Technical Reference Manual

for the Installation, Management, and Operation of

TNTserver 2006:72 and TNTmap 2006:72

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Web Map Service (WMS)

Wikipedia defines an Open Geospatial Consortium (OGC) WMS as a service that "produces maps of spatially referenced data (geodata) dynamically from geographic information. This international standard defines a 'map' to be a portrayal of geographic information as a digital image file suitable for display on a computer screen. A map is not the data itself. WMS-produced maps are generally rendered in a pictorial format such as such PNG, GIF or JPEG, or occasionally as vector-based graphical elements in Scalable Vector Graphics (SVG) or Web Computer Graphics Metafile (WebCGM) formats. This is in contrast to a Web Feature Service (WFS), which returns actual vector data and a Web Coverage Service (WCS), which returns actual raster data."

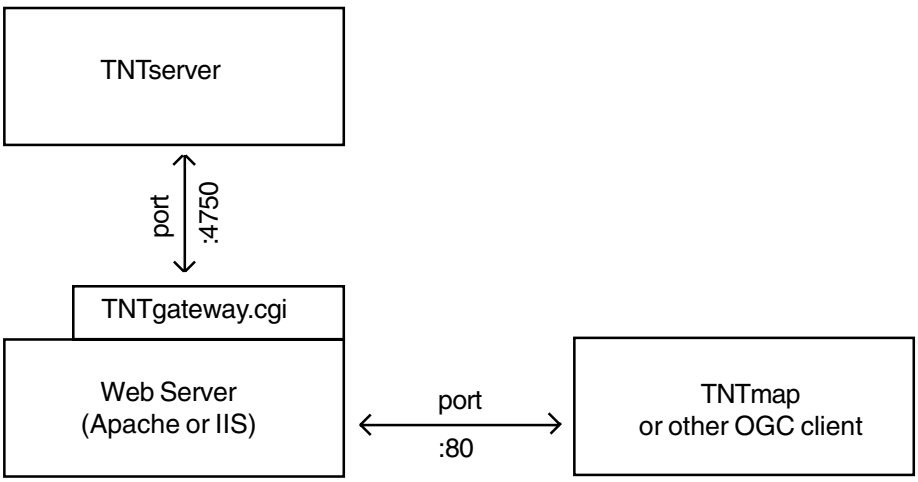
It is important to understand that this OGC standard (**ISO 19128**) defines how to provide views of the geodata a web site is offering via a WMS. It responds only with the area, or extents, of the geodata that the viewing application, or client, requires to construct the area to be viewed. It may be in a lossy image format and is not the geodata itself.

A web site advertising that it will respond with a WMS protocol indicates that it will reply to requests sent to it using this documented protocol. The designation that a server (for example, TNTserver) implements WMS 1.1.1 or 1.3.0 protocol does not mean that it will respond to every allowable variant of a WMS request sent to it. It also does not prevent that server from automatically responding to requests in any other additional protocol it may support as an alternative to or extension of the WMS. Whether or not a server responds correctly or at all to a specific request can vary widely. The majority of server products listed as supporting WMS are in a category on the OGC site (see www.opengeospatial.org/resource/products) designated as "Implementing Products, that is, software products that implement OpenGIS specifications but have not yet passed a compliance test." Thus a close inspection of this OGC listing of server products reveals that at present, only about 20% of the server products are certified by OGC as WMS 1.1.1 "Compliant Products, that is, software products that comply to OGC's OpenGIS® Specifications." TNTserver passes this OGC CITE (Compliance & Interoperability Testing and Evaluation) Compliance Testing Initiative test suite using the OGC CITE Engine when tested from web sites hosting TNTservers and has been submitted to OGC for their testing. At this time OGC does not provide a compliance test for WMS 1.3.0. It is also important to understand that a server's implementation of WMS 1.1.1 may also be restricted to responding to requests in that protocol.

How a Web Map Service Works

A WMS uses a web server (Apache or IIS) and a Common Gateway Interface (CGI) program to communicate between a WMS-compliant client and server. The client makes requests and receives images and other information. The server responds to requests by providing images and information. There are three types of WMS requests a client can make: GetCapabilities, GetMap, and GetFeatureInfo.

Like any other web-browsing experience, it may be that the site you are requesting a response from is not currently operational and you have no way of knowing until your web browser times out. In TNTmap Builder you receive a message



if a site cannot be contacted, but connecting to the site does not insure that you will receive a response to a request for a map view. Additionally, a site may be operational but not all of its advertised layers are available. WMS clients, like your browser, have no way of determining when a request will be answered or if it will ever be answered. In TNTmap Viewer, all layers are initially listed in red in the legend. This listing turns to black when the image for that layer is received.

GetCapabilities (mandatory feature). A GetCapabilities request queries a server for the types of maps it can deliver. Depending on the number of layers available from a site, this can be a great deal of information because in addition to general information about the server, which includes contact information, the Coordinate Reference Systems (CRSs) supported by the server, available image formats, and information about every available layer that includes its web location, CRS, extents, visible scale if using map-scale controlled visibility, and other information. The response may or may not include the full capabilities of the server. For example, sites that provide support for all the European Petroleum Survey Group's (EPSG) CRSs may only advertise the most popular subset to allow for quicker response times. Thus, there is an option on the Image panel of TNTserver Manager that toggles between sending the full CRS report and sending a minimized report. The complete list approximately triples the size of the file created in response to a client's GetCapabilities request (for example, 35 KB to 103 KB), which may result in significant delays on slower web connections if the full report is sent. If the response received does not appear to be a WMS capabilities document and/or if no layers are found, the server or context will be listed in red on the Services panel of TNTmap Builder.

GetMap (mandatory feature). A GetMap request asks a server to respond with the specified layers and with the requested geographic extents and CRS required by the viewer. Since multiple servers may be involved in this request, the result may be hit and miss. If TNTmap Viewer does not receive a requested layer, the layer name is shown in red in the legend. If you right-click on a layer shown in red, you can choose to view the error. The same right mouse button menu choice (View Layer / Error) will display only that layer in a separate window if the layer is successfully acquired. Layers can be set by the atlas designer to only display above or below a specified map scale or within a specified scale range. Map scale control is generally set for layers whose resolution or level of detail make them unsuitable for viewing outside the specified range. For example, you may want to replace a lower resolution image with a higher resolution image of the same area as the viewer zooms in. Very complicated vector layers may not appear until you have zoomed in far enough for the viewer to resolve separate elements. Layers that are not currently drawn because of these map scale controls deliberately designed into the layer are shown in green in the legend in TNTmap Viewer.

GetFeatureInfo (optional feature). A GetFeatureInfo request queries a server for information about the content of a map at the location you click. This type of request is made when using the InfoTip tool in TNTmap Viewer and TNTmap's implementation of Google Maps. The information returned by TNTserver is the information set up to appear as a DataTip for that location in the TNT products. This request type is not mandatory for a WMS.

TNTserver

TNTserver is a geodata server designed to provide Internet or intranet access to any object or layout in any Project File or any pre-defined atlases by any remote client compliant with the operations defined in the OGC's specifications for a WMS. Using these ISO 19128 standard WMS operations, TNTserver renders composite views of massive collections of raster, vector, shape, CAD, TIN, and relational database materials in any or all of the following formats: JPEG, JPEG2000, SVG, PNG Palette (8-bit Indexed), PNG True Color (32-bit RGBA), PNG Palette - Interlaced (8-bit Indexed), PNG True Color - Interlaced (32-bit RGBA), and KML (Google Earth). The administrator of a TNTserver uses the TNTserver Manager program to decide which formats to make available and the client request determines which format is delivered among those available. TNTserver runs on Windows 2000, Windows XP, and Windows Server 2003 platforms. The geodata accessed by a TNTserver can be on a fileserver available from a local network. Thus, it can reside on any platform (Windows, Mac OS X, Linux, and/or Solaris). The geodata on your fileserver does not need to be in MicroImages' RVC format; it can be in any format supported for direct display by the TNT products (for example, JPEG2000, MrSID, shapefile, and DXF).

TNTserver is a service and requires a web server for operation, such as Apache HTTP Server (recommended) or Windows IIS (Internet Information Services). If you are running Windows XP Pro, Windows 2000 Pro, or TNTserver 2003,

you already have IIS (Internet Information Services) on your machine. The Apache HTTP Server is a free download from www.apache.org or the MicroImages web page listed in the next section. It is important to have your web server running prior to installing TNTserver so that virtual directories can be automatically identified and TNTserver can be automatically started at the end of installation. Apache is the recommended web server because

- Apache runs with Windows Home Edition of Windows XP and 2000,
- Apache supports 250 simultaneous clients (IIS supports 10 for XP Pro), and
- atlas-viewing digest restrictions and authentication can be set up and managed directly in TNTserver Manager for Apache (managed by Windows for IIS).

Installation and Configuration

The most current, official-release of TNTserver can be downloaded from http://www.microimages.com/product/tntserver.htm. You can also download a version of the Apache HTTP Server that has been tested with this version of TNTserver from this page. Please make sure this version of Apache or IIS is running before you install TNTserver. The location of virtual directories for Apache or IIS is established during their installation and is detected and used to automatically configure TNTserver to use them. If you are going to make user-selected viewing in Google Earth, Google Maps, World Wind, and/or TNTmap Open available for use by others from TNTmap Builder on your site, you need to also install Perl script, which is also available for free download (http://activestate.com/store/productdetail.aspx?prdGuid=81fbce82-6bd5-49bc-a915-08d58c2648ca).

Installation of TNTserver uses the familiar InstallShield Wizard to guide you through the simple installation steps, which include acceptance of the license agreement; user name, organization, and usage restrictions (just you or anyone using your computer); and setup type. When installation of TNTserver is complete, TNTserver Manager guides you through the necessary configuration steps. If you have not installed a professional version of one of the TNT products on the computer where you are installing TNTserver, which is not required and not recommended because your TNTserver machine should be dedicated to that purpose so its operation is not compromised or slowed by other running software, the first configuration step is to identify the type of software authorization key you have so the correct key driver can be installed. You are then asked to identify the network type (Inernet, Internet by Proxy, or Intranet) and network name before the license is acquired, which occurs at the next step. After the license is acquired, you are prompted for the required information for TNTserver. You are not prompted for this information if you are updating a previous installation of TNTserver. If you need to make changes to or simply want to check the required information from your previous installation, it can be viewed on the Contact and Title tabbed panels in TNTserver Manager.

When the configuration steps are complete, TNTserver Manager opens and pauses on the Control tabbed panel until TNTserver automatically starts (if your web server is running). TNTserver Manager then automatically switches to the Web tabbed panel so you can view the status of the TNTgateway cgi (Common Gateway Interface) access point that has also been installed. A green ball precedes the tntgateway entry when the status is good and your TNTserver is running. This indicator ball can also be yellow (cautionary) or red (inoperative). A common cause for cautionary status (yellow) is the presence of a newer version of TNTmap on your machine than the one that was installed with TNTserver. A newer TNTmap, however, is not a cause for cautionary status immediately after installation because the installation and configuration process checks for a newer TNTmap on your system and updates the version installed if necessary. The most likely cause for a red indicator ball at this point is that your web server (Apache or IIS) is not running. If you have a yellow or red indicator ball, click on the + to expand the listing for the cgi access point and read the status line. If your status is green, or good, TNTmap Builder will automatically launch at this point to verify your server is working.

For more information see the attached color plate entitled

TNTserver 2006:72: Installation, which provides details for both new and update installations, and

TNTserver 2006:72: Configuration and Network Type, which describes the network type choices for TNTserver installation and the network name choices.

TNTserver can be run in a FREE test mode using either a TNTserver software authorization key designated for test mode or any TNTmips, TNTedit, or TNTview key. The purpose of the test mode is to provide every MicroImages client the

opportunity to experiment with the latest version of TNTserver and to permit those with professional versions of TNTserver to try the latest patches without disrupting a working, published site that is using the key purchased for the operation of the professional version of TNTserver.

For more information on running in test mode, see the attached color plate entitled

TNTserver 2006:72: Using in Test Mode, which describes and illustrates the utility of test mode.

Management

The TNTserver Manager is a graphic interface that lets the system administrator modify configuration settings necessary for TNTserver operation after TNTserver is installed. Additional features, such as automatic work directory cleanup and the list of layouts to cache automatically are also set here. These settings are presented on ten tabbed panels in the TNTserver Manager window. Note that this window also provides the serial number for the authorization key for TNTserver in the title bar.

Complete information on the features and use of TNTserver Manager can be found in the attached 8-page document with sections corresponding to each tabbed panel and an additional color plate entitled *TNTserver 2006:72:*

Configuration, which provides general information about TNTserver, TNTsever Manager, and TNTmap;

Managing General Controls, which describes the functions of the Control tabbed panel including starting and stopping TNTserver;

Managing Image Properties, which describes the functions of the Image tabbed panel including which image types to offer and maximum image size to be sent;,

Managing Logging, which describes the functions of the Log tabbed panel including where to save system and status logs and provides the ability to view them;

Managing Site Logo, which describes the functions of the Logo tabbed panel including the file to use and where to place it;

Managing Layers, which describes the functions of the Layer tabbed panel. This panel provides for management of all layers/atlases advertised by a TNTserver including adding, deleting, reordering, and the level of detail to provide about atlas layers;

Managing Web Access, which describes the functions of the Web tabbed panel including the ability to add and edit common gateway interface (CGI) access points and restrict access to atlases;

Managing Administrator Contact, which describes the functions of the Contact panel;

Adding and Editing CGI processes, which describes the details of adding and editing CGI processes from the corresponding buttons on the Web tabbed panel;

Managing ID Titling, which describes the functions of the Title tabbed panel including the title and abstract to be advertised for this TNTserver and the ability to add keywords;

Managing Directories, which describes the functions of the Directory tabbed panel to manage the Directory Lock List and the Drive Mount List;

Managing System Parameters, which describes the functions of the System tabbed panel including queue size and threads, connection parameters, choice of language for the TNTserver Manager interface, and saving and loading TNTserver parameters*;*

Publishing Layers, Groups, or Layouts, which describes and illustrates the effects of the *Show groups only* and *Show layout only* options on the Layers tabbed panel.

