMS servers and map and image layers

MicroImages' map and image catalogs contain the following parameters for the WMS and ArcIMS services and layers located by searching the Internet. Your searches for geodata layers of interest to you are based upon these catalog contents. Some of these parameters are extracted from the mandatory response of these services when they are interrogated (e.g., service type, bounding box, ...), and some are built up using statistics from MicroImages' periodic interrogations of the services (e.g., success and failure counts, last success and failure, ...).

Server
URL
service type
service name
capabilities
last success
last failure
success count
failure count
last failure reason
bounding box
version (WMS only)
abstract (WMS only)
keywords (WMS only)

numlayers
weight
base URL
domain name
domain title
OGC service
area
last scan

Layer
URL
name
title
bounding box
area

TNT products
2008-74

Using MicroImages' WMS and ArcIMS Catalogs

When using your own local geodata layers, you use some means of keeping track of them (naming conventions, project files, GeoCatalogs, directory structures, drives, and so on). Corporate networks may develop and document a more formal geodata indexing that provides you with information about more widely dispersed map and image materials. However, to make use of any specific web-centric map or image, you must know that it exists and meets your requirements.

One way of using Internet-based geodata in your TNT product is to know and enter the URL address of the web site and the map and image layers it is publishing. It is possible that you already know the address of popular, reliable map and image services or located them by your Internet searches. However, this can be a daunting task since over 1,400,000 layers are currently published for your possible use.

MicroImages' TNT products provide catalogs to assist you in your search and evaluation. A Web Map Service Selection and ArcIMS Service Selection window provide access to these catalogs. They also provide tools to search all these layers to find those of particular interest to you and your project. Using these tabbed panels and tools, you can search for layers by place name; coverage of a geographic area, which can be defined by the current view or group, or using a located place and buffer distance; and by layer title or service keywords (WMS only). Your first searches may return many layers from multiple services. These results can be further refined by repeated use of the search tools. Any layer can be previewed before you add it to your composite view. As you find services of interest, you can add them to your Favorites list for direct selection and future reuse. Once you have selected a single service, you can select one or more layers to display as a single, composite layer and to be added to the current view using the Web Map Service or ArcIMS Service Layer Controls window.

- Search panel of Service Selection window uses latest daily catalog
    (if TNT product allowed access to catalog files from microimages.com)

- Interface provides a reference view
    automatically shows global image and national boundary overlay
    displays geographic extents of buffered areas located by search
    accepts interactive input of your areas of interest

- Search for layers that contain specific points and features
    uses Google Maps and Geonames look-up tables
    interactively plot new areas of interest on the reference view
    use geometric object points to define area (for example, geotagged photo locations)
    define a geographic area of interest centered on a point

- Search for layers that cover a geographic area (in other words, by extents)
    area you define is entirely within the area of the WMS/ArcIMS layers
    WMS/ArcIMS extents are smaller than or equal to your defined area
    any part of extents you define overlaps some part of the WMS/ArcIMS layer

- Search for layers using words in title or URL

- Preview selected layers before adding to composite view

- Optionally exclude layers that have global or almost global coverage
   (almost every service offers some generic global layers)
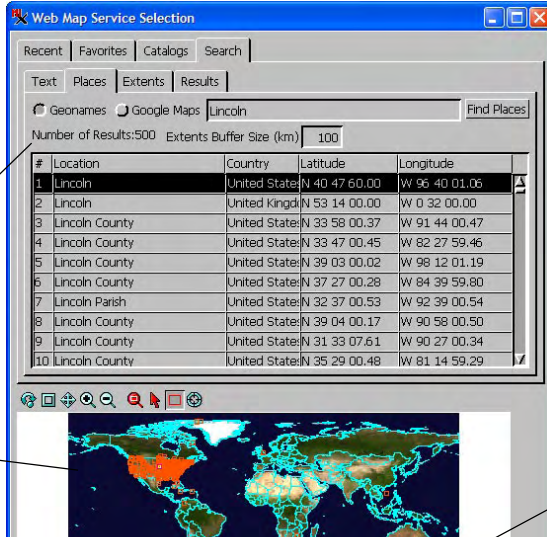
Maximum number of results obtained.

The majority of Lincolns found by the GeoNames search are in the United States.

After selecting one of the GeoNames or Google Maps search results, the limit extents toggle is automatically turned on and the extents defined by the buffer size are filled in.

Extents Box. The size of the box can be determined automatically using the point located for a place name and the entered buffer distance.

100 km

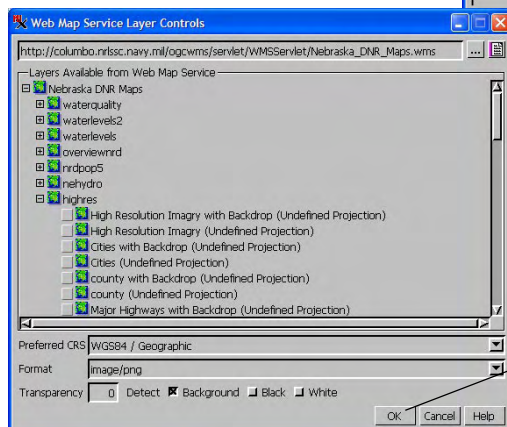Once settings on the Extents tabbed panel are what you want, click on the Results tab to continue.

When you click on OK in the Web Map Service Selection window, the Web Map Service Layer Controls window opens with the layers offered by that WMS listed for you to select from for addition to your view.

The Search features have slightly different behavior depending on your search method. When you search for text, the Results tabbed panel automatically becomes the active panel when the search is complete. When you search using the Places panel, you can manually select the Results tabbed panel. However, you may want to further refine the geographic coverage of your place selection by using the Extents tabbed panel and then review the servers/layers that meet these criteria on the Results tabbed panel.

Eliminate results with global or near global extents if desired.
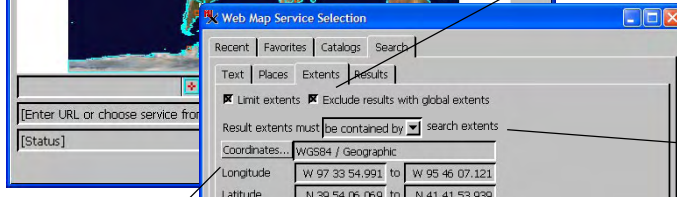
Choose inclusion method from "contains," "is contained by," or "overlaps."

All of these layers contain Lincoln within their advertised extents.

Clicking on this button displays the selected layers here.

Once you have selected a service and a response has been received, the OK button becomes active in the Web Map Service Selection window.

Clicking on this OK button includes the selected layers in your TNT view.

TNT products
2008-74

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Voice (402)477-9554 • FAX (402)477-9559 • email info@microimages.com • web www.microimages.com • May 2008

View Five Years of 1- and 2-Meter Imagery of the USA

MicroImages has used the Mosaic process released in TNTmips 2008:74 to assemble and publish web-based, 1- or 2-meter color image coverage of the lower 48 US states for 2003, 2004, 2005, 2006, and 2007. All these images are published on the Internet as WMS layers using a single TNT-server. The principal purpose of these materials is to demonstrate the robust nature of MicroImages' WMS and WFS TNTserver product and the kinds of clients that can be created to use it.

Your 2008 TNT desktop products can also make direct use of these images in any TNT view. When you choose to add a WMS layer to your view, the Favorites tabbed panel automatically provides you access to the list of all these five years of state images. If you are conducting a project in these states, you might add one of these 1- or 2-meter color images to your view for a wide variety of purposes: viewing them in Google Earth, checking an area to determine if it has changed over five years, correcting an existing map, or directly creating a new geospatial layer.

Each annual state image is actually a single hierarchical tiled raster object. The Farm Services Administration (FSA) of the USDA has collected these images each Spring starting in 2003. They are then provided for public access as county-wide color composite *.sid files and, starting in 2008, some are in 4 band *.jp2 files. Since this is a program focused on monitoring agriculture in the USA, some states get complete coverage every year (e.g., Nebraska) while others might get only nominal or no area coverage in a specific year. 2006 had the most intensive flying campaign with about 80% of the lower 48 states imaged in color at 1 meter. This extensive 2006 coverage was possible as other federal agencies (e.g., USFS) and state governments contributed to the program to cover the non-agricultural lands that they administer.