TNTmap

TNTmap is a FREE WMS-compliant browser with two parts: TNTmap Builder and TNTmap Viewer. TNTmap is available for use and modification by anyone. TNTmap Builder lets you choose layers from any WMS site for display in TNTmap Viewer, TNTmap Open, the extended Google Maps launched by TNTmap, Google Earth, or World Wind.

TNTmap is automatically installed with a TNTserver but can also be acquired and updated separately and used without cost. TNTmap is available to run as a web application or can be downloaded and installed. TNTmap 2006:72 is significantly different than the TNTmap that was initially released with the 2005:71 TNT products.

TNTmap Viewer

TNTmap Viewer is launched when you select an atlas for viewing from MicroImages' web site (www.microimages.com/tntmap) or can be chosen as the viewer from TNTmap Builder for the WMS layers you have selected. TNTmap Viewer runs in an Internet browser including Internet Explorer, Safari, Firefox, and Mozilla. TNTmap Viewer provides tools so you can zoom, navigate, measure, and acquire other information about the layers in the atlas selected. You can also open your current view as an overlay in Google Earth. Using the companion TNTmap Builder, opened via an icon in the TNTmap Viewer window, you can also acquire and add image and map content from any other web site providing a Web Map Service.

For additional information and details, see the attached color plate entitled

TNTmap Viewer 2006:72: Viewing WMS Layers, which provides general information and labels the TNTmap Viewer window components with short descriptions.

TNTmap Builder

TNTmap Builder is a free means of browsing and selecting WMS layers to be viewed in the extended Google Maps launched by TNTmap, Google Earth, World Wind (this application is not available for Mac OS X), TNTmap Open, or TNTmap Viewer. TNTmap Builder can be used on Windows or Mac OS X computers. It can be run as a web application or downloaded and installed. In either case, once acquired, TNTmap Builder can be used independently of any contact with MicroImages' web site or any other MicroImages professional product.

For more information on TNTmap Builder, see the attached color plate entitled

TNTmap Builder 2006:72: Choose WMS Layers for Use in Popular Viewers, which provides a general introduction to TNTmap Builder.

Ways to Run

There are four ways to run TNTmap Builder.

Installed Windows application. This program lets you browse the layers advertised by any WMS-compliant site; select layers for viewing; initiate display of those layers in Google Maps, Google Earth, World Wind, TNTmap Open, or TNTmap Viewer; and build up a list of favorites;

Installed Macintosh Widget. This widget runs on your Dashboard to let you browse the layers advertised by any WMS-compliant site; select layers for viewing; initiate display of those layers in Google Maps, Google Earth, TNTmap Open, or TNTmap Viewer; and build up a list of favorites;

Web application for Windows. This web application can be run from microimages.com or any other web site that has it posted to let you browse the layers advertised by any WMS-compliant site; select layers for viewing; initiate display of those layers in Google Maps, Google Earth, World Wind, TNTmap Open, or TNTmap Viewer; and it leaves nothing behind on your drive/system; and

Web application for Mac OS X. This web application can be run from microimages.com/tntmap or any other web site that has it posted to let you browse the layers advertised by any WMS-compliant site; select layers for viewing; initiate display of those layers in Google Maps, Google Earth, TNTmap Open, or TNTmap Viewer; and it leaves nothing behind on your drive/system.

The difference in appearance of these four versions of TNTmap Builder is subtle, and most features are shared by all versions. One difference is that by design you can save to a personal favorites list that appears in TNTmap Builder on the Favorites panel in the installed versions but not when run as a web application. The web application versions deliberately do not leave anything behind on your drive/system when you exit and, hence, you cannot have a personal favorites list. However, you can save the layers currently on the Layers panel as a context file (*.kml, *.htm, *.xml, *.cml) that can later

be opened in the designated application when running by any method. Context files are discussed in a later section. A list of favorites compiled by MicroImages is provided for all four methods of running. The TNTmap Builder widget for Mac OS X cannot update an already open TNTmap Viewer widget. An already open TNTmap Viewer window can be updated with TNTmap Builder using the three other methods of running.

For more information on these aspects of TNTmap Builder, see the attached color plates entitled

TNTmap Builder 2006:72: Four Ways to Run, which details the features of and minor differences between the different ways to run TNTmap Builder and

TNTmap 2006:72: Widget Viewing of WMS Content for Mac OS X (2-sided), which describes using the installed version for Mac OS X.

Forms

TNTmap Builder has three forms for Windows and Mac OS X: the standard form, the mini form, and the quadrant form. All three forms provide the same functionality. These three different forms are provided to support different devices and user preferences. The standard form organizes its different components on tabbed panels making its size convenient for general use and fits within the new Microsoft UMPC (Ultra Mobile PC) device dimensions (800 x 480 pixels). The mini form of TNTmap Builder is being designed for small portable devices, such as larger PDA or cell phone screens. The quadrant form of TNTmap Builder is a power users' desktop version. It provides visual access to site selection, Coordinate Reference System specification, the Locator, the list of available layers from the currently selected WMS, and a view defining panel (Layers, Overview, or Favorites) all at the same time so you can make new selections for all without having to flip between tabbed panels.

For more information on these three forms see the attached color plate entitled

TNTmap Builder 2006:72: Three Forms to Fit User's Preference and Device, which illustrates these forms and provides the reasons for choosing between them.

Tabbed Panels

All three forms of TNTmap Builder have tabbed panels, but the only tabs in the quadrant form are on the view defining panel (Layers, Overview, and Favorites). The standard and mini forms of TNTmap Builder provide their features on tabbed panels to maintain a convenient size. Some of these panels are linked together to make the results of an action perfectly clear. For example, when you click on layers in the Services panel, you jump to the panel they were added to (Layers or Overview).

For additional information and illustrations, see the attached color plate entitled

TNTmap Builder 2006:72: Features Located on Tabbed Panels (2-sided), which describes the function and features of each of the tabbed panels.

Favorites Panel

The contents of the Favorites tabbed panel vary with your method of running TNTmap Builder. All versions have a list of context files compiled by MicroImages and available from MicroImages' or other web sites. In the installed versions there are two headings at the top of the list that act as tabs taking you between this MicroImages-created list and context files you have created. Switch between these lists by clicking on the heading for the list not shown. The Saved Views list, which is initially exposed when you first click on the Favorites tab, is a list of context documents that are installed with TNTmap that present the color orthophoto urban area imagery assembled by USGS that is available from the TerraServer WMS. Any favorites you save (installed versions only) using the Save to Favorites icon on the Layers panel will be added to this list. You may also acquire OGC context files from other applications and place them in the appropriate folder to show up on this list. The appropriate folder on a Windows machine is \MicroImages\TNTmap\contexts in your Program Files directory. The appropriate location for Mac OS X is the Maps folder in your home directory. This folder is for OGC context files (*.cml), which can be opened in any of the supported viewers from TNTmap Builder. If you double-click on any of the entries in this list on a Windows machine (assuming you configured TNTmap to be the default application for opening *.cml files when TNTmap was installed),

TNTmap Viewer opens showing the the selected imagery. If you single-click on an entry, you can choose the viewer by clicking on the desired viewer icon (Google Maps, Google Earth, World Wind, TNTmap Open, or TNTmap Viewer). There is further discussion of context files in the next section.

In web application versions the single list that appears is equivalent to that on the Web URLs list. In addition to a MicroImages-created list, the Web URLs list has two headings below the list: Saved Context URLs and Saved Server URLs (installed versions). URLs you enter and save are added under these headings. If you select any of the entries on the Saved Server URLs list, the information concerning WMS layers available from that server is added to the list on the Services panel. Most selections from the Saved Context URLs list will be added to the layers on the Layers panel. However, if the context file specified is a context collection file, its list of contexts will be added to the Services panel.

The Macintosh widget version lists entries on the Saved Views list under two headings: View Directory and Saved in Maps Directory. The selections on the View Directory list are saved with the widget and not available for distribution. Contexts are saved here when you use the Save to Favorites icon button on the Layers panel.

Services Panel

The Services tabbed panel provides a list of layers available from the currently selected site providing a WMS. The organization of these layers or lack thereof depends on the site. Some sites list all available layers individually. Other sites organize their layers into logical groupings. Depending on how the grouping is done, you may or may not be able to select individual layers from within the group. TNTserver Manager provides controls that allow your atlases to be published in a hierarchical organization for selection purposes and to also designate whether individual layers, groups, or only the layout as a whole can be selected for viewing. When layers are listed hierarchically, clicking at any level adds all the groups/layers under it, which means all the layers in an atlas can be added with a single click.

Initially for sites with multiple servers if an XML server list exists, the Services panel lists the map contexts and WMS compliant servers found in this XML file at the designated URL, which leads to much faster loading of site information. A GetCapabilities request for information only about the layers provided by individual servers offering a WMS or contexts is made when you click on its name or expand it in the list. This approach prevents you from waiting for the response to a GetCapabilities request for the layers provided by contexts/WMS servers you have no interest in. Legend images are not acquired from the WMS until the associated layer is exposed.

The Services panel also has icons to the right of the list that let you set various properties for images returned by the server providing the WMS, clear the list, and view the last received capabilities response.

Layers Panel

The Layers tabbed panel lists the layers you have selected from the Services panel. When TNTmap Builder is first opened, layouts/groups/layers you click on are added to the Layers panel. Layers can also be added to the Overview panel. Once the Overview panel has been visited, you need to click on the Layers tab then the Services tab to get subsequently selected layers added to the Layers panel.

The icons on the Layers panel let you set the Coordinate Reference System (CRS) and extents for the initial view to match the highlighted layer, use the current extents of the Locator for the initial view of selected layers, change image properties for individual layers, move layers up and down, delete layers, use the layer set on the panel for the Locator view, show/hide the manual extents tool, and save the layers on the panel as a local context that will appear on your personal favorites list (installed versions only).

Overview Panel

The Overview tabbed panel initially lists the layers designated to provide the Locator image for the server shown in the DataTip when the mouse is paused over the Locator. To add layers to the Overview panel, click on the Overview tab, then on the Services tab and select your layers. Layers are added to the panel (Layers or Overview) that was last visited before the layers were selected. If neither panel has been visited, layers are added to the Layers panel.

The icons to the right of the Overview list let you load the default overview, match the Layers panel layers, change properties for individual layers, move layers up and down, delete layers, and use the layer set on the Overview panel for the Locator.

Help Panel

The Help tabbed panel is divided into three sections: Information About, Help About, and Contact MicroImages. The Information About section has links to general introductory pages on MicroImages web site. The Help About section of the Help tabbed panel supplies links to a number of differnent, specific help documents and technical reference plates, all of which are included in this Technical Reference Manual. If you are running an installed version, there are also two icon buttons that let you determine which version of TNTmap Builder you are running and to check to see if a newer version is available. The Contact MicroImages section lets you choose between Client Support and Marketing and Business, which are links to pages on MicroImages web site with relevant information.

Saving and Using Contexts

An OGC context is a list of layers and where they can be found that is saved for future viewing. A context may also include scale and position. Strictly speaking, an OGC context file has a .cml extension and does not specify a viewer. The context files created by TNTmap Builder and TNTmap Viewer (Mac widget version only) do specify a viewer and have an extension consistent with what that viewer expects (*.htm for TNTmap's Google Maps, .kml for Google Earth, *.xml for World Wind, *.htm for TNTmap Open, and *.htm and *.cml for TNTmap Viewer).

During installation of TNTmap on a PC, you are asked if you want to register TNTmap Viewer to open OGC Web Map Context documents. If you okayed this behavior, double-clicking on a *.cml file will launch the context described by the file in TNTmap Viewer. If you double-click on a *.cml file on a Mac, you are asked to choose a default application for opening it. However, widgets are not general-purpose applications, and, thus, cannot be selected. On a Mac you need to open the desired viewer then open the *.cml file or you can open TNTmap Builder and select the context file from your favorites then choose whether to open it in Google Earth, Google Maps, TNTmap Open or TNTmap Viewer. Double-clicking on a *.kml file will launch Google Earth with the layers described on both Windows and Mac OS X platforms. It is unlikely that you would want double-clicking on all XML files to open World Wind. You can open these files in World Wind using TNTmap Builder or you can add NASA World Wind to the Open With choices for XML files.

You can save a context file from TNTmap Builder that references layers with global extents that opens zoomed to a particular location if you zoom to that location in the Locator before you save the context. You can also save a context file zoomed to the extents of the current view in the Mac OS X TNTmap Viewer widget using the Save As icon in the lower left corner of the Viewer.

For more information see the attached color plate entitled

TNTmap 2006:72: Saving and Using Contexts, which discusses saving WMS layers selected with TNTmap Builder for future viewing and continued use in Google Earth, Google Maps, World Wind, TNTmap Open, or TNTmap Viewer.

Google Earth

You can choose to launch the layers currently selected on the Layers panel in Google Earth or to save these layers as a context file, in this case *.kml, for future use in Google Earth. You must have Google Earth installed for either of these options to work. When Google Earth opens from a context file, it automatically zooms to that location with the contents specified as Temporary Layers.

For more information see the attached color plate entitled

TNTmap 2006:72: Use Google Earth to View WMS Layers (2-sided), which discusses using layers selected with TNTmap Builder in Google Earth and the settings for saving a context file for Google Earth.

Google Maps

You can choose to launch the layers currently selected on the Layers panel in Google Maps or to save these layers as a context file, in this case *.htm, for future use in Google Maps. When you launch into Google Maps using the icon in TNTmap Builder, you are using the Google Maps API together with extensions provided by the TNTmap web application or executable version. The extended Google Maps that launches from TNTmap Builder is automatically installed with TNTmap or, if running the web application, is run from MicroImages' web site.

For more information see the attached color plate entitled

TNTmap 2006:72: Use Google Maps to View WMS Layers (2-sided), which discusses using WMS layers selected with TNTmap Builder in the extended Google Maps that launches from TNTmap Builder and the settings for saving a context file for Google Maps.

World Wind

You can choose to launch the layers currently selected on the Layers panel in World Wind or to save these layers as a context file, in this case *.xml, for future use in World Wind. The World Wind application is not available from its developers for Mac OS X. The only version of TNTmap that can directly launch into World Wind is the installed Windows version. When running the web application version, a *.xml file is saved to your default browser location. This file needs to be moved to the NASA/World Wind/Config/Earth folder for the layer set to be available the next time you launch World Wind. If World Wind is already running, you will have to close and reopen it.

For more information see the attached color plate entitled

TNTmap 2006:72: Use World Wind to View WMS Layers (2-sided), which discusses using WMS layers selected with TNTmap Builder in World Wind and the settings for saving a context file for World Wind.

TNTmap Open

You can choose to launch the layers currently selected on the Layers panel in TNTmap Open or to save these layers as a context file, in this case *.htm, for future use in TNTmap Open. When you launch into TNTmap Open using the icon in TNTmap Builder, you are using the Open Layers API together with extensions provided by the TNTmap web application or executable version. TNTmap Open is automatically installed with TNTmap or, if running the web application, is run from MicroImages' web site. If using Windows Explorer with a saved html context, there are additional features available on the right mouse button menu that let you add the context to your Windows Explorer favorites list and create a shortcut or copy the URL for the context, which can be pasted where desired.

For more information see the attached color plate entitled

TNTmap 2006:72: Use TNTmap Open to View WMS Layers (2-sided), which provides a general introduction to the features of TNTmap Open.

TNTmap Viewer

You can choose to launch the layers currently selected on the Layers panel in TNTmap Viewer or to save these layers as a context file, in this case *.cml or *.htm, for future use in TNTmap Viewer. The *.cml context files can be used by other WMS-compliant viewers and, if you have installed TNTmap and left the Register to open OGC Web Map Context Documents (.cml) option checked, you can double click on a saved *.cml context file and launch it in TNTmap Viewer. When saved as dynamic html, double-clicking opens a page in your browser, which can be modified if desired. If using Windows Explorer with a saved html context, there are additional features available on the right mouse button menu that let you add the context to your Windows Explorer favorites list and create a shortcut or copy the URL for the context, which can be pasted where desired.

For more information see the attached color plate entitled

TNTmap 2006:72: Use TNTmap Viewer to View WMS Layers (2-sided), which provides a general introduction to the features of TNTmap Viewer and

TNTmap Viewer 2006:72 Help (5 pages), which details all functions and features of TNTmap Viewer.

Other WMS Viewers

Some spatially-oriented viewing and analysis applications support using geodata layers requested from web sites offering access to view it via an OGC WMS. These applications can directly exploit the use of geodata via the WMS of a TNTserver without using TNTmap. You can use any WMS-compliant viewer or analysis application you have access to. Some applications must be downloaded and installed while others run only as web applications from their provider's web site. TNTmap Viewer can run either way. When using other WMS-compliant client applications, you may or may not see the hierarchical atlas structure of layers presented for selection in TNTmap Builder because they do not support this component of the WMS specification.

A table is attached describing MicroImages' testing of a selection of viewers' ability to retrive a simple WMS layer from web sites using a TNTserver and from other web sites using other implementations of a WMS. Your experience with these viewer's may be different for several reasons, which include changes in the viewer since the date of this report or MicroImages' lack of understanding of how to use them with a WMS.

For more information see the attached color plates entitled

TNTserver 2006:72: Comparison of Web Map Service (WMS) Viewers, which compares the results of using each viewer to retrieve a simple, single image layer from various WMSs and

TNTserver 2006:72: URLs for Web Map Services (WMSs) and Viewers, which provides the URLs for some WMSs, web and desktop WMS viewing applicationss, and more information about the products cited.

Detailed information about each of these other viewing applications listed in the table is summarized in a collection of color plates that is attached at the end of this Technical Reference Manual and can be viewed at www.micoimages.com/product/tntserver.htm. You can check this web address periodically to see if any new viewers have been described. Each plate summarizes the application's technical details and reviews how to use it to view three WMS layers (two vector overlays and a base) raster from a TNTserver.

Additional Documentation

Complete documentation for all features of TNTmap Viewer and TNTmap Builder is available

TNTmap Viewer 2006:72 Help (five pages), which describes all of the buttons and fields in TNTmap Viewer and

TNTmap Builder 2006:72 Help (nine pages), which details all the functions and features of TNTmap Builder.

These documents are included as part of this Technical Reference Manual.

Frequently Asked Questions

TNTserver

Why is the status indicator (ball icon) on TNTserver Manager's Web panel yellow?

Yellow indicates TNTserver is running with cautionary status or that TNTserver is stopped. A common cause for cautionary status is the presence of a newer version of TNTmap on your machine than the one that was installed with TNTserver. If TNTserver is not running, the status will be cautionary (yellow) only if it could be started using the control panel. If TNTserver is not running for any other reason, the staus indicator will be red.

Other reasons for cautionary status are:

- the web web page pointed to by the cgi that shows a yellow indicator ball requires a user name and password, which can be provided by clicking on the Validate button on the Web panel, and
- the cgi uses Digest authentication protocol and the cgi page and publish page specify different realms.

Why is the status indicator on TNTserver Manager's Web panel red when TNTserver installation is completed?

Red indicates that TNTserver cannot run. The most likely cause for a red status indicator when installation is completed is that your web server (Apache or IIS) is not running.

Other reasons that TNTserver cannot run are:

- the cgi or publish physical path is invalid,

- the cgi or publish physical path is read only,
- an unknown web server platform is detected,
- no cgi is installed,
- the cgi or publish virtual path is invalid,
- cgi or publish errors not covered by the other causes in this list and most likely not previously encountered, and
- incorrect cgi setup (for example, the cgi refuses to run because of a missing dll).

What is a virtual directory and how do I select one?

A virtual directory is a location in web space that refers to a physical directory where files are put that TNTserver uses for a specific CGI. The TNTmap that is installed with TNTserver is in this directory along with document type definition files and miscellaneous files generated in response to a GetMap request. TNTserver Manager creates both a physical and virtual directory in the correct locations when a new CGI is added (Web tabbed panel). It is recommended that you accept the default locations for these directories automatically generated by TNTserver Manager.

Why do I and others get the error (%1 is not a valid Win32 application) when attempting to launch Google Maps from TNTmap Builder on my published TNTmap web site?

You (the TNTmap web site publisher) need to obtain a FREE Google Maps key code (in other words, a Google Maps authorization and identity code) and include it anywhere in the ini.js file for TNTmap in the Publish directory for TNTserver. This line should read

googlemapkey="key_code";

where key_code is replaced by the key code you obtained from Google Maps, which is case sensitive and enclosed in quotes followed by a semicolon.

I don't want to serve the default overview Blue Marble group. How can I remove it from the layers being advertised?

Change the name of global.atl to global.hideatl in the C:\Program Files\MicroImages\TNTserver_72\data directory. If you are not offering TNTmap from your site, you can delete the global.atl file along with Global.rvc, VisibleEarth.rvc, and bnd.rvc. Deleting these files rather than renaming the atl file will cause problems if you decide to provide TNTmap from your site.

Why does TNTserver Manager allow setting up restricted access web pages for Apache but not for IIS?

For Apache, setting up users to login to specific web pages is easy and local. TNTserver Manager creates and manages the files that Apache uses for authentication for either Basic or Digest protocols. IIS depends on the users being actual users on the system that IIS is running on or on a DC (Domain Controller). Plus the files to be accessed must have their ACL (Access Control Lists) changed to deny access to the "anonymous" IIS account. Those issues are for the Basic authentication protocol. For the Digest protocol, you are required to have a DC available (NOTE: the actual protocol requires no such thing, it is how Microsoft® set up IIS to support it).

Can I set up TNTserver's web pages in a method different than TNTserver Manager wants to set the web pages up?

Yes. You will need to configure Apache or IIS to publish the web pages in the way you would like them. Remember that TNTserver 2006:72 would like separate CGI and publish web pages. Before starting TNTserver Manager to set up the web pages, copy the files from the /TNTgateway/WIN_32 directory where TNTserver is installed into the directories that you have set up in Apache or IIS as CGI pages. Change the name of the tntgateway.cgi file to another name "anyname.cgi" so that TNTserver can distinguish between them. You may now start TNTserver Manager and add CGI items through its wizard. In the specific wizard panels, enter the name of the CGI and the physical and virtual directories that you have already set up.

How do I use data from a network drive with TNTserver?

TNTserver defaults to running as localsys, which cannot access network resources. You need to make a new user with just the privileges you want. Run TNTserver as that user and make sure the network resource allows that user. You may wish to make network drives read only as an added precaution.

TNTserver can use UNC paths directly. If you have multiple data sources in different sub-directories or if your machine changes, UNC paths can be a problem. To have TNTserver mount the UNC path to a network share, go to the Directory tabbed panel in TNTserver Manager. Press the "Add" button in the Drive Mount List section and add the network share with the drive letter it is to be mapped to. When TNTserver starts up, it will set up the network drive for itself. WARNING: pick a drive letter to mount to that is in the lastpart of the alphabet. Any USB devices that show up as a drive will override that drive letter, if the USB drive letter conflicts with the one selected, in TNTserver and TNTserver will not find its data on the network drive.

How high should I set the Layout Cache Size on the Image tabbed panel for TNTserver Manager?

The answer depends on large your layouts are in terms of number of groups and layers and the types of layers. If the layouts are simple auto-links to jpg, png or other files, the value can be set to as many layouts that you have. If the layouts are large and TNTmap Viewer takes a while to load the layout, then this value should be lower depending on how much memory TNTserver has to work with.

Why do some clients get an "Invalid Parameter Value" error when requesting layers from TNTserver?

There are two causes for this error.

1) The client supports WMS version 1.1.1 and not 1.3.0.

2) The client is requesting a view that is larger than the Maximum Dimensions settings on the Image tabbed panel.

Why are some of my atlases/layers grayed out and non selectable in TNTmap?

There are two main reasons an atlas name would be dimmed on the Services panel.

1) The atlas/layers are somehow bad. Check the TNTserver log for details. The most common cause is that not all the data was copied or something (directory or file) was renamed.

2) The XML files generated by TNTserver are corrupted. This can occassionly happen after adding or reodering layers in TNTserver or for external reasons. Fist determine that the atlas/layers are not bad because the following fix will cause TNTserver to be slow on startup. Stop TNTserver and exit TNTserver manager. Delete all XML files in the AtlasFolder directory where TNTserver is installed (C:\Program Files\MicroImages\TNTserver_72 if installed in default location). Restart TNTserver Manager and TNTserver.

How do I manage a TNTserver machine remotely?

Use Microsoft's remote desktop client, if the TNTserver is within your network. Use remote access software like logmein.com, gotomypc.com, pcanywhere, or RealVNC if you are attempting to manage a TNTserver over the Internet or behind a firewall.

Why do TNTserver and other WMSs build images to satisfy GetMap requests that the viewer no longet needs?

It is very important to understand that the WMS specification does not include a protocol that permits it to cancel a GetMap request. In simple terms the WMS protocol does not support a StopGetMap request.

A WMS will build and attempt to send back all images that have been requested by a viewer. For example, Google Maps accessed via TNTmap requests many 256 by 256 tiles for a single view including many outside the current view to support its panning feature. Each of these tiles is a separate GetMap request that must be satisfied by a WMS. It is not possible within the standard WMS protocol for this or any other viewer to communicate that a specific or all GetMap requests are no longer needed because the user of the viewer has zoomed based on partial coverage, picked another option, quit, and so on.

TNTmap

Can I add or delete features or change the look of TNTmap so that it matches the style of my web site?

TNTmap is not copyrighted, encrypted, or otherwise protected from your modification or alteration. You are welcome to change the various cascading style sheets (css) and html files associated with TNTmap, which is imple-

mented in AJAX. Most customizations you might want are fairly easy to accomplish, such as changing background colors and button graphics (although in some cases you will need to take care to retain the same graphic name as referenced in the TNTmap code). Buttons and menu items can be removed to simplify TNTmap without problems. The source code can be dowloaded from http://www.microimages.com/ogc/tntmapsetup.exe (Windows release version), http://www.microimages.com/ogc/tntmapsetupdv.exe (Windows development version), http://www.microimages.com/ogc/tntmap.dmg (Macintosh release version), and http://www.microimages.com/ogc/tntmap.dmg (Macintosh development version). The majority of the source code for the web application is the same as that for the installed version, but there are a few files that are only used in the installed version, which generally end in .hta. Some of these files have a corresponding htm version for the web application.

How is TNTmap coded?

TNTmap 2006:72 has been created using AJAX web application programming (JavaScript, HTML, XML, CSS [Cascading Style Sheets], and JSON [JavaScript Object Notation]).

Why does a WMS layer appear quite slowly in Google Maps?

Google Maps uses a specific tiling structure and tile server. Thus Google Maps must be sent many small 256 by 256 cell tiles in the global Mercator projection. The geodata requested from a WMS may not be in this projection and will need to be converted by the service. It may be in a vector, shape, or database format and need to be converted to an image. The image format used for the geodata WMS may not support fast access to the many small tiles. The WMS specification and, thus, any WMS is not optimized for serving many small tiles. So a single request for using its layers in the Google Maps viewer will require that TNTserver generate many small tiles.

Why do square and circular features appear as rectangles and and ellipses in Google Earth?