MicroImages' online coverage of each state for each year available can be viewed by anyone at www.microimages.com/TNTmap/StateOrtho2.htm (as illustrated on the reverse). Each state can be selected and a thumbnail image can be reviewed showing the coverage available from MicroImages' WMS using TNTserver. From this same location you can view these images in Google Maps, TNT-map Viewer, TNTmap Open, on your iPhone or iTouch, or launch them into Google Earth. All of these images can be selected for viewing in the lower right corner of MicroImages' home page and enlarged from there to full screen coverage.

MicroImages
microimages.com
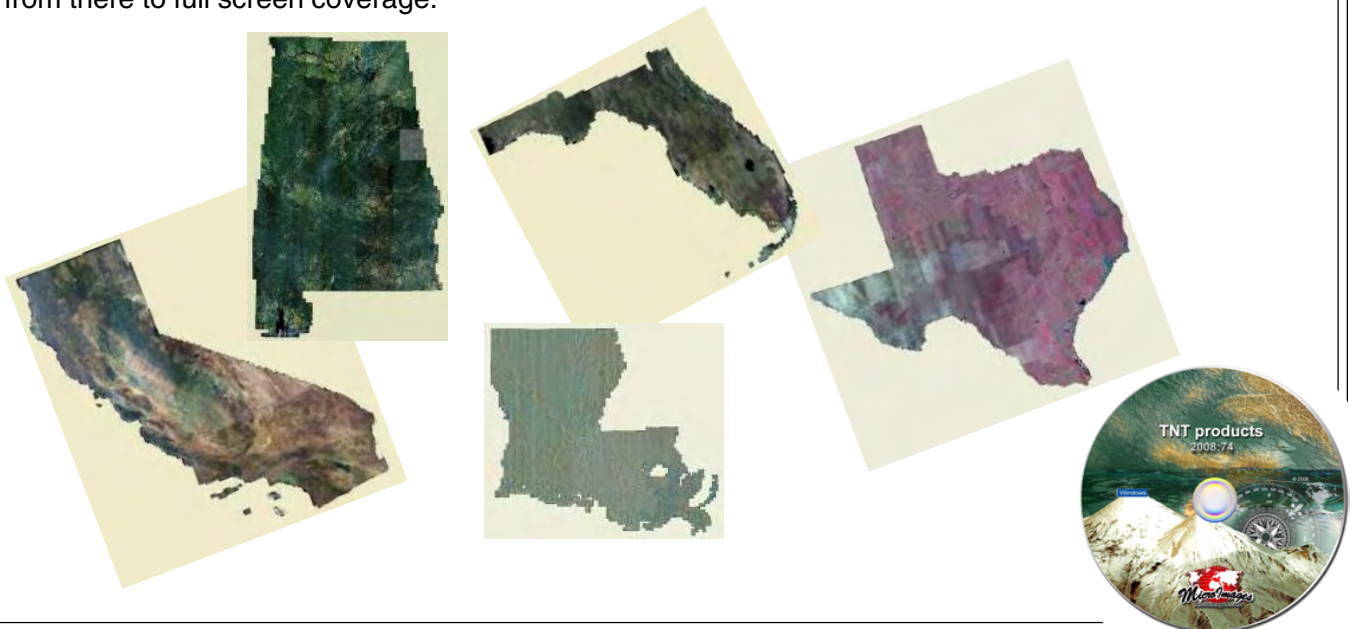
Online Maps

State Orthophotos
State Soil Surveys
Terrain
Online Maps
TNTserver
TNTmap
TNTmap Builder

State Orthophotos

State-by-State Coverage

View seamless color image coverage of any state listed with a ground detail of 1 or 2 meters in the map viewers provided. This imagery is collected annually by the USDA (United States Department of Agriculture) as a joint project of the

FSA (Farm Services Administration),
NRCS (Natural Resources Conservation Service), and
RD (Rural Development).

These statewide images were downloaded in county units or digital orthophoto quads (DOQs or DOQQs) and assembled into seamless state coverages in a special web-oriented JPEG2000 format using MicroImages' TNTmips geospatial analysis product.

Why some states have missing coverage ...

The statewide coverages are hosted by MicroImages' TNTserver product. TNTserver is a Web Map Service (WMS) certified as compliant with this specification of the Open Geospatial Consortium (OGC). These state images can also be combined for use with imagery, maps, and other layers from WMSs offered by other web sites.

There are many map and image layers available from thousands of web sites offering them for viewing as standard WMS layers. For example, MicroImages' WMS provides access to statewide soil type maps; 10-, 30-, and 90-meter digital elevation layers; and various other global geodata.

You need a WMS browser to locate and select WMS layers for viewing as composite maps in the viewers listed. MicroImages provides TNTmap FREE for Internet Explorer, Firefox, Safari, and Opera as a web application, as a downloadable executable program, and as an Apple widget via apple.com.

links:

Geospatial Data Gateway
TNTmips
TNTserver
Open Geospatial Consortium
Apple TNTmap Download

Alabama
Arizona
Arkansas
California
Colorado
Connecticut
Delaware
Florida
Georgia
Idaho
Illinois
Indiana
Iowa
Kansas
Kentucky
Louisiana
Maine
Maryland
Massachusetts
Michigan
Minnesota
Mississippi
Missouri
Montana
Nebraska
Nevada
New Hampshire
New Jersey
New Mexico
New York
North Carolina
North Dakota
Ohio
Oklahoma
Oregon
Pennsylvania
Rhode Island
South Carolina
South Dakota
Tennessee
Texas
Utah
Vermont
Virginia
Washington
West Virginia
Wisconsin
Wyoming

Hierarchical Tileset Rasters

A hierarchical tileset is a directory of uniformly sized files called tiles stored in conveniently sized subdirectories. A single TNT tileset raster object is linked to this directory structure functioning just as links to other raster file formats. This link file contains the internal pyramid layers needed for the lower resolution uses of the full-resolution base tileset (e.g., zooming out). This assembly functions as a single raster object in your TNT activities. If the individual tile files in the base tileset are in a format that has an internal pyramid concept, such as *.jp2, these pyramids are automatically used and are not duplicated in the link file. For tilesets in GeoJP2 and GeoTIFF formats every tile is individually georeferenced, so these conveniently-sized files are directly accessible and usable by other mapping software.

The time required to draw a tileset as a layer in a TNT view is independent of the overall size of the raster object it represents. A tileset raster object can be displayed in a TNT product at any scale and projection in less than 1 second from a hard drive connected using USB 2, Firewire 400 or 800, eSATA, or an internal hard drive. Similarly, a tileset raster object can be viewed at any scale and projection from CD, DVD, or Blu-Ray media in 1 or 2 seconds. This fast access permits real time predictive panning of huge images at any scale from any local media. Access to a tileset over a network can appear to be slower (several seconds) due to the network connection, transmission delays, and drive sharing, so the View may revert to backfill panning if you pan a large distance. (See the Real Time Panning feature page for an explanation of the panning features available in version 2008 of your TNT product.)

Imagery mosaicked into a tileset might yield a raster object of 250 gigabytes and still be viewed in a fraction of a second. It could use 15 to 1 JPEG2000 compression for the GeoJP2 tiles and thus represent an uncompressed raster object of almost 4 terabytes. *Thus a tileset might represent a nation, a province, or complete coverage of a major city at 100 centimeter resolution*.

Example Tileset of Texas

(area 678,051 sq km or 261,796 sq mi)

Input to Mosaic:

    1 meter resolution 24-bit color-infrared orthoimage coverage in 2004
        (~17,000 DOQQs,*.sid format compressed 15 to1, several UTM zones)

    Uncompressed bounding image size: ~4.5 terabytes
        (1,192,066 lines by 1,255,742 columns by 3 bytes)

    1 meter 24-bit cells contained within Texas boundary: ~2.0 terabytes

Output from Mosaic:

    Tileset raster object of 134 GB

    GeoJP2 tiles of 2048 by 2048 compressed 15 to 1
        (all tiles in UTM zone 14, the dominant Texas UTM zone)

The Texas tileset can be viewed in Google Maps, Google Earth, TNTmap Viewer, and TNTmap Open or via your iPhone or iTouch at www.microimages.com/TNTmap/StateOrtho2.htm. Color or color-infrared tileset images of all of the lower 48 states at 1- or 2-meter resolution can be similarly viewed at this same URL. These state tilesets can also be used as Web Map Service layers in your TNT product by selecting the Add Web Layer... icon and selecting a state from the USA State Imagery service shown by default in the Favorites tabbed panel of this window. All of these state tilesets dated 2003 to 2007 are published directly from the corresponding state tilesets by MicroImages' Web Map Server product (TNTserver).