Google Earth requires layers to use Latitude/Langitude for their CRS. Circles and squares appear as ellipses and rectangles in Lat/Lon. If the layer requested is in Lat/Lon, you will get ellipses and rectangles. If the layer is in another map projection that maintains circles and squares, such as State Plane, these shapes will be maintained when it is converted to Lat/Lon. Google Maps uses the Mercator projection, which maintains the correct shapes of circles and squares.

Why doesn't the Services tabbed panel in TNTmap Builder permit deleting a single server's addition to the list?

In this version of TNTmap Builder, you can only delete all server entries and then re-add those of current interest by entering its URL or using the Add other WMSs to the list button on the Services panel.

Why doesn't the TNTmap Google Maps view in the Apple widget automatically close when I open TNTmap Builder to create a new Google Maps view with new WMS layers?

For security reasons Apple prevents widgets from communicating with each other, in other words each widget operates completely independent of any other widget. This is why widgets do not open other windows in the widget layer but rather present their options and other features by flipping over—this double presentation is all done in a single widget. MicroImages uses a trick to sequentially open the totally independent Control Panel, Google Maps, TNTmap Builder, and TNTmap Builder widgets.

How do I close the Google Maps view in the Apple widget when I open the Builder to change the WMS layers it uses?

Any single widget can be closed by holding down the Option key and moving the cursor into that widget. The widget close icon then appears for this purpose at the upper left corner of that widget only.

Why do I get a black background instead of transparency with PNG responses from some WMSs?

The service you have acquired the image from does not support transparency for PNG.

How can I determine the correct GetCapabilities syntax for web sites that claim to be WMS compliant but do not provide the syntax to access them?

Try their own WMS viewer and search for the keyword GetCapabilities in the html source for that page.

What happened to the old method of viewing TNTatlas projects that are HyperIndex linked to other layouts or files? Can I still Use this functionality?

Yes, the Navigate icon is activated if the atlas has HyperIndex links.

Sometimes I get popup error messages from WMSs instead of a list of layers advertised. Is there a way to see the actual response from the WMS?

Yes, the response to the GetCapabilities request provided by the server can be seen using the XML icon on the Services tabbed panel.

When measuring in Google Maps, I get a distance readout but do not see the lines I have drawn. Is the tool working?

Using the Google Maps API, measurement lines appear only over the base layers. If the WMS layers you add obscure the base layer, you will not see the line for which distance is reported. Turn off obscuring layers, and you will see the line on the current WMS or Google Maps base layer. Unfortunately this restriction means you cannot measure over added, high resolution WMS imagery and confirm that the measurement lines fall where you expect unless the imagery is partially transparent. You do get a marker that appears over all layers that marks the start point for your measurement, so it is possible to measure distance and return to the origin without seeing the line. To make the high-resolution WMS imagery partially transparent so you can see the line through the image overlay, highlight the layer on the Services panel in TNTmap Builder, click on the Change Layer Properties icon, and change the Opacity value.

What does my web site need to publish TNTmap?

To publish the full TNTmap web application you will need a web site with CGI access and Perl script capabilities. These capabilities allow you to publish the CGIs used to enable TNTmap Builder and the KML reflection used for Google Earth. Additionally, if you are publishing KML on your web server, you will need to have the kml mime type defined:

application/vnd.google-earth.kml+xml kml, and
application/vnd.google-earth.kmz kmz.

If you are publishing an OGC context file (*.cml) on your web server you will need to have the cml mime type defined:

application/vnd.ogc.context+xml.

Can TNTmap be on a different web server than TNTserver?

Yes, MicroImages does this currently on our web site. Some elements may work better if they are published from the same web site because access to the local TNTserver is more direct and doesn't have to travel through the tntmap.cgi.

Can I publish a view from TNTmap without publishing TNTmap Builder or the cgi for TNTmap?

Yes. A view can be published as an html file for use in either TNTmap Viewer or TNTmap's implementation of the Google Maps API. Neither of these uses requires either a CGI orTNTmap Builder. Publishing the html file makes views readily customizable on an individual basis.

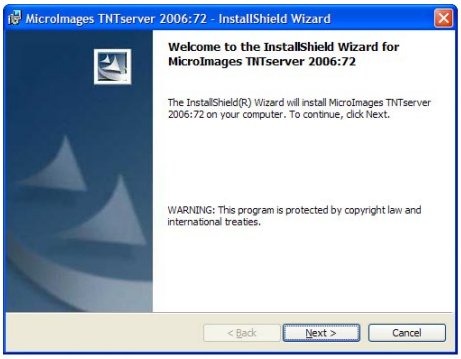
Additionally, an OGC Context Document (*.cml) and a link to TNTmap viewer can be posted, such as is posted at http://www.microimages.com/ogc/ogcclient/viewer.htm?cml=http://www.microimages.com/ogc/nebr.cml. This method has two advantages: TNTmap Viewer can be updated without having to generate a new page because the OGC context document is reusable and the CML may be usable in other WMS viewers.

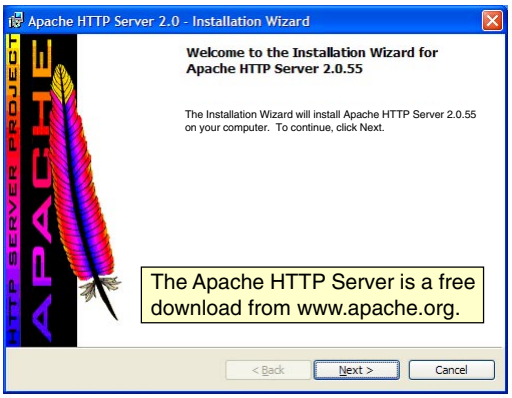
Can I publish just a Google Earth KML from TNTmap?

A KML created using TNTmap Builder includes a link to a TNTmap reflector CGI, which is a fairly simple CGI that should not add much to the bandwidth required for viewing. This reflector CGI tells the KML how to update itself so that your installed Google Earth can download the images from the web map servers.

Installation

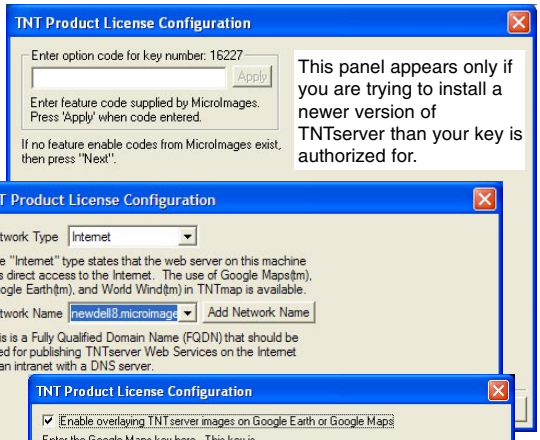
TNTserver runs on Windows 2000, Windows XP, and Windows Server 2003 platforms. The data accessed by TNTserver can reside on any supported platform (Windows, Mac, Linux, or Solaris) and may be on multiple, mixed platforms. A software authorization key is required only on the computer running TNTserver and should be connected to its USB or serial port prior to installation. The key attached during installation may be authorized for TNTserver, TNTserver in test mode, or TNTmips. If the key is a TNTmips authorization key, TNTserver will run in test mode. No TNT product is required on any other computer(s) that hosts only the TNT Project Files or files of other supported data formats.



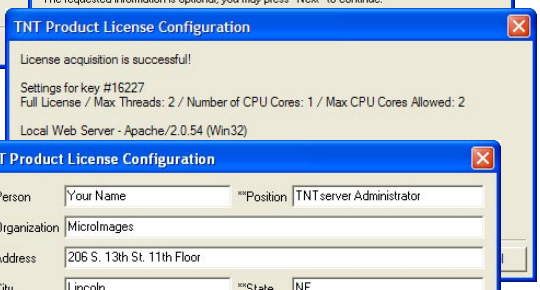


The Apache HTTP Server is a free download from www.apache.org.

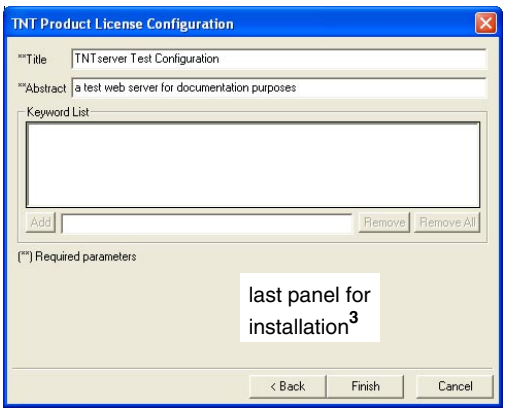
Prior to installing TNTserver, install a web server, such as Apache (recommended) or Windows IIS (Internet Information Services), and test it to insure it is running properly on the machine chosen for your TNTserver installation. The TNTserver installer can then automatically set up features for the web server (for example, the correct location and virtual location for the installed CGI file so that the TNTmap installed can automatically connect to it) while it takes you through all other steps necessary for TNTserver installation. Having Apache or IIS running is also necessary for the automatic start of TNTserver when installation is complete.



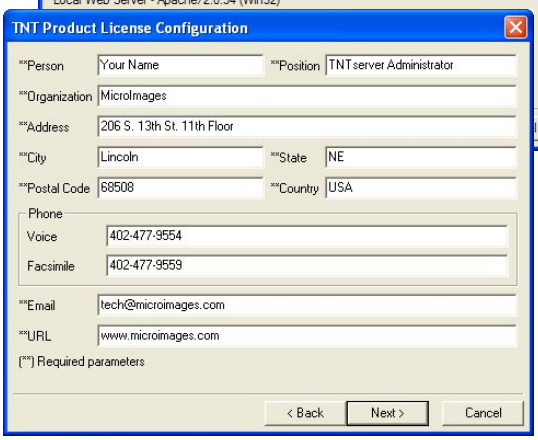
This panel appears only if you are trying to install a newer version of TNTserver than your key is authorized for.



Installation of TNTserver 2006:72 uses InstallShield and TNTserver Manager to guide you through the installation and configuration steps. After installation, a TNT Product License Configuration window opens. This window may open before you have the opportunity to click on the Finish button in InstallShield. You can finish InstallShield before or after going through the configuration steps. The first Configuration panel[1] shown at the right appears only if you are trying to install a newer TNTserver than your key is authorized for. If this panel appears, obtain and enter the feature code, then click on Next. After initial installation, you can enter feature codes on the System panel of TNTserver Manager. The next panel has you specify a Network Type and Network Name. See the color plate entitled *TNTserver 2006:72: Configuration and Network Type* for additional information on setting the network type. If the Network Type was set to Internet or Internet by Proxy, the next configuration panel lets you acquire the components necessary to launch Google Earth or Google Maps from TNTmap Builder. You will not see this panel if your Network Type was set to Intranet[2]. The next panel informs you about the success of the license acquisition, the key number, and the local web server detected (IIS or Apache) and its version. If a web server



last panel for installation[3]



is not detected, a button appears on this panel that links to the Apache download. If a license was not successfully acquired (because the key is not attached or is damaged), you will get the error message generated when trying to acquire the license and be instructed to resolve the key problem. After a license is detected, the next panel[3] requires you to enter information that identifies the system administrator and is required by the Open Geospatial Consortium (OGC) for compliance with their Web Map Service GetCapabilities operation. Required fields are marked with **. The only fields not required are the position of the contact person and phone contact information. All required fields must be filled out before the Next button becomes active. The next panel[3] also has you enter required information. The title is the name OGC uses to identify your TNTserver. This name appears at the top of the Layers list in TNTmap Builder. Individual atlas names are set separately when the atlas is added using TNTserver Manager. The abstract is your description of your TNTserver. Each is limited to 512 characters. All of the information on both of these panels can be changed later using the TNTserver Manager's Contact and Title panels. Once these are entered, click on Finish and TNTserver Manager will launch and start TNTserver after connecting to Apache or IIS. TNTserver Manager then flips to the Web tabbed panel so you can see the status of TNTserver. If TNTserver is running, then TNTmap, which is included in this installation, should also start at this point. If there is some configuration problem, TNTmap will not start. See the eight pages on TNTserver Manager for information on its operation.

[1] If you have not previously installed TNTserver or another TNT professional product on the machine you are currently installing TNTserver on and you do not have the driver for your key, the first configuration panel (see below) will ask what kind of key you have so the correct driver can be installed as part of the configuration process.

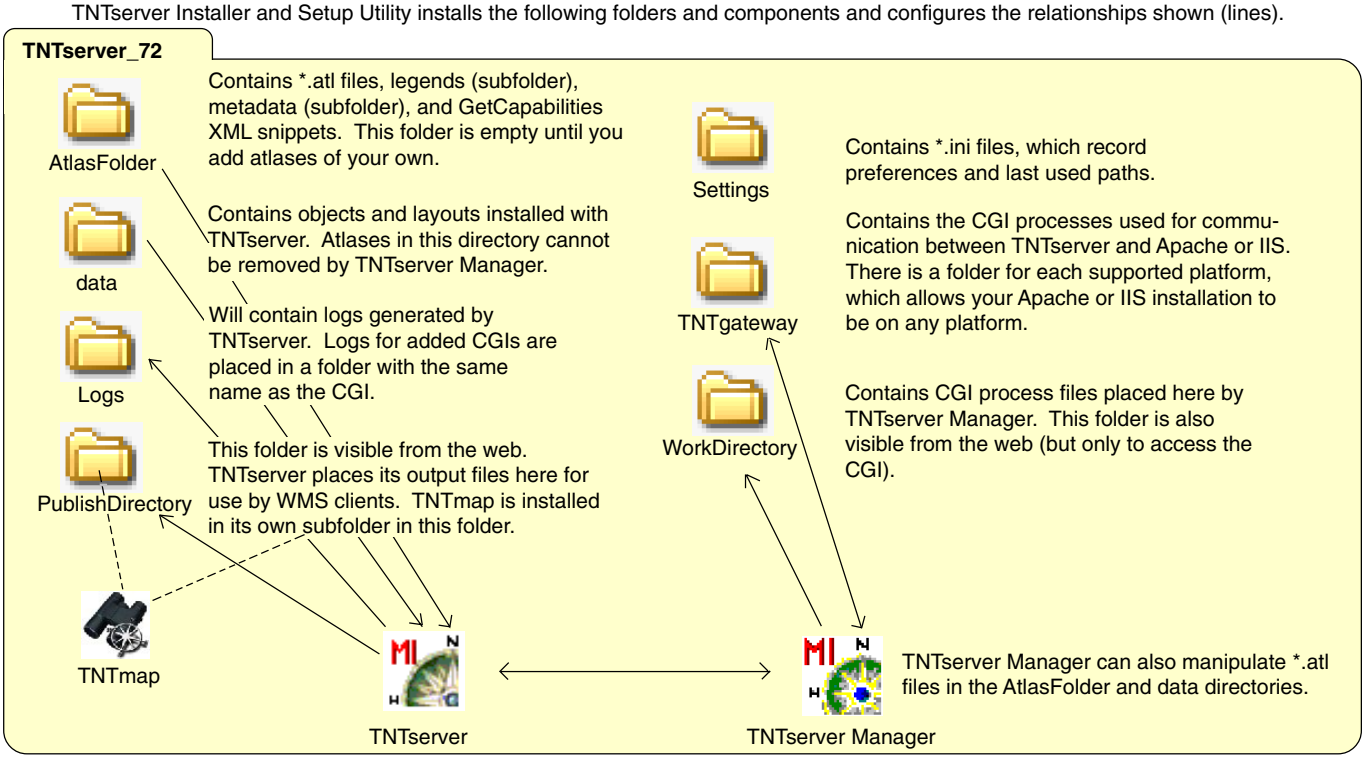
[2] This panel does not appear during an update install if you have already installed Perl and acquired and entered a Google Maps Key.

[3] If you are updating your installation of TNTserver, this panel will not appear. If you need to make changes to information entered during your first TNTserver installation, you can do so on the Contact and/or Title panel of TNTserver Manager.

If you have not previously installed TNTserver or a TNT professional analysis product on the machine you are installing TNTserver on now, the first configuration panel will ask you to identify the type of key you have so the appropriate driver can be installed during configuration. If you have already installed a TNT product, the driver will already be installed and you begin configuration at the panel that lets you enter an option code or the panel that has you specify the Network Type and Name as described on the front of this sheet. Your TNTserver license key must be attached during installation so the license can be acquired for configuration purposes and so TNTserver can be launched. If a TNTmips license key is attached to the computer, TNTserver will run in test mode.

You install Apache or IIS.

TNTserver Installer and Setup Utility installs the following folders and components and configures the relationships shown (lines).



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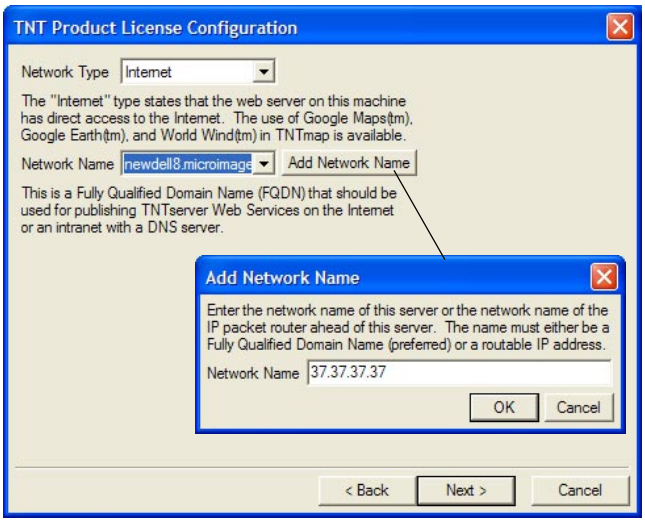
TNTserver 2006:72

Configuration and Network Type

To exploit the full capabilities of TNTmap in conjunction with a TNTserver installation, the machine on which your web server (Apache or IIS), TNTserver, and TNTmap are installed must have a routable, or public, Internet address. If your machine is connected to the Internet using a packet forwarding device, or router, the router must have a routable Internet address. All TNTserver features are available if running on a private network (private networks do not have routable addresses), or intranet, but communication with Google Earth, Google Maps, and World Wind via TNTmap requires communication with a routable Internet address. Thus, there are three choices for network type for use with TNTserver: Intranet, Internet, or Internet by Proxy. The last choice applies to the case where the computer lacks a routable Internet address but is connected to the Internet by a router that has one.

The second panel of the TNTserver installer (see the color plate entitled *TNTserver 2006:72: Installation*) has you specify the network type and the network name for your TNTserver installation. The network name can be a machine name, an Internet Protocol (IP) address, or a Fully Qualified Domain Name[1] (FQDN, recommended[2]). All network names for your machine detected by TNTserver will be listed on the Network Name menu. If you are using Internet by Proxy, the FQDN and/or IP address of the router is not on this list, and it is the router's network name that is needed with this setup for your TNTserver to respond to requests over the Internet. To add your router to the list, click on the Add Network Name button and type in the FQDN or IP address for your router.



The messages you see in the TNT Product License Configuration window under both the Network Type and Network Name option menus depend on the current selection. The messages for an Internet Network Type and an FQDN Network Name are shown in the window at the right. The messages for Internet by Proxy and Intranet Network Types are shown below along with the messages received if you have selected a machine name, a routable IP address, or a nonroutable IP address for the network name. Any type of network name (FQDN, routable IP address, nonroutable IP address, or machine name) is valid for use on an intranet although it is not explicitly stated in all of the name messages. Network names that are machine names are only valid for use on an intranet and must also be supported by a Domain Name System (DNS) on that network or be in the client machine's hosts file (...\Windows\System32\Drivers\Etc).

Internet by Proxy	The "Internet by Proxy" type states that the web server on this machine has indirect access, via a packet forwarding device, to the Internet. The use of Google Maps(tm), Google Earth(tm), and World Wind(tm) in TNTmap is available.
Intranet	The "Intranet" type states that the web server on this machine has no access to the Internet.
nonroutable IP address	This Internet Protocol address is not a valid address for publishing TNTserver Web Services on the Internet. If the web server is having its IP packets forwarded from an Internet visible device, add the DNS name to the list of network names and select it, along with "Internet By Proxy" for the network type.
routable IP address	This Internet Protocol address is a valid address for publishing TNTserver Web Services on the Internet or an intranet.
machine name	This is a machine specific name and cannot be used on the Internet. This can be used on an intranet if the name is supported by an internal DNS or is contained in the hosts file.

[1] An FQDN consists of a host and domain name, such as www.microimages.com, where www is the host, microimages is the second-level domain name, and .com is the top-level domain name. An FQDN always starts with the host name then sequentially presents the domain name levels separated by periods with the top level being last.

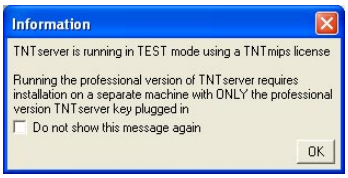
[2] FQDNs are preferable to IP addresses because IP addresses are more likely to change.

TNTserver 2006:72

Using in Test Mode

TNTserver can be run in the full professional mode or test mode on Windows 2000, Windows XP, and Windows Server 2003 platforms. No special authorization code is required for you to run TNTserver in test mode with a fixed-license TNTmips, TNTedit, or TNTview software authorization key. TNTserver does not support the use of a floating license for any TNT product.

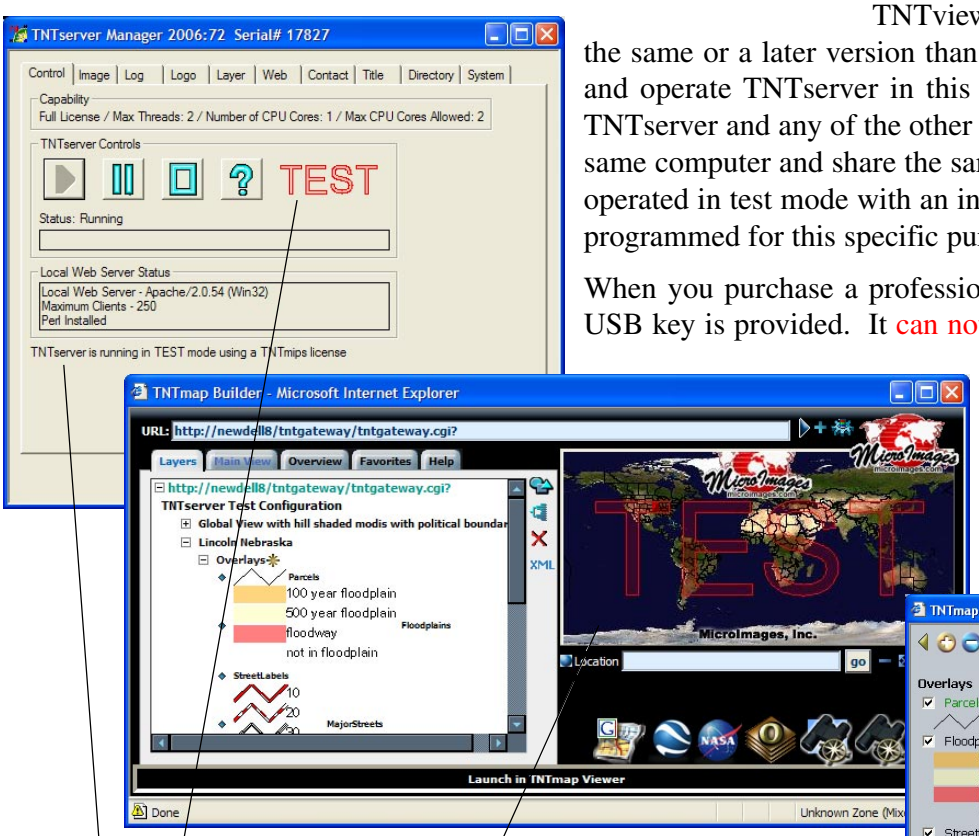
The purpose of the test mode is to provide every MicroImages client the opportunity to experiment with the latest version of TNTserver. It also permits those who have purchased a professional TNTserver to try the latest patches and design new content without disrupting a working, published site.



If a TNTmips key is detected by TNTserver Manager during startup, you will get the message window at the left, which informs you that you are running and can only run in test mode. This same information is included on the license acquisition panel during installation.

Although the test mode is FREE, it watermarks every view by inserting the word "TEST" as shown here. Any TNTmips, TNTedit, or TNTview software authorization key that is at the same or a later version than the TNTserver can be used to install and operate TNTserver in this test mode. Both the test version of TNTserver and any of the other TNT analysis products can run on the same computer and share the same USB key. TNTserver can also be operated in test mode with an independent software authorization key programmed for this specific purpose.

When you purchase a professional version of TNTserver, a separate USB key is provided. It can not be attached to a computer that has a professional TNTmips, TNTedit, or TNTview key attached to that same computer. Professional TNTservers used to publish geodata via a LAN, WAN, or the Internet should use dedicated computers for this purpose.



The large, red word TEST appears on the Control panel in TNTserver Manager as well as text that explains that TNTserver is running in test mode and what type of product license key was found.

The word TEST is prominently inserted in every image generated from the layers selected for the main view by a WMS client.

The Locator image for TNTmap Builder and the Overview image for TNTmap Viewer are also generated by TNTserver and include the superimposed word TEST and the MicroImages logo.

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Configuration

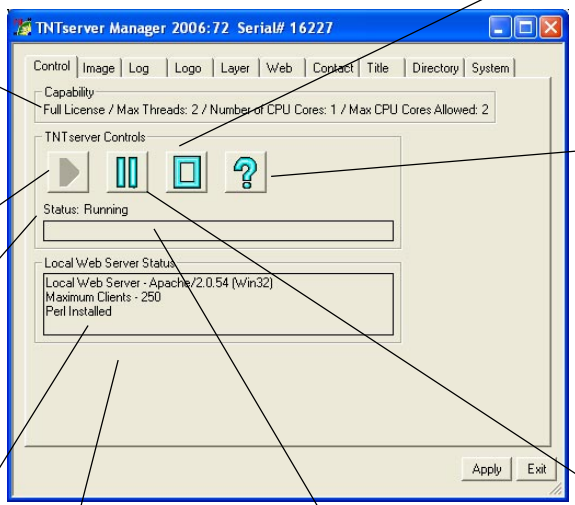
TNTserver is a geodata server designed to provide Internet or intranet access to any object or layout in any Project File or any pre-defined atlases by any remote client compliant with the operations defined in the Open Geospatial Consortium's (OGC) specifications for a Web Map Service (WMS). Using these ISO 19128 standard WMS operations, TNTserver renders composite views of these massive collections of raster, vector, CAD, TIN, and relational database materials as JPEG, JP2, PNG, KML, or SVG views, which can be viewed in TNTmap, Google Earth, Google Maps, or NASA's World Wind. A WMS capable client can request an image from TNTserver generated in any of the thousands of standard Coordinate Reference Systems (CRS, ISO 19111:2004) supported by the TNT products. TNTserver's support of Web Coordinate Transformation Service (WCTS) allows a WCTS capable client to translate features (points, lines, polygons, and so on) from one CRS to another. For example, this feature can be used to enhance a WMS client by converting a measurement line from decimal degrees to a projected CRS so that calculating the distance along the line is far more accurate.