- Ultrafast viewing of raster object of any size (10 gigabytes or 10 terabytes)
- View at any scale (i.e., fractional zoom) or CRS
  (by comparison, Google Maps provides only discrete zoom levels)
- 1/5 second is typical draw/redraw from 250 gigabyte compressed object
- Approximately same time to view from internal or USB 2 connected drive
- Time to draw/redraw View is not a function of tileset size
- Uses small tile files in your directory structure
- Avoids OS performance issues caused by too many files in one directory
- Optimal tile sizes are in range from 256 by 256 to 8192 by 8192 cells
- Build directly from single raster with Create Tileset process
- Create from several or many input rasters using Mosaic
- Recommended tile format is JPEG2000 (GeoJP2)
- Tiles can also be in GeoTIFF or PNG formats
- Increasing tile compression decreases viewing time (less data to read)
- Each GeoJP2 and GeoTIFF tile file is internally georeferenced for concurrent direct use in other software

Typical drawing times are illustrated for a 1-meter natural color orthoimage tileset of the State of Florida (32.2 GB at 15:1 compression) read from:
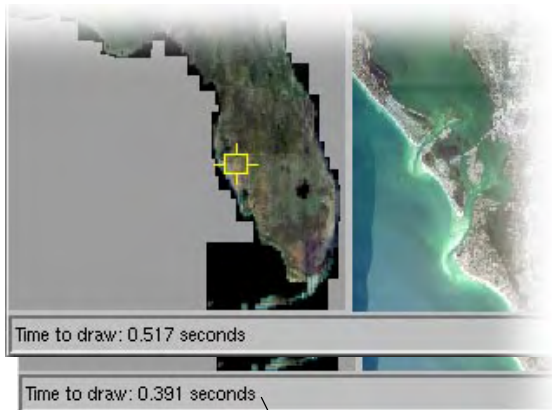
   an external USB 2 hard drive

   an internal hard drive

Time to draw a full view of the entire tileset

Time to draw: 0.026 seconds

Time to draw: 0.002 seconds
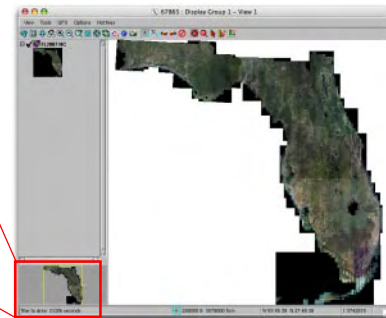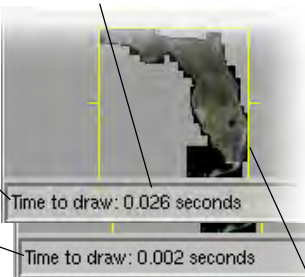
The yellow rectangle in the Locator outlines the area being drawn in the View.

Nothing is cached for any test time.

Time to draw: 0.517 seconds

Time to draw: 0.391 seconds

Time to redraw from full view to an arbitrary fractional zoom level using the zoom box

Time to draw: 0.308 seconds

Time to draw: 0.127 seconds
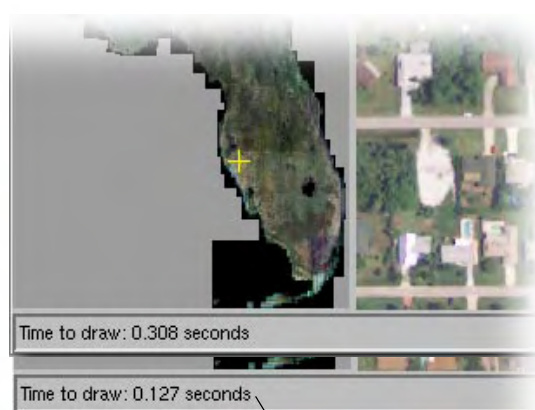
Time to redraw from full view or any zoom level to maximum detail (1 raster cell per screen pixel)

Mosaic Process

The Mosaic process has been redesigned to be faster, require less drive space and memory, handle much larger tasks, present a new interface for greater convenience and flexibility, and to provide a base for important new features. It uses the TNT image processing pipeline for faster throughput for even massive mosaics (terabytes of data). No mosaic task is too big or too small. No large temporary intermediate mosaics are created that could require double or triple the storage necessary for the final object(s). The input objects flow through the pipelined process directly to the final output object or tileset.

The revamped Mosaic control window shows more of the critical information you need to review as you assemble your mosaic. Each layer you add shows in a scrolling list containing the object name, Coordinate Reference System, dimensions, and cell size. Tab panels are used to organize the many different parameters that can be set to control the Mosaic process. All of the selected images are displayed in a built-in preview panel.

New output formats are available. In addition to the previous single raster object output, you can mosaic to a hierarchical tileset raster object. You can also independently set the compression method and parameters for the TNT pyramids created for the tileset raster object. Since pyramid tiers are created for low-resolution viewing, they can be optionally compressed using higher ratios than the full-resolution base image without adversely impacting their viewing. All input objects are processed directly through the mosaic pipeline process into the final form.
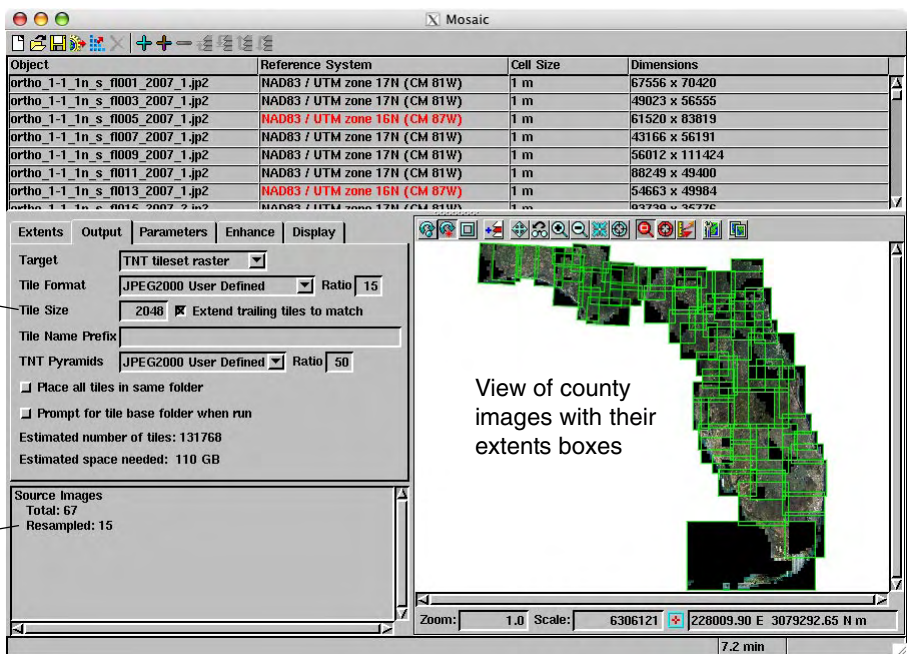
If you are mosaicking into a tileset raster object, the image files (i.e., the tiles) created for the tileset can be GeoTIFF, PNG or compressed JPEG2000 (JP2) files. For example, 20,000 DOQQs in *.sid format might be mosaicked to a tileset of *.jp2 (actually GeoJP2) files. As each output tile file is processed, those DOQQ files needed for that area are read, decompressed, reprojected if required, and recompressed to the final GeoJP2 file in the proper directory. In another example, 100 large (gigabyte) images might be in the input list. Only the portion of each that is needed for the current tile is read and processed at one time. In processing these examples, no large intermediate uncompressed temporary rasters are created.

- Mosaic into massive single raster object or to hierarchical tileset raster
- Mosaicking into tileset can be interrupted and continued later
- Input 1 or 100,000 rasters
- Uses pipeline processing throughout
- No large temporary intermediate files are created
    (i.e., drive space required equals that needed for inputs and result)
- Inputs can mix any directly-supported linked georeferenced raster format
  (e.g., set up job using internal raster object, *.jp2, *.jpg, *.sid, ...)
- Mix input files in any Coordinate Reference System (CRS)
- Mosaic output into any Coordinate Reference System

(over)

- Fast multi-threaded decompression/compression for JPEG2000 input and output (e.g., 8 cores are used equally with low demand on a Mac Pro)

- Single integrated Mosaic job setup window providing
  - scrolling list of all selected files (name, CRS, cell size, dimensions)
  - tabbed panels conveniently organizing all job setup parameters
  - current job summary panel (count of layers, number needing resampling, ...)
  - preview panel that displays all layers in the input list

- All TNT compression types and options available for all output raster types

- Create pyramids for tilesets and separately set their parameters

67 county orthoimages

131,768 GeoJP2 tiles

15 images will be reprojected

Mosaic setup window showing input of the 67 county orthoimages of Florida at 1 meter resolution in 24-bit color. Each input is a *.jp2 file compressed 15 to 1. Inputs can also be raster objects in a Project File or *.sid, *.tif, or any other supported file format. The rectangular bounding size of this image is 739,738 by 744,133 cells, thus a 24-bit uncompressed temporary mosaic of this area would be 1.65 terabytes.