The TNTserver Manager is a graphic interface that lets the system administrator modify configuration settings necessary for TNTserver operation after TNTserver is installed. Additional features, such as automatic work directory cleanup and the list of layouts to cache automatically are also set here. These settings are presented on ten tabbed panels in the TNTserver Manager window. Note that this window also provides the serial number for the authorization key for TNTserver in the title bar.

TNTmap is a sample client implemented in AJAX (Asynchronous JavaScript and XML) and compliant with Open Geospatial Consortium (OGC) specifications and sites. It does not require the installation of Tomcat or any other servlet as part of a TNTserver installation. It uses a small program called TNTgateway (tntgateway.cgi) for this purpose. The CGI source code for TNTgateway is provided by MicroImages so you can modify it to add additional functionality, such as load balancing between TNTservers.

Managing General Controls

The Control panel reports your TNTserver license options, your local web service status, and lets you start, stop and pause TNTserver.



Lists your license level (full or demo with expiration date for latter), maximum number of compute threads, number of CPUs detected on your machine and the maximum number of CPUs allowed with your license.

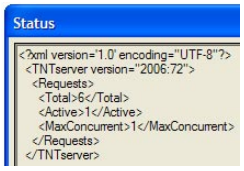
Start button starts TNTserver again after it is paused or stopped. Start button is not active when TNTserver is running but is active when TNTserver is paused or stopped.

The TNTserver status is determined when TNTatlas Manager is launched and is updated if the status changes.

Lists parameters for the web server currently running on the machine with TNTserver and notes whether Perl is installed.

Stop button stops TNTserver, which means there is no access to the atlases served by TNTserver. If stopping/restarting TNTserver is necessary for your configuration updates, you will be notified when you click Apply.

Status button opens the Status window, which reports the TNTserver version running, the total number of requests TNTserver has received, the number currently active, and the maximum number that have been concurrently active since TNTserver was started.



This window has Save As and Close buttons.

Provides status messages while TNTserver is loading layouts into the cache when started or later if added.

The Pause button lets you change existing, currently cached atlases and is the state your TNTserver will assume if the key is removed. You do not need to pause to change atlases that are not currently cached. If you try to change an atlas that is cached using the Display process in a TNT product, you will get a permission denied error, which means you need to pause TNTserver to make changes to that atlas.

If you are running in test mode, a message appears here telling you what type of key was detected. The large word TEST also appears to the right of the Status button.

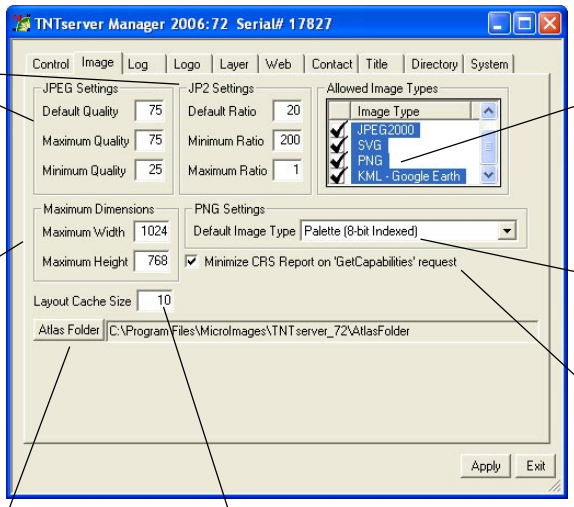
Managing Image Properties

The Image tabbed panel lets you set a variety of image properties, such as which image types you will permit to be sent in response to client requests, quality/compression values for JPEG and JP2 files, and maximum image dimensions. You also can indicate the maximum number of layouts to be cached (caching options are set on the Layer tabbed panel). When the number of layouts cached exceeds the Layout Cache Size, the layout with the longest idle time is removed from the cache unless the layout has the *Always keep layout in TNTserver cache* option set on the Layer tabbed panel.

The location of the atlas folder is established during installation. You can use the Atlas Folder button to change this location but all atlases available at a given time from TNTserver must be in the indicated folder to insure that atlas names are unique.

JPEG quality is expressed as a percentage of original quality, such that 80 means 80% of the original image information is retained. JP2 quality is expressed as a compression ratio (20 means lossy 20:1 compression while 1 means lossless compression). Note that the highest quality images sent will use the maximum quality (JPEG) or minimum ratio (JP2) value set, which means you can purposefully degrade the quality of the imagery supplied by TNTserver when sent in response to a client request if desired. Web Map Service requests only use the default image quality value. The KML - Google Earth option delivers a KML file with a linked PNG image that includes vector overlays of the requested area that can be viewed in its correct position in Google Earth.

These fields set the image quality sent in response to a client request. The default value is used for Web Map Service client requests. HTML clients can request a specific image quality but the request will only be sent in the minimum to maximum quality range specified.



These check boxes set the image types TNTserver can send in response to a client request. The client can then choose from among these image types for the format received.

Set the type of PNG to send in response to a client request: Palette (8-bit Indexed), True Color (32-bit RGBalpha), Palette (8-bit Indexed) - Interlaced, or True Color (32-bit RGBalpha) - Interlaced.

Maximum image dimensions that will be sent by TNTserver.

Maximum number of layouts that will be cached before the least recently used layout not designated as a layout to keep is removed from the cache.

TNTserver supports thousands of Coordinate Reference Systems (CRSs). The complete list approximately triples the size of the XML file created in response to a client's GetCapabilities request (for example, 35 KB to 103 KB). Turning on this option reduces the number of CRSs listed to a small, popular subset, which includes Latitude/Longitude (WGS84/Geographic) and those defined by the Web Map Service. If groups in the layout use other CRSs, those CRSs can also be used for retrieval of images.

The atlas folder contains the *.atl files for the atlases available from TNTserver. These files may contain instructions that restrict the information about the contents of the layout named in the .atl file. This information can be included using a text editor or using the check boxes on the Layer tabbed panel. In the absence of such instructions, the name of layout, all of its groups, and all of their layers are listed for selection when accessed by a client.

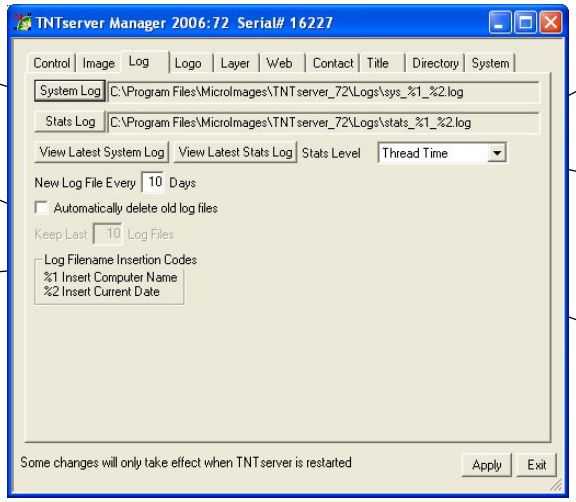
Managing Logging

The Log tabbed panel lets you indicate where you want your server system and statistics logs to be saved, which statistics you want logged, and how to maintain these files. The system log reports the time that atlases are opened and closed and any errors generated during atlas operation. The statistics log can contain three types of information: connect time, thread time, and request type. If you select Connect Time, the time for TNTserver to complete each task is recorded in the designated file as comma separated values. If you choose Thread Time, the time for each thread category (receive, compute, and send) is included also. Choosing Request Type adds the type of request to the thread time information. Log files can grow rapidly if you receive many requests. The Thread Time option produces a file four times the size of the Connect Time option while Request Type adds another 12 percent. You can open the latest system and statistics logs directly from this panel.

The system log location is set during installation and can be changed later if desired.

If you turn on this option, you can enter the number of log files you want to keep.

Include these in your system and statistics logs file names to insert the machine name and date in the name of the log file. The date is inserted in the format set for the computer running TNTserver. For example, if you enter sys_%1_%2 when naming your file, your system log may be named sys_tntservermachine_23_6_2005.log.



Select a statistics log if you want one. It can be in the same or a different directory than your system log.

The statistics level is presented in a least to most hierarchy with the middle (Thread Time) as the default. Other options are Connect Time and Request Type (see above).

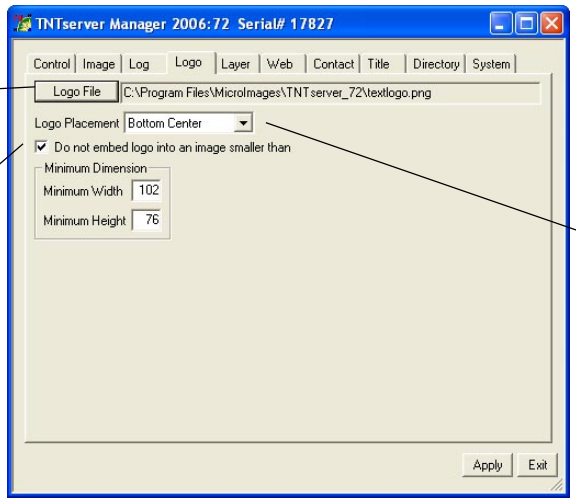
Set to determine how many days' information is kept in an individual log file. After that number of days, a new log file is created. If you choose to have log files automatically deleted using the defaults of keeping 10 log files and creating a new log file every 10 days, you will have log information going back 100 days before the first log file is deleted.

Managing Site Logo

The Logo tabbed panel lets you specify information for the logo that is placed in the image returned by TNTserver. Logos must be RGB rasters in PNG or JPEG format (8- or 16-bit with color map, 16- or 24-bit RGB or BGR, or 32-bit PNG). You should consider making your logo partially transparent, which is done using the alpha channel with PNG files, so the logo blends with the geospatial data beneath. You also want full transparency for non-logo areas of the logo raster if your logo is not rectangular. JPEG does not support transparency, so PNG is generally preferred.

The MicroImages text logo is selected as part of the installation process. You can use this button to navigate to and select a different logo file if desired.

Turning on this toggle lets you use the fields below to set the minimum dimensions of an image for logo insertion. Using this option prevents the majority of a small image from being covered by your logo.



Choose from top left, center left, bottom left, bottom center, bottom right, center right, top right, top center, and center of the view for logo placement or choose no image so the logo does not display.

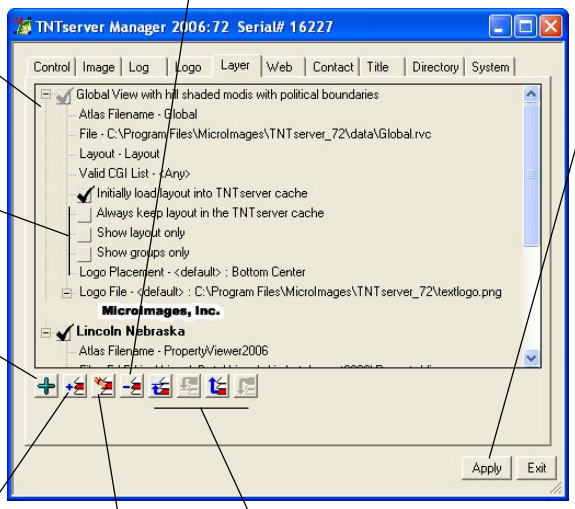
Managing Layers

The TNTserver Manager lets you add atlases (existing *.atl file) or choose any single TNT object or layout to be automatically used as an atlas. There is no need to pause TNTserver to add any atlas. If you click on Add Object, you can select any single object type in Project File format or any other format supported for direct use in the TNT products (for example, *.png, *.jp2, *.shp) or a simple or complex layout. If you select an external file that does not have accompanying georeference, such as a world file, it can be displayed in TNTmap but not overlaid with other georeferenced layers from TNTserver or other WMSs because there is no way to establish relative position. Whether you have clicked on Add Atlas or Add Object, the Atlas Parameters window opens after the file/object is selected. You can then indicate your caching and layer/group display preferences, which can be viewed and changed on the Layer tabbed panel after the atlas/object is added. You can also select a different logo and its placement for each atlas. When you click Apply, whether you have selected an object or an atlas, a new *.atl file is automatically created for it in your atlas folder. This *.atl file has the same name as the object/file selected and includes the information provided in the Atlas Parameters window. Additional parameters that you may have added to a *.atl file to govern its operation in the stand-alone TNTatlas product, such as the DataTip viewing mode, do not apply to atlas operation with TNTserver and are removed from the *.atl file saved to your atlas folder. Sometimes when you add an atlas, the location of the starting object for the atlas cannot be determined from the *.atl file. In such cases, the Object field will be blank and you are prompted to select an object if you click on the Apply button before selecting one.

This global atlas is automatically installed with TNTserver.

Removes the active atlas from the TNTserver list. The Global atlas installed with TNTserver cannot be removed.

Be sure to click Apply after each object or atlas is added or has parameters edited to create/update the *.atl in the atlas folder for TNTserver. This button only applies changes to the highlighted (bold) atlas in the list (Lincoln Nebraska at left).

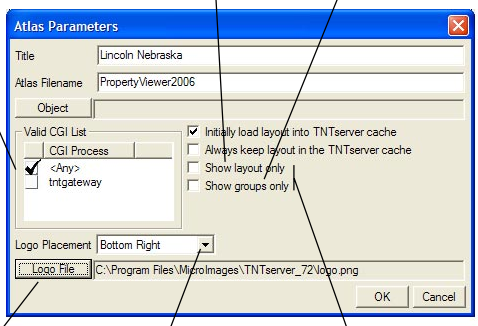


Check boxes are active for changing parameters. Don't forget to click on Apply to make changes in *.atl file.

If checked on, layout name only is listed in TNTmap Builder and it cannot be expanded.

Check the box for an individual CGI process to limit where the atlas runs if you have multiple CGI processes.

If checked on, group names are listed when layout is expanded but groups cannot be expanded.



Prompts for selection of a new *.atl file then opens the Atlas Parameters window.

Prompts for selection of a new object in Project File format (including layouts) or any file in a format supported by TNT for direct use then opens the Atlas Parameters window. A *.atl file is automatically created when you click Apply.