Running this mosaic does not make any temporary uncompressed Florida or county image. The 24-bit color raster object produced will be a hierarchical tileset of 131,768 GeoJP2 files totaling 33.1 GB. Each of these image tiles will be 2048 by 2048 cells, compressed 15 to 1, and directly useable in other products.

Virtual Mosaic

Using only the Import process, a collection of image files in one of several directly linkable file formats can be quickly assembled into a virtual mosaic raster object. A virtual raster might be built from a few source files or 10,000s. The files used might range from collarless quadrangle maps to color orthoimage tiles or DOQQ images.

The performance of a virtual raster in a View does not depend on the file count or their size, but primarily upon how fast their format can be read (including the media and the connection to it). For example, a virtual mosaic of 1000s of quadrangle maps or images stored in *.jp2 files can be viewed almost as fast as a hierarchical tileset raster object, whereas the same files in *.jpg format would display slower. Another example would be a virtual mosaic of a state from 1000s of 1 meter color orthophotos where using *.jp2 files would be very fast and *.sid files would be slower (reading *.jp2 files is multi-threaded whereas *.sid is not).

The import process builds a single TNT raster object link file by defining paths to, and characteristics of, all the source images. It also builds pyramid layers in the link file for the virtual mosaic so that it can be drawn quickly at any zoom level. This new raster object can then be viewed, used to extract subsets, and in other TNT processes as long as the paths to the source rasters remain valid.

- Virtual mosaic raster object is viewed and processed as a single raster
  (i.e., view as layer, pan, zoom, extract, ...)
- Import process builds pyramid tiers linked directly to original files
  (i.e., files are not imported and remain in their original locations)
- Overlapping, abutting, or disjoint images can be selected
  (use for orthoimages, DOQQs, collarless quadrangle maps, ...)
- Select GeoJP2, GeoTIFF, MrSID, ECW, JPEG, or other formats
  (slow formats such as JPEG affect display rates)
- Source files in a virtual mosaic
  can be located in distributed directories
  remain in their original format and locations for other uses
  can be shared in multiple virtual mosaics
- Add all eligible files in a nested directory structure at once
- Individual link files automatically built
- No preparation of source files required but all must be in same format and CRS
- For source files with marginal null areas use Mosaic process to resolve overlaps
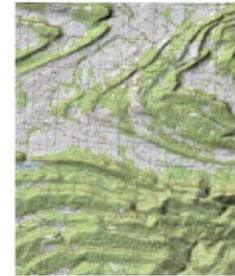
(over)

Huntington
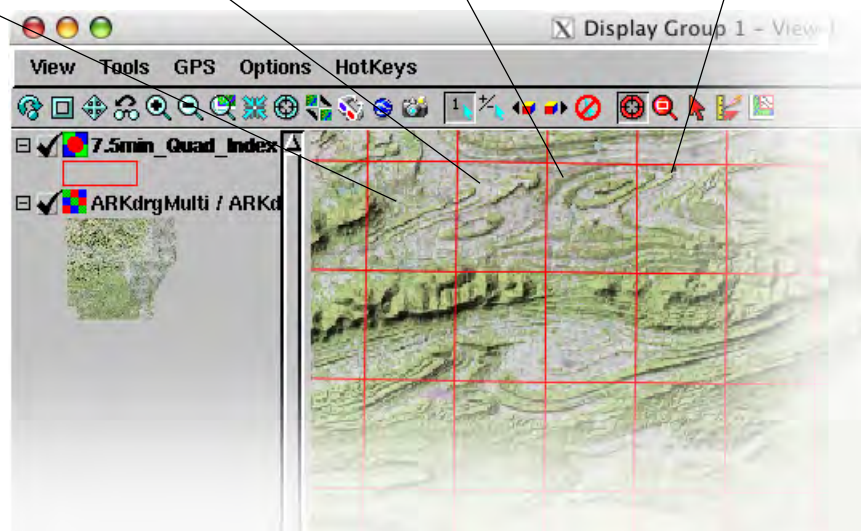Quadrangle

Abbott
Quadrangle

Ione
Quadrangle

Golden Valley
Quadrangle

A virtual mosaic of shaded-relief topographic quadrangle maps with 2-meter resolution covering the State of Arkansas.

906 MrSID files,
aggregate 6.8 GB
(102 GB uncompressed)

Display time 1 second
or less at any scale

Display Group 1 - View

View   Tools   GPS   Options   HotKeys

7.5min_Quad_Index

ARKdrgMulti / ARKd

TNT products
2008:74

Streamlined Spatial Data Editor

The TNT spatial data Editor has been modified to use panning, Locator view, maps and images from the Internet, and other 2008 modifications to TNT viewing. You can create or edit a linked shape layer, such as a shapefile. If you are frequently tracing around curved and complex shapes in an image, you can now draw smoother and faster and erase errors on the 23" WACOM stylus sensitive monitor or your Windows Tablet PC. The user interface has been improved in many areas using drop down vertical panels, thus fewer viewer windows, improved icons and keyboard eqivalents, and others.

- Directly edit or create layers from linked shape objects

- Move view with real-time panning of view

- Reposition view using panning, Locator, arrow keys, and other new options

- Reference layer can be map or image from any WMS or ArcIMS

    create or update any layer by interpreting these reference layers

    use MicroImages WMS 2006 layers for 80% of the USA
        (1- to 2-meter 2006 color coverage of 80% of USA and
        2003, 2004, 2005, and 2007 coverage of many states)
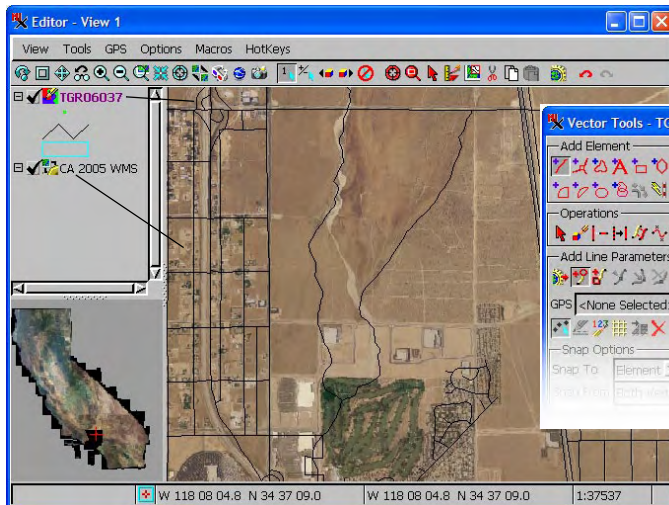
Add line for new road shown in WMS layer.
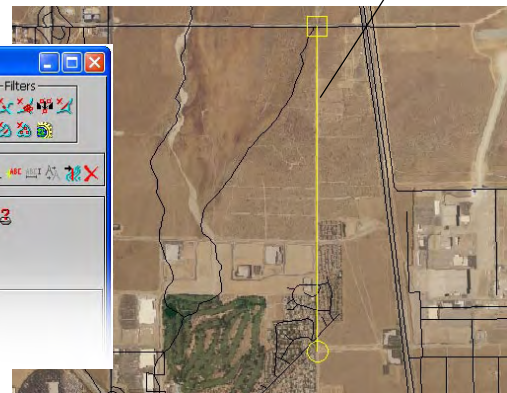
The TIGER line data is local data selected for update in the Editor using an NAIP orthophoto available as a WMS layer for reference.

- Edit with stylus directly on screen of tablet PC or Wacom 23" monitor in stereo

- Edit any georeferenced object or linked file viewed as a stereo overlay
    (use anaglyph glasses or any other TNT-supported stereo technology)

- Create stereo view for editing from any georeferenced non-stereo image using:

    90-m global DEM tileset provided by MicroImages

    30-m USA DEM tileset

   optional USA 10-m DEM tileset, or

    your own local DEM

(over)

- Vertical drop-down panels reduce number of windows
- More hot keys and all directly defined in edit tool panels
- Line and polygon edit tools

  erase with eraser end of stylus or using mouse while drawing

  auto insert vertex and drag

  vertices repositioned proportionally to distance away from node dragged
  (i.e., rubberband-effect curve reshaping)

① node selected for editing

② node activated for editing (right-click)

③ node dragged (attached lines reshaped)

④ editing complete (compare 1 and 4)
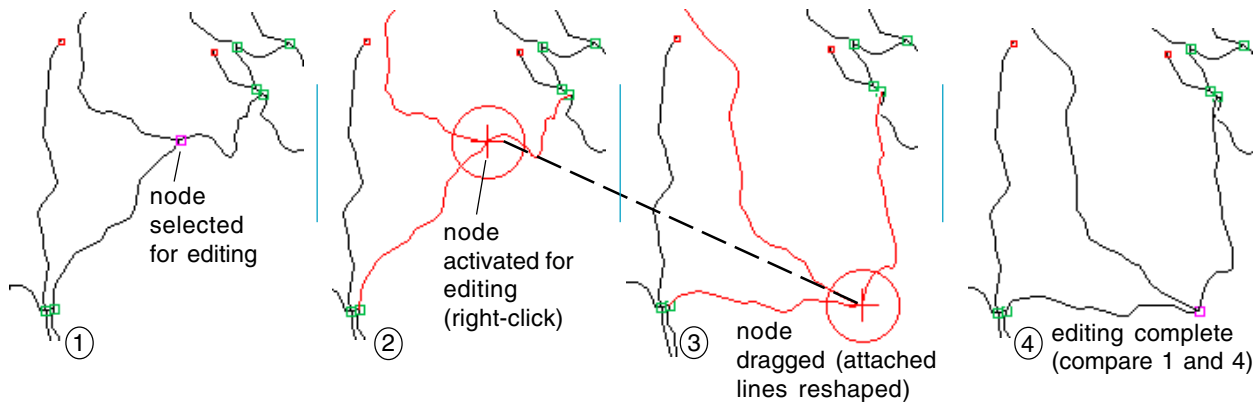
When nodes are repositioned, all attached lines are reshaped. This reshaping occurs along the lines attached to the node and extends to the next node, which represents the end of each attached line. The degree of reshaping decreases with the distance from the node being repositioned.

- Select, cut or copy, and paste elements into new or exising object

  CAD, vector, shape, or region elements into CAD, vector, or shape object or
  irregularly shaped raster area into raster object

select area

copy to clipboard

paste area into another raster object
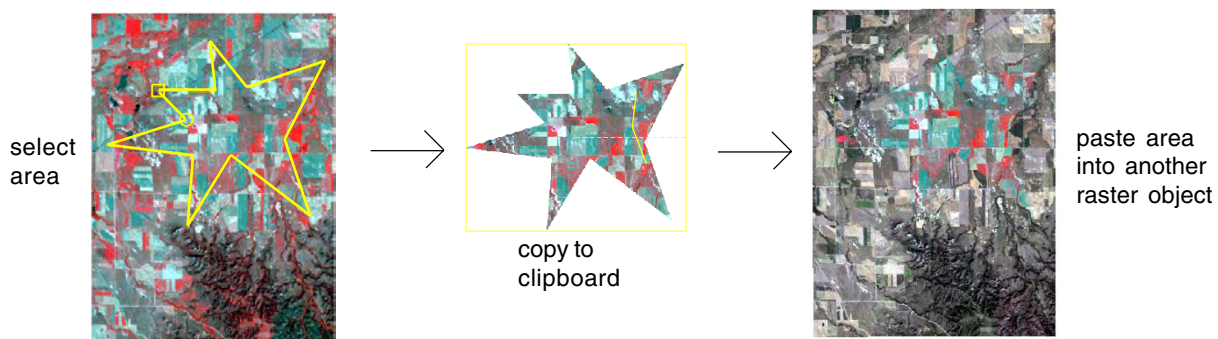
- Create, save, and reuse template objects from existing objects

  duplicates data type, georeference, and relational database structure

  does not save any geometric elements or raster cell values

- Template provided for international nautical chart standard (IHO S-57)

  automatically defines relational tables' structure
  (i.e., uses standard template of object)

  feature types and constraints automatically set up

  easy attributing from single or tabular record view

Interpret/Draw/Edit Directly on Screen with Tablet PCs and Pen Displays

Combining TNTmips with a Tablet PC or a pen display allows you to edit your geodata directly on the display screen using a pen stylus. Since you draw directly on the screen with the stylus to control the cursor position, these devices provide a natural and intuitive interface for drawing and editing. Wacom (www.wacom.com) makes pen displays ranging from 12 to 23 inches (measured diagonally) that can be used in single or multiple-monitor setups with Windows and Mac OS X systems. Tablet PCs provide the advantage of portability, allowing use in the office or in the field. Windows Vista and Windows XP Tablet PC Edition include direct support for on-screen stylus control. For Wacom pen displays running on Windows XP or Mac OS X, the pen interface is provided by an installed driver.

- Stylus functions as mouse directly on the screen
- Interpret or sketch directly on any View with the GeoToolbox
- Draw / edit directly in Spatial Editor with all tools
- Reverse end of stylus erases (center button on mouse)
- Stylus and mouse 100% interchangeable or use both
- Reference image in View can be in anaglyph stereo

Use a 23" pen display as a primary or secondary monitor.

A Tablet PC allows you to edit directly on the display with a stylus in the office or in the field.

The TNT products also support the use of a pen stylus for drawing with graphics tablets, such as the cordless Wacom Graphire Bluetooth tablet pictured here. A pen tablet provides the same natural drawing action as pen displays but at a much lower cost. Prices for tablets start at US$100 and vary with tablet size and connection method.
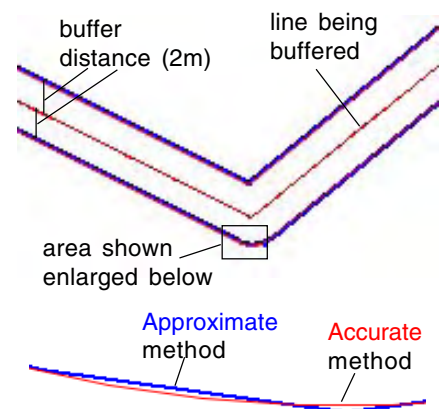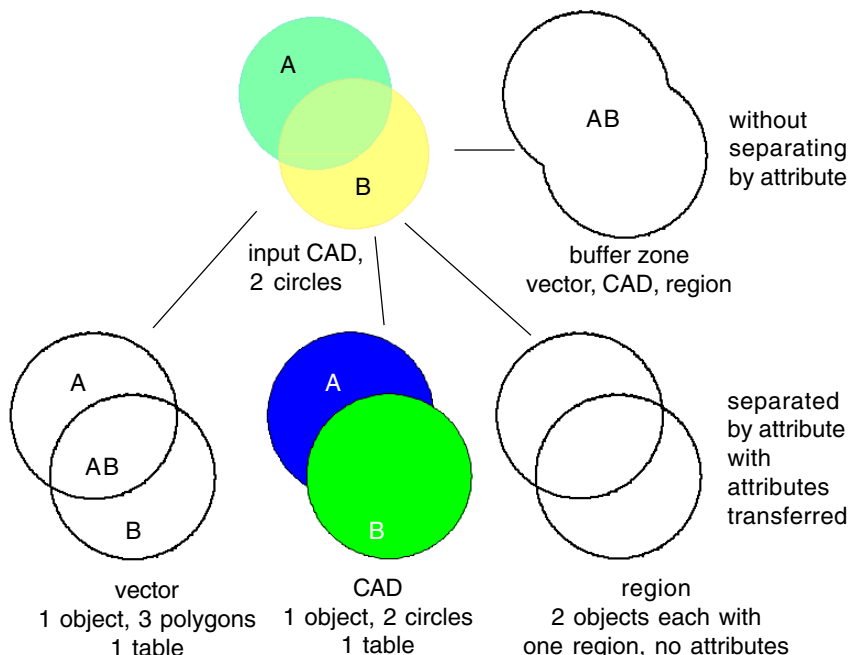
Geometrically-Derived Buffer Zones

Buffering selected geometric elements in earlier TNT releases computed the buffer zones based on a rasterization approach. In effect a raster buffer was constructed around each element. Its boundary was created and topologically reconciled, if required, with the buffer boundaries of other selected elements. This raster buffering method, labeled as the "approximate method," is ineffective for the creation of narrow buffer zones.