Change order of atlases in list: Raise, Lower, To Top, and To Bottom.

The Edit button opens the Atlas Parameters window so you can change the object selected, the valid CGI processes, and the logo file and/or placement. You can also change the caching and legend layer parameters, and these can also be directly changed on the Layer panel of the TNTserver Manager.

Select a diifferent logo than installed with TNTserver.

Specify logo position on the TNTmap Viewer canvas.

Both of these options must be off to see legends in TNTmap.

Original ATL file

```
[TNTatlas]
DisableOpen=No
StartZoom1X=No
Object=Global_Atlas.DLAYOT
File=/Volumes/Macintosh HD/Data/WorldLayout/WorldLayout.rvc
Title=Global_Atlas

[tntatlas]
DisplayLayoutViewDataTipMode=3
```

are not applicable when accessing atlas via TNTserver

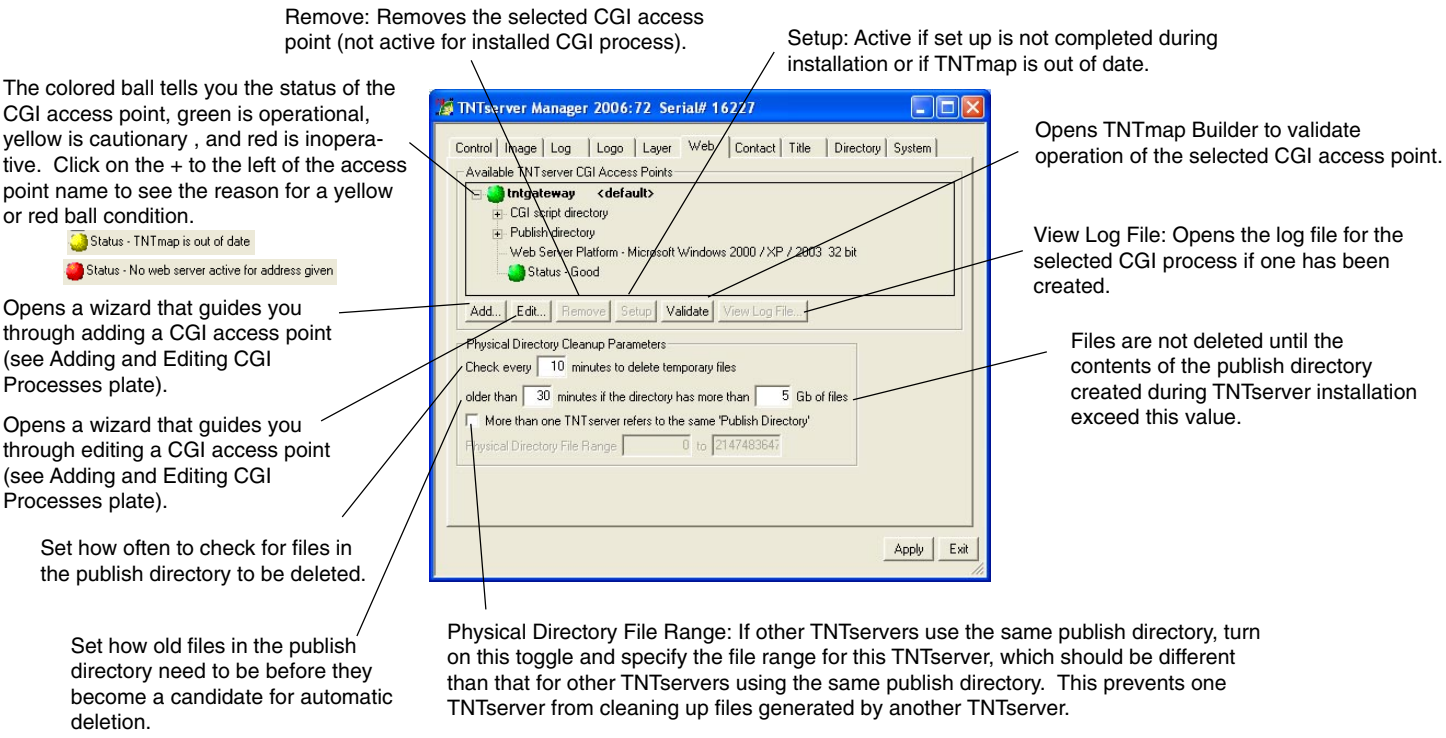
TNTserver ATL file

```
[TNTatlas]
Title=Global_Atlas
File=!PC!C:\GlobalData\Data\WorldLayout\WorldLayout.rvc
Object=Global_Atlas.DLAYOT
LogoPosn=BottomRight
LogoImage=!PC!E:\snapshots\Pic_2\Pic_2.png
BackgroundColor=0 0 0
Preload=yes
KeepInCache=no
ShowLayoutOnly=no
ShowGroupsOnly=yes
ShowGroupsAndLayers=no
```

5 entries determined by 4 checkboxes on right in Atlas Parameters window

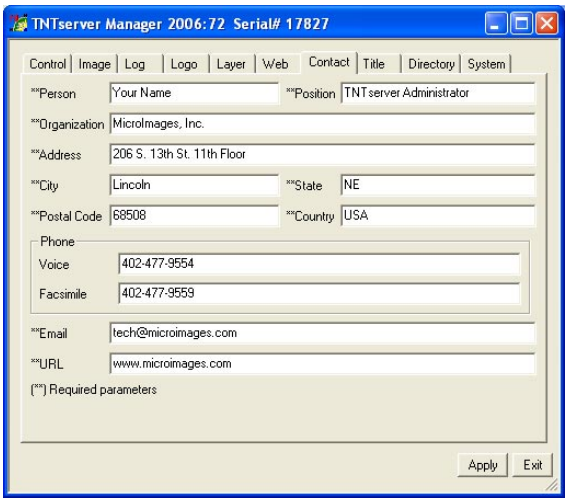
Managing Web Access

The Web panel specifies cleanup and management parameters for the publish directory and lets you add and edit Common Gateway Interface (CGI) processes that provide access points. The publish directory is where the files generated by TNTserver in response to client requests go, which can be on a different computer than TNTserver. These work directory files include the images/SVG layers generated in response to client requests, selected logos, and other miscellaneous files. The location of the publish directory and the CGI process (tntgateway.cgi) that provides the interface between TNTserver and its web requests/responses are established during installation. You can also add additional CGI processes to limit access to atlas layers and edit existing CGI processes. Additional CGI processes can be on the same or a different drive as TNTserver, which can be on any computer using any operating system supported by TNTmips.



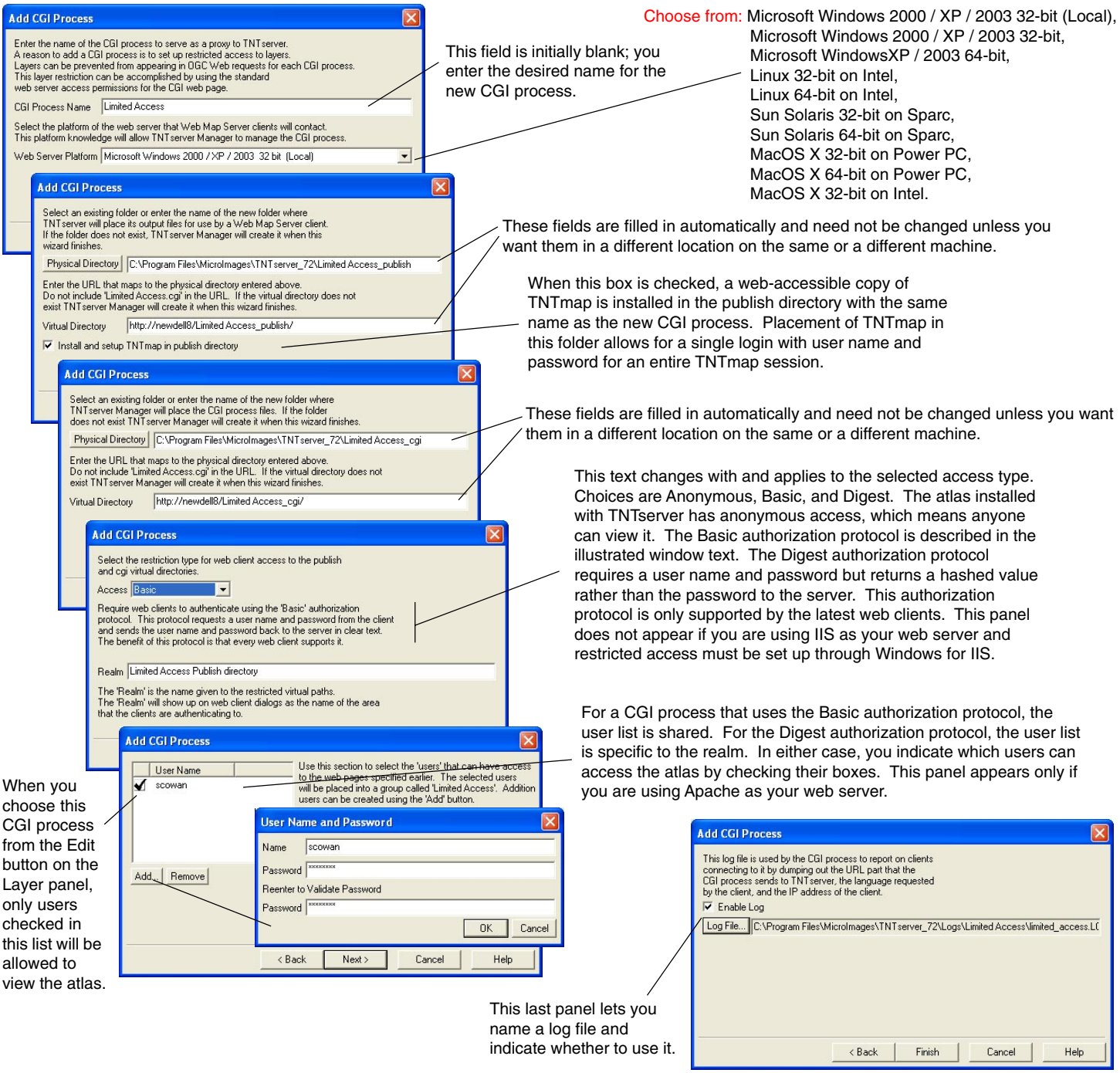
Managing Administrator Contact

The information on the Contact tabbed panel identifies the system administrator and is required by OGC for any Web Map Service to respond to a GetCapabilities request. Required fields are marked with **. This information is added, along with the title, abstract, and keywords, to the capabilities of the OGC web service according to the ISO 19115 specification. The only fields not required are the position of the contact person and phone contact information.



Adding and Editing CGI Processes

The Web tabbed panel of TNTserver Manager has an Add button that opens a wizard that takes you through the creation of a new CGI process to restrict access to atlas layers. Restricted atlases require an authorized user name and password. When complete, you have a new, fully functional CGI access point. The Edit button on the Web tabbed panel uses the same wizard to take you through the panels that apply to the selected CGI process (for example, you cannot set restricted access to atlases served by tntgateway.cgi, so the user selection panel does not appear). TNTserver is a Windows only TNT product. However, your atlases, objects, and layouts as shown below can be on any computer running any operating system supported by TNTmips (no TNTmips license is required on these platforms that contain only data for TNTserver).



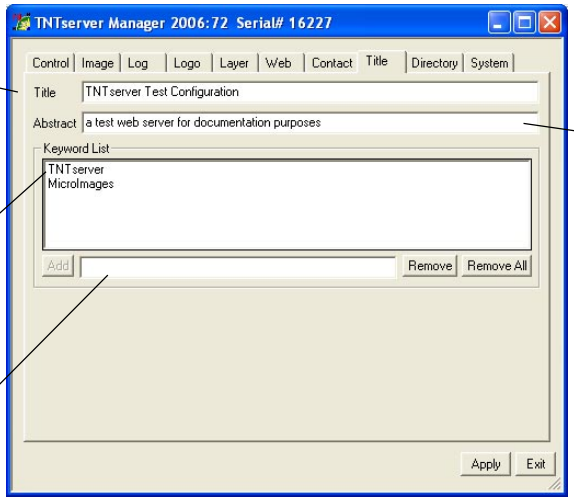
Managing ID Titling

The information on the Title tabbed panel is added, along with the contact information, to the capabilities of the OGC web service according to the ISO 19115 specification.

The title is the name OGC uses to identify your TNTserver. The title can be up to 512 characters. The name for each individual atlas you publish via your WMS is set and can be edited in the Atlas Parameters window that appears when you add or edit an atlas (Layer panel).

TNTserver installs with TNTserver and MicroImages already added as keywords. A scroll bar will appear when needed to show all the keywords you have added.

You type each desired keyword into this field, then click on Add. The Add button is inactive until you have typed something in this field.



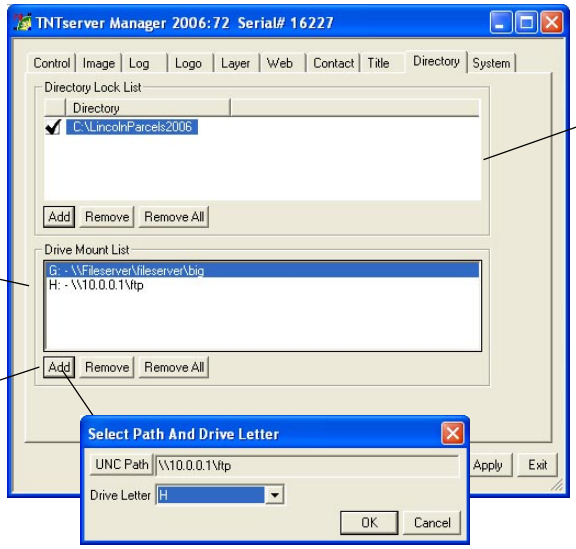
The abstract is your description of your TNTserver site. The abstract can be up to 512 characters.