Geometric buffering has been implemented in version 2008 of the TNT products as an alternative buffering mechanism and labeled as the "accurate method." It can be used interchangeably with the faster, rasterized buffering of elements in any geometric object. However, geometric buffering will produce accurate narrow buffer zones such as curb setbacks, line thickening, cartographic representation of stream banks and road edges from lines, and storm drain pipe widths from lines.

- Derive narrow buffer zones for elements and regions
- Create buffer zones in decimal feet or meters
  (for example, roads from lines or road curb setbacks)
- New "by query" option for selecting elements to be buffered
- Buffer CAD, shape, vector, and pinmap elements and regions
- Choose regions for output object type in addition to vector or CAD
- Interface for Buffer Zone process uses tabbed panels to organize selections
- Apply buffering when extracting irregular areas of rasters
  (which means, apply inside or outside buffering to extraction by region or polygons)

Accurate method: a 2-meter buffer (black lines) around a stream line styled to appear as a line pattern with flanking lines.

input CAD,
2 circles

buffer zone
vector, CAD, region

without
separating
by attribute

AB

separated
by attribute
with
attributes
transferred

vector
1 object, 3 polygons
1 table

CAD
1 object, 2 circles
1 table

region
2 objects each with
one region, no attributes

buffer
distance (2m)

line being
buffered

area shown
enlarged below

Approximate
method

Accurate
method

The difference between Accurate and Approximate methods is shown where the line being buffered abruptly changes direction.

TNT products
2008-74

Import / Export / Link

BigTIFF

The TIFF specification has been expanded to support TIFF and GeoTIFF files much larger than 4 GB. TNT processes now support these changes for import, export, and rendering for TIFF and GeoTIFF files for all bitdepths, datatypes, compression modes, and standard tags. A BigTIFF file has the same *.tif or *.tiff file extension for backward compatibility, but this expansion of the TIFF format is not yet widely supported by other software products. Therefore you should use caution in selecting this expanded format for creating TIFF files greater than 4 GB to transfer your images to other products.

- Automatically useable in Mac or Windows
  (i.e., it's simply a larger *.tif file in any TNT process)
- Separate BigTIFF format selection for export to files greater than 4 GB.
- Use as source or target in pipeline SML scripts

LAS LIDAR

- Directly use LIDAR elevation data in LAS files as shape objects
- Table view of shape object shows all attributes of every LAS point
- Create region object containing irregular boundary of all points in LAS file
- View LAS file header information in shape object's metadata
- Set view scale when an LAS file is linked as shape object
- Fast import of LAS files into vector and CAD layers as point elements

DWG/DXF

- Import/export/link to AutoCAD R14 file
- Export from linked shape objects (e.g., shapefile, PostGIS, Oracle Spatial, ...)
- Export labels from CAD or vector to DWG
- Expanded support for:
  - multiline text formatting codes
  - DXF subscripts
  - font and character encoding
  - font information with elements

KML/KMZ

- Improved import of KML or KMZ layouts as objects
  (creates multiple CAD and raster objects and databases as needed)
- Improved export of Views with any object, linked file, or WMS layer to KML/KMZ

Database Support

- Link to Oracle using Oracle's own faster OCI Open Call Interface Protocol (slower generic ODBC and OLE DB still supported)

- Export via OLE DB

- Delete duplicate records procedure attaches elements to retained records

Stream Ordering

- Automatically determine stream order values for connected lines in a vector object

- Computes database table with Strahler, Horton, Shreve, and Scheidegger order values

- Flow direction automatically determined for 3D vector source

- Manually designate outflow nodes for 2D vector source

Strahler Order

———	1
———	2
———	3
———	4
———	5

Vector object with stream order line attributes computed by the Stream Orders process. Lines have been theme-mapped in different colors using the Strahler order values as shown by the legend.
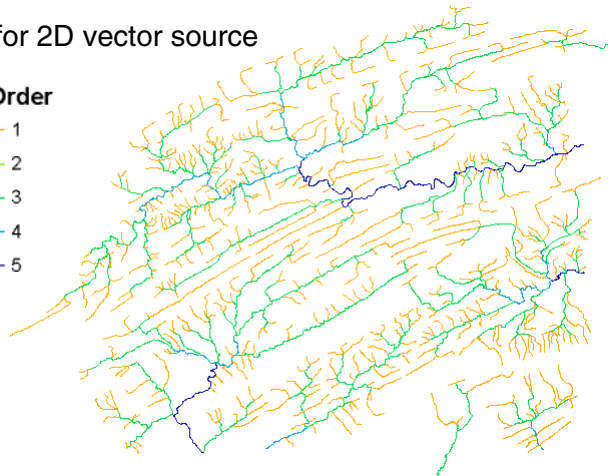
Surface Modeling

- Surface fitting using a TIN provides multiple triangle interpolation methods (Linear, Quintic, and new Modified Quintic and Nonic methods)

- Triangulate points into TIN using CAD, spatial database (pinmap), or vector as source

Miscellaneous

- Symbols imported from ArcView files

- Feature Mapping has region-growing tool to expand sample areas

- RGB layers can be selected with one button

- Movies of activities can be recorded to *.wmv format for Contact Support form

- Kerning supported for TrueType fonts

- Iraq and Libya datum definitions and transformations

- Canadian Digital Elevation Data (CDED) files can be linked

Render to Geospatial PDF

"Render to" in the TNT products means to convert the contents of your map or layout or the components of a complex view into some other layout format. PDF, KML/KMZ, and SVG are all examples of layout formats that can be rendered by the TNT products. Converting from a map or display layout to other layouts is more complex than simply exporting a single layer, and you must have more controls that also vary with the destination layout format. When you render your current view (i.e., display layout), you can choose the rendering to represent only the area of the layers in the view or match the bounding extents of all the layers in the display (group or layout), which can be very large. You can also select the layers that are rendered as there are some advanced capabilities in a TNT layout that have no equivalent in a simpler layout format. For example, you may need to decide how large and detailed the destination file will become as some layout formats limit some kinds of data types, such as the raster size or the precision of geometric elements. If TNT enhanced fonts are used, how will they be represented in the destination layout, and so on.

Geospatial PDF is a specification becoming more widely used that georeferences the components making up a PDF layout. Map materials are being published on the Internet by USGS, NGA, and others in this extended PDF format. Exploiting the geographic positioning of a geospatial PDF requires a geospatial PDF-capable viewer. For example, a geospatial PDF file can be geographically overlaid or combined with other materials, has geographic coordinates readout, and maps mosaicked when viewed depending on the capabilities of the viewer used. The Analysis Toolbar available with Adobe Reader 9.0 lets you make measurements and enter desired coordinate locations.

Every component used in a complex TNT display or map layout can be georeferenced. These components can include everything ranging from inserts to legends, even labels. A complex layout can be rendered with layer control into a geospatial PDF. For example, a geologic map can have many complex layers, inserts, legends, and fonts. The illustration shows that a standard geologic map prepared as a TNT layout for publishing as a paper map can be rendered to geospatial PDF. Since its TNT layers are separate in the geospatial PDF, the marginalia, legends, and selected layers can be individually turned on and off when it is viewed in Adobe Reader.

layer visibility controls
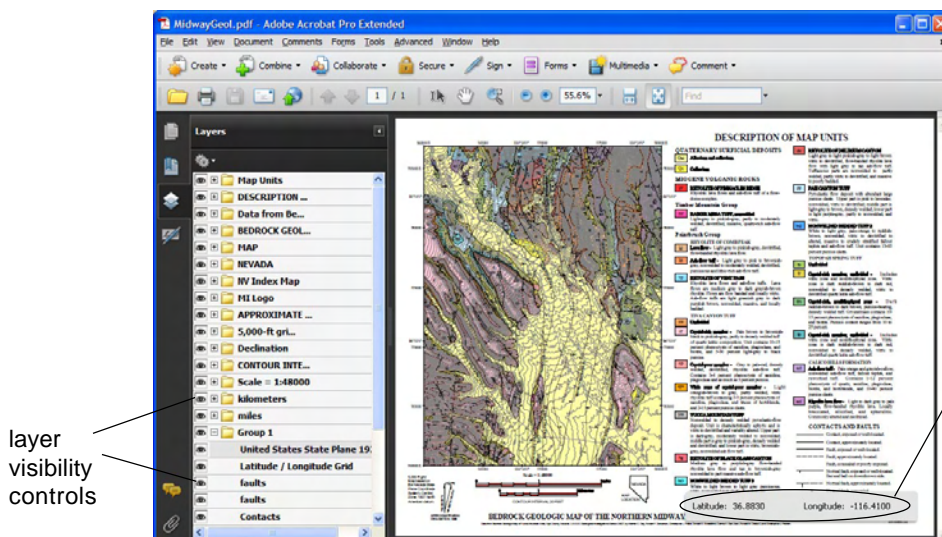
Geospatial Location Tool is active to provide coordinate readout when cursor is over georeferenced elements of the layout.
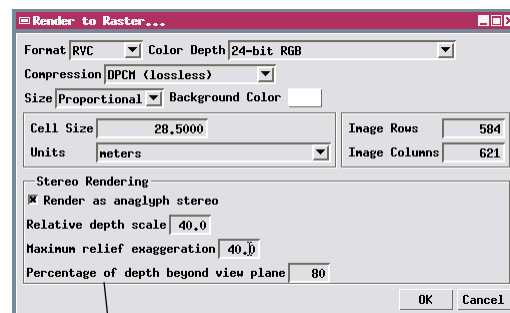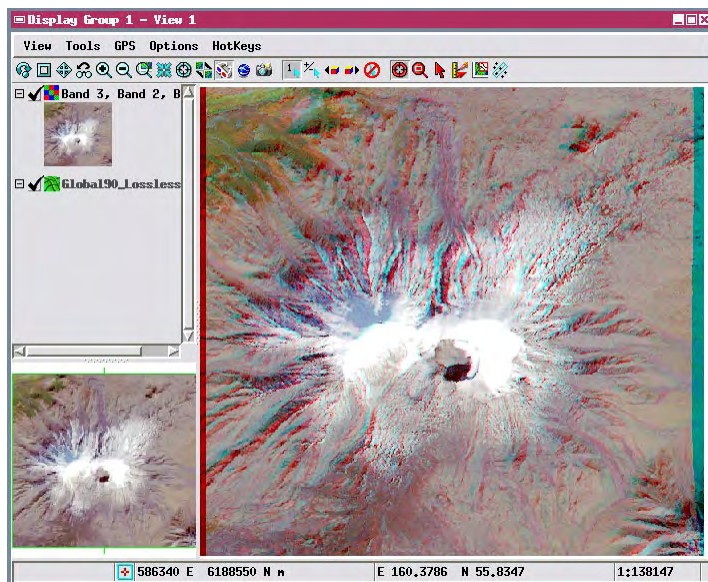
(over)

Viewing and using geospatial PDF files is free. Creating geospatial PDF files from your TNT product requires no additional software. Viewing the geospatial PDFs produced by TNT 2008:74 requires Adobe Acrobat 9.0 or later.

- Render from complex TNT map layouts
- Handle complex geologic maps, image maps, or simply the rasters in current view
- Maintain individual layers in PDF
- Render only area in view or area matching extents of all layers
- Choose to link to system fonts, embed fonts, or render text
- Automatically launch result in your (default) Acrobat viewer (i.e., Adobe Reader, Adobe Acrobat, Adobe Acrobat Professional, Adobe Acrobat Pro Extended)

Render Anaglyph Stereo to Raster

The TNTmips Spatial Display process allows you to view any image in stereo using an elevation raster and to print large map layouts and posters that include stereo anaglyph images. When the View is in anaglyph stereo mode, you can also use the Render to Raster procedure to render the view to a high-resolution raster for printing a large anaglyph stereo image map or poster.

- Render to TNT raster object for use in the TNT products
- Render to GeoJP2, GeoTIFF, JPEG, or PNG for use in printed reports, Powerpoint, ,,,
- Separate controls for stereo rendering to raster (need not be the same as used in View)
- Control row/column dimensions and cell size of the rendered raster

The Stereo Rendering panel on the Render to Raster window is active when the View is in stereo anaglyph mode. It provides control over stereo settings to be used in rendering the View to a stereo anaglyph raster or image file.

Watershed Geomorphology

Extensive new technical capabilities were added at your request to this 2007 process after its official release last March. As these capabilities were perfected throughout the past year they were provided to you via the weekly updates. They are described in multiple Technical Guides provided via MicroImages NEWS as post-release TNTmips 2007 features and are included here along with additional new features for TNTmips 2008.

- Many internal improvements to allow efficient watershed processing of very large DEMs (many gigagbytes in size).

- Faster and more flexible depression-filling with thresholds to restrict filling by depression area and depth (also available as separate process).

- Let depression-filling routine automatically place null cell (drain) at low point of unfilled depressions to model their internal drainage.

- Compute geomorphic characteristics of DEM: specific catchment area, Compound Topographic Index (wetness), downstream and maximum upstream flow distances.

- Compute hydrologic attributes for stream segments: average slope, sinuosity, upstream and downstream flow distances, and many others.

- Compute hydrologic attributes for catchment polygons: mean stream slope, drainage density, basin relief, and many others.

- Stream and basin hydrologic connectivity tables identify relationships between catchment polygons and their contained stream lines.

- Select seed points for watersheds and stream lines from geometric objects.

- Automatically subdivide streams into reaches (segments) based on flow accumulation or elevation, with control of segmentation interval (equal, exponential, or custom spacing).

- Stream attributes recomputed and attached to stream segments.

Flow Accum Rng:	256000
Strahler Order:	4
Average Slope:	0.214723
Sinuosity Ratio:	1.26748
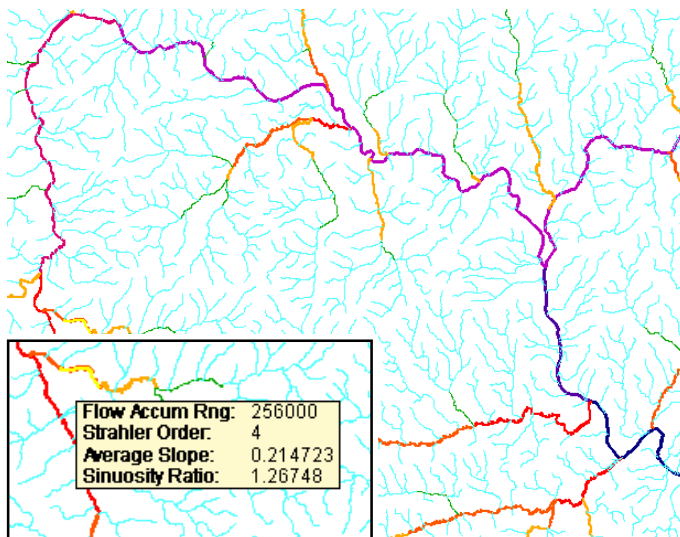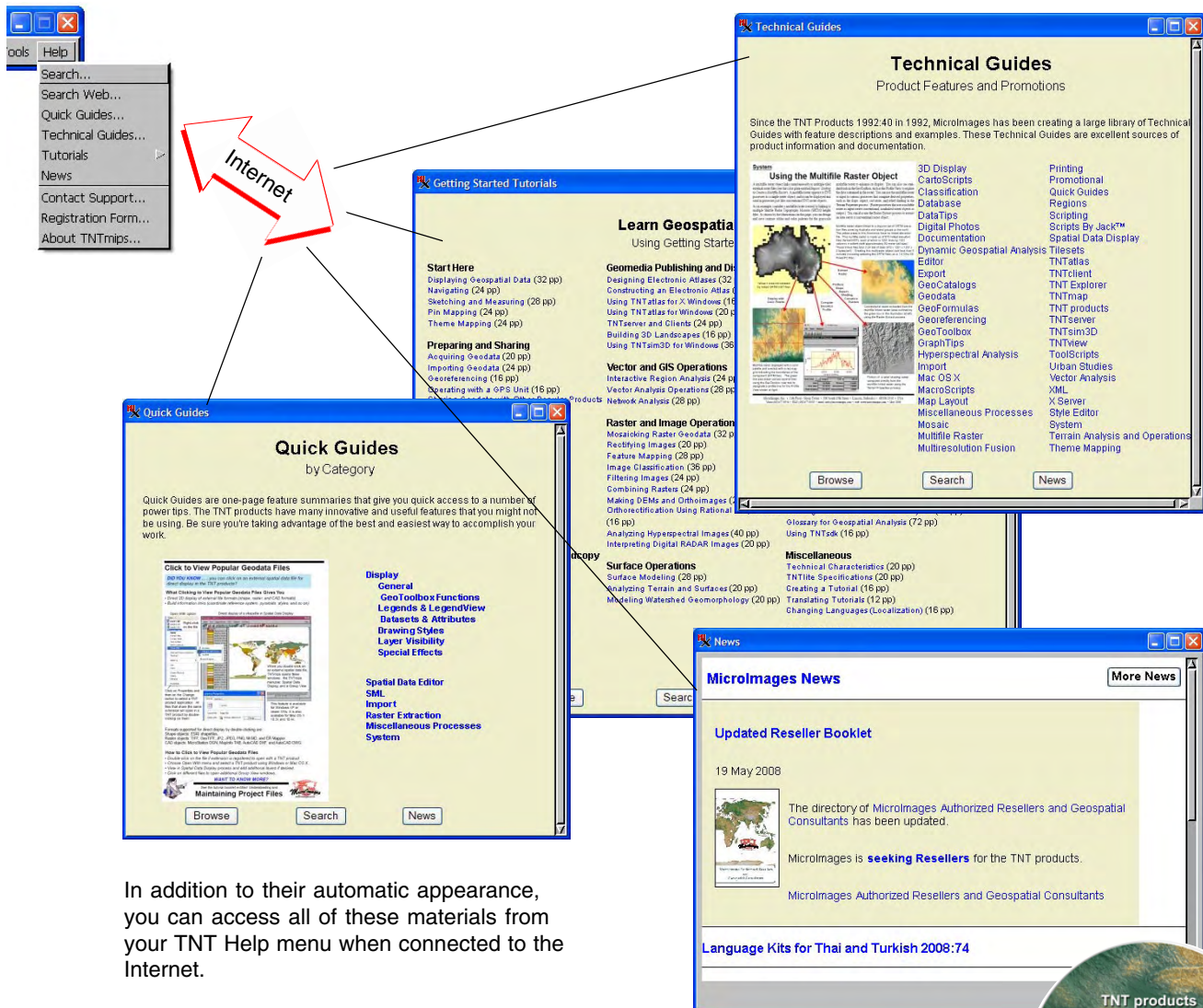
The Watershed process subdivided these stream lines based on flow accumulation ranges using an exponential interval. The line colors from cyan to dark blue identify each resulting stream reach. The boundary values between these stream reaches increase downstream by a factor of two (flow accumulation = 16000, 32000, 64000, and so on). The DataTip in the inset shows some of the stream line attributes that are also computed by the Watershed process.

Integrated Network Access to Reference Materials

Access to MicroImages' most recent reference materials is now available from microimages.com in your TNT product. This documentation access includes all the Tutorials, Technical Guides, Quick Guides, and news items. Using the built-in site search options you can directly search these materials for topics of interest. New important technical reference materials are published frequently as MicroImages news. Periodically when you start up your TNT product you are informed and provided direct access to all the news that you have not yet reviewed. TNTmips is a complex and constantly evolving product and it is important to review the new Technical Guides as they come out to be aware of all the new features available to you in the current release edition or in the new development version.

In addition to their automatic appearance, you can access all of these materials from your TNT Help menu when connected to the Internet.

Geospatial Modeling Language (SML)

Several MicroImages clients are currently carrying out major analysis projects that use a combination of interactive and batch SML scripts with geodata preparation by TNTmips and access via TNTserver. Since their activities and the SML scripts they write are proprietary, the scripts cannot be documented here in detail. These SML-based projects include, among others:

- a major U.S. company's large-scale, multistate, near real-time monitoring of agricultural crop conditions for the spatial management of its service fleet and other assets;
- large-scale, near real-time truck fleet management systems in the Asia-Pacific region;
- commercial-scale production image analysis for product creation and sales in Europe.

In order to optimally achieve their goals, these SML development projects required access to new 2008 product features and alterations (e.g. pipeline processing, improved display speed, in-line filtering, interactive functionality, ...). It is MicroImages' custom to expand SML and support script development efforts in the TNTmips release version (e.g. in 2007:73) as long and as much as possible via weekly updates. However, some requested new features can only be implemented in the development version (e.g. in 2008:74) because these new features depend on or require low-level changes in internal TNTmips program code. Such new features become available in the weekly update of the TNTmips development version, where you can take advantage of them in your scripts. The comprehensive SML projects noted above were implemented concurrently with the development of 2008:74. The project developers requested several new technical features in SML that were implemented by MicroImages and tested and refined in production environments.

MicroImages has tested and modified all of its sample scripts to insure their operation in version 2008:74. Some of these scripts have been modified and streamlined to use new 2008 capabilities. These include complex sample tool scripts such as the one illustrated on the reverse of this page, the interactive strike/dip script that is being used by clients in geological mapping and which has several new advanced features.

A selection of new classes were added to SML, including classes that make all of the TNTmips pipeline architecture for streamlined raster image processing available in SML. A number of Technical Guides have been prepared to document pipeline programming techniques and the new pipeline sample scripts. Several existing sample scripts were also modified to use the new pipeline classes to improve processing efficiency and to serve as additional pipeline script examples.

Other SML changes include new functions and new methods (class functions) added to some existing classes. These are features such as interface methods to access linked databases, a method to determine the element type (2D or 3D) of a geometric object, and a method to move a point a specified distance and direction. (over)

Hundreds more of these kinds of utility modifications have been added to support the creation of large production-oriented scripts. The following are some of the additions whose uses are more obvious.

- Use multiresolution image fusion.
- Apply contrast tables.
- Generate DataTips by script.
- Construct and send e-mail messages.
- Use regions in pipeline to crop and mask images.

16 Inclined

88 Overturned

Horizontal

Vertical
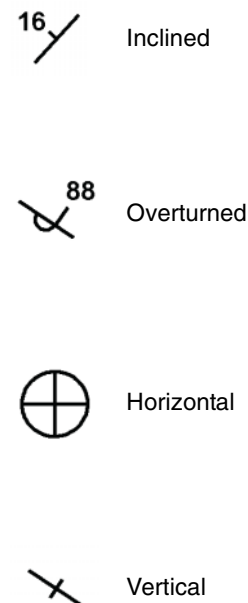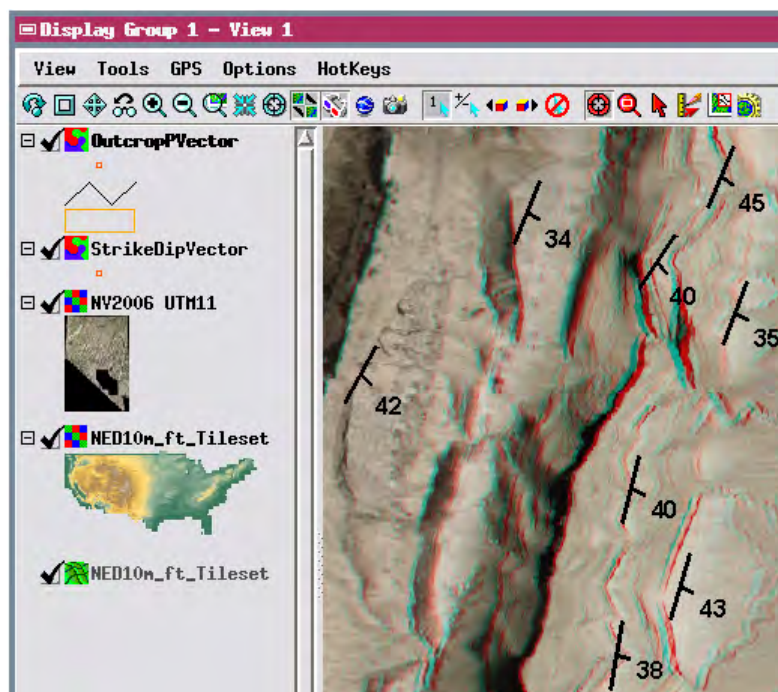
The Strike/Dip Tool Script (StrikeDipTool73.sml) provides an interactive tool to geologists to use with a digital elevation raster (DEM) and image overlay to quickly measure and record the orientation of rock layers and other geologic structures. The image and DEM used with the tool can be large TNT tilesets as in the illustration above, which shows a detail from a 1-meter natural color orthoimage mosaic covering the entire U.S. State of Nevada and uses a 10-meter DEM tileset covering the conterminous United States as the elevation reference layer. The image overlay can also be displayed in anaglyph stereo (as shown) to enhance the interpretation of terrain features. This script was improved in several ways after the initial release of 2007:73. The CartoScript used to render the strike/dip symbols (see examples in the illustration above) is now embedded in the Tool Script and saved automatically with the StrikeDip vector object produced. The DEM used can have any projected map coordinate system or geographic (latitude/longitude) coordinates, and its elevation values can be in any unit (meters, decimeters, feet, ...).