Managing Directories

The Directory tabbed panel lets you select directories to be locked from TNTserver access and specify your drive mount letters for atlases, layouts, or objects on remote resources.

The drive mount list tells TNTserver how to find files referenced on remote resources in an atlas. If you have such atlases, you should add their drive mounts to this list before TNTserver is started.

Clicking on Add opens a window for you to specify the UNC (Universal Naming Convention) path and designate the corresponding drive letter. A scroll bar will appear if needed for the number of directories you have added.



Place directories in this list to prevent access to them by TNTserver so that you can update files without pausing or stopping TNTserver. TNTserver can then still access atlases in other directories. Remember to remove directories from this list or uncheck them after update so they can be used by TNTserver again. A scroll bar will appear if needed for the number of directories you have added.

Managing System Parameters

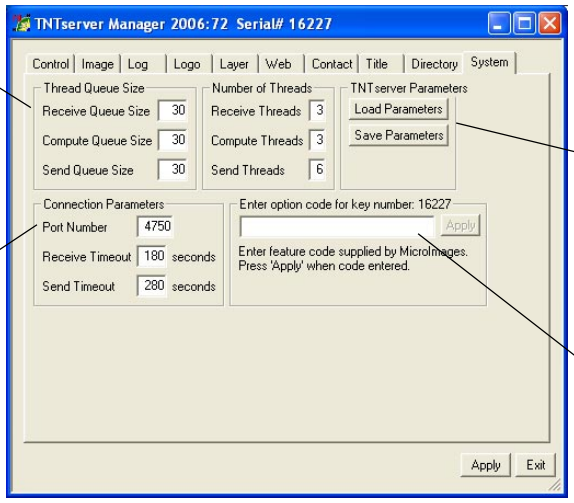
You specify queue sizes, thread distribution, and connection parameters on the System tabbed panel. You can also save the parameters you have specified in the TNTserver Manager or load the parameters saved by another TNTserver and upgrade your license by entering an option enable code. The port number specified for communication with TNTserver must be open and not filtered by a firewall or router between the CGI and TNTserver. The number of compute threads is the number of threads that can be processed, or computed, at the same time. It is recommended that this number be no more than one greater than the number of CPU cores in each TNTserver workstation. The number of cores is reported on the Control tabbed panel.

Some operations skip the compute thread. These operations include the request that gets the GetCapabilities for any OGC service, and the IsTransformable and DescribeCRS operations of the WCTS. These operations are metadata gathering operations, which must be carried out even if all compute threads are busy.

Requests wait in the receive queue if there are no open receive threads at the time the request is received. The Receive Timeout sets the length of time a receive thread will wait to receive a complete request. At that point, the connection is broken and the thread moves on to the next request in the queue. The send thread receives data from the send queue and sends it back to the client that requested it. If the time spent on the send thread is longer than the timeout set, the connection is broken and TNTserver looks for the next item in the send queue to send. You may want to set the Send Timeout to be longer than the Receive Timeout because TNTserver typically sends more data than it receives.

The number of simultaneous network connections you can have may be limited by your operating system or web server. For example, Windows XP Professional is limited to 10 connections using IIS. The number of connections is not limited if you use the recommended Apache. If your network connections are limited, the sum of the number of receive threads and the receive queue size should not be greater than your network connection limit.

Leave this port number at this system default unless you have a conflict with some other use of this port in your internal system. Changing this port number also requires using an editor to make the same port number change in the tntgateway.ini file for use with TNTmap and to provide access to TNTserver by some other WMS compliant client.



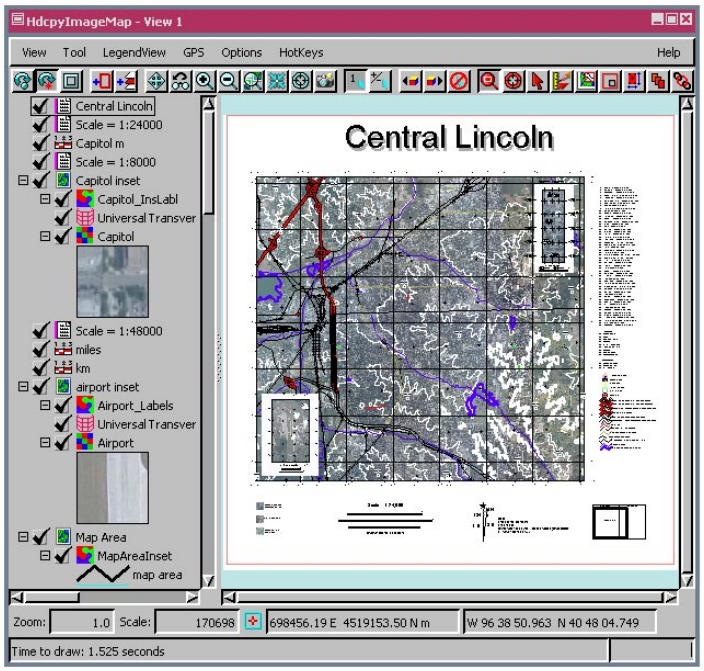
This port is used by the tntgateway.cgi program to talk to (which means, connect to) TNTserver. This is not the port used by TNTserver to communicate with the Internet.

Save and Load are very important functions once you have your TNTserver configured. New installations of TNTserver or updates to your existing server can then be configured by loading a saved parameters file (created by clicking on Save button). It is recommended that this file not be in your TNTserver directory in case it is deleted before updating.

Lets you enter option enable codes for additional capabilities that you get when you purchase TNTserver upgrades from MicroImages, such as a newer version authorization or increasing the number of CPU cores authorized. The Apply button becomes active once a code is entered.

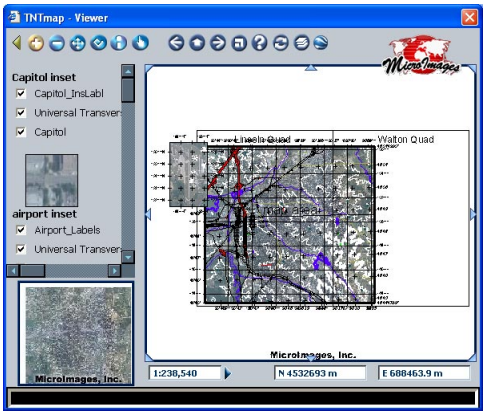
TNTserver 2006:72

Publishing Layers, Groups, or Layouts



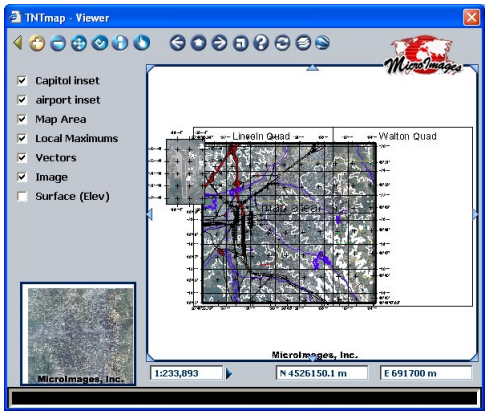
TNTserver Manager gives you the option of making atlas layers available as layers, groups, or layouts. If you do not turn on the *Show layout only* or *Show groups only* options on the Layer tabbed panel of TNTserver Manager (see illustrations below), all layers in the atlas are available for individual selection. If the atlas is available as individual layers and you select all layers in an atlas, layers can be turned on and off individually from the legend in TNTmap Viewer, the extended Google Maps and Open Layers launched by TNTmap, and in World Wind. (All layers are sent as a single image for better display in Google Earth.) These layers are, however, individual layers all of which are positioned using georeference information. A layout will only appear as it does in TNTmips (shown at right) if it is composed of a single group or of multiple groups that all have geographic attachment. Most of the sample atlases posted on MicroImages' web site, such as Egypt Oases, Nebraska Land Viewer 2nd Ed., and Lincoln Property Viewer 2nd Ed., are composed of a single group or geographically attached groups. Such atlases will look the same whether they are selected as layers, as groups, or as a layout. When displayed as layers, the end-user has the most control over what they are viewing.

Atlases, such as the one illustrated here, that have multiple, manually positioned groups are not suitable for display together other than as a layout. For such layouts, you should turn on the *Show layout only* option. Geographic overlay of these layers has a variety of consequences: the index map is enlarged to encompass the full map area, the inset at the upper right of the map is reduced and placed in position within the overall image, and the inset at the lower left is enlarged and positioned off the edge of the map in its actual location, among others. The view canvas appears the same whether both options are off or if *Show groups only* is on. The difference between making individual layers available and making only groups available is only in the legend controls for turning layers/groups on and off.



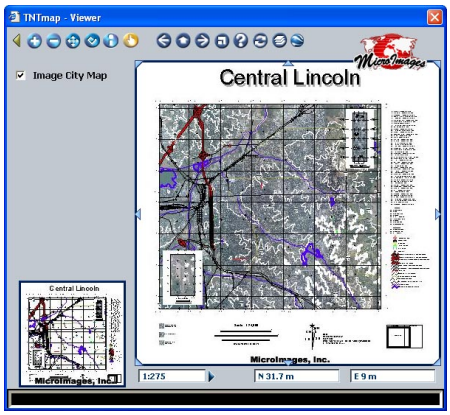
Show layout only
Show groups only

Individual layers are advertised by the Web Map Service (WMS). When all layers from this atlas are are selected and displayed together, the result is as above.



Show layout only
Show groups only

Only group names are advertised by the Web Map Service (WMS). When all groups from this atlas are are selected and displayed together, the result is as above.



Show layout only
Show groups only

Only layout names are advertised by the Web Map Service (WMS). When this single image is selected, the result is as above.

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TNTmap 2006:72

Widget Viewing of WMS Content for Mac OS X

The installed version of TNTmap for the Macintosh is a set of five interconnected Dashboard widgets that are automatically installed as a group: the Control Panel, TNTmap Builder (your WMS browser and layer manager), and TNTmap Viewer, TNTmap Open, and Google Maps WMS widgets you use to view Web Map Service (WMS) content. The Control Panel widget can also be used to launch your Google Earth application.

Google Maps, Google Earth, TNTmap Open, and TNTmap Viewer are illustrated here using the Nebraska Land Viewer content published on the Internet by a TNTserver, a WMS product of MicroImages. Using this TNTmap Builder widget any of these viewers can be redirected to use the map and image content published by any other WMS on the Internet.

Control Panel Widget

Control Panel Widget

The Control Panel widget is carefully designed to occupy only a small area on your Dashboard. It provides access to the icons used to launch each of the other TNTmap widgets and Google Earth. The flip side ⓘ of this widget lets you set defaults to use when opening the TNTmap Builder and TNTmap Viewer widgets.

Remember: You can close any individual widget by pressing the Option key and moving the cursor onto that specific widget. This will expose that widget's close icon ⓧ at its upper left corner.

Google Maps WMS Widget

The Google Maps icon on the Control Panel widget opens a Google Maps WMS widget. This widget provides all the familiar Google Maps image and map content and control features. It also lets you view image and map layers selected from any WMS compliant web site(s). When launched directly from the Control Panel, Google Maps will automatically load the same list of WMS layers you last viewed. To locate and select new WMS layers, you must use the Builder widget.

By default Google Maps, Google Earth, TNTmap Open, and TNTmap Viewer use a standard atlas from a TNTserver published by MicroImages' web site the first time they are used if no layers have previously been selected with TNTmap Builder.

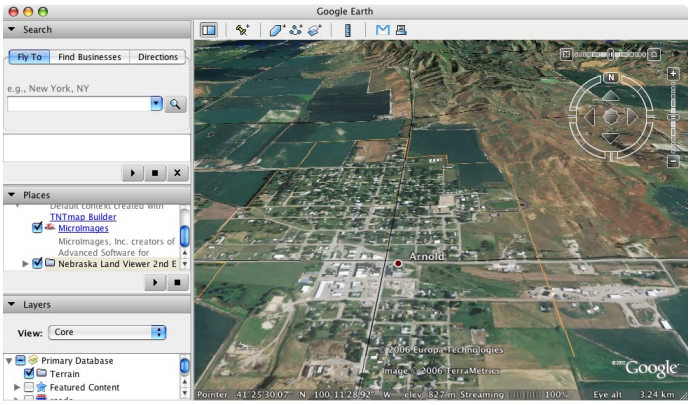
Google Maps WMS Widget

The list of layers currently loaded in Google Maps is exposed or hidden by hovering over the Layers icon at the upper right of the view. You can toggle these layers on and off on this list, change the order of layers on the list, and move images to the Base Maps group. Only one WMS layer at a time can be in the Base Maps group. Selecting a second WMS layer to be in the Base Maps group automatically returns the WMS layer currently in Base Maps to its last position on the list.

Additional features in this widget include tools for measurement, a zoom box, information retrieval, and cursor coordinate readout. The operation of this Google Maps WMS viewer is described in more detail on the color plate entitled *TNTmap 2006:72: Use Google Maps to View WMS Layers*.

Launching Google Earth with WMS Layers

The Google Earth icon on the Control Panel will start this Google application if it is not already running and zoom to the area of the WMS layers you have selected. Google Earth automatically drapes each WMS layer onto the 3D view and adds them to the list of Temporary Places. Although these layers are being read from one or more WMS they can be turned on and off and used like any other Temporary Places. If you do not have Google Earth installed, this icon will create a KML file that can be used later or provided to others (note, it would be better to save KML files in the Builder, which provides more control of the KML parameters). When launched directly from the Control Panel, Google Maps will automatically load the same list of WMS layers you last viewed. To locate and select new WMS layers, you must use the Builder widget. This use of Google Earth as a WMS viewer is described in more detail on the color plate entitled *TNTmap 2006:72: Use Google Earth to View WMS Layers.*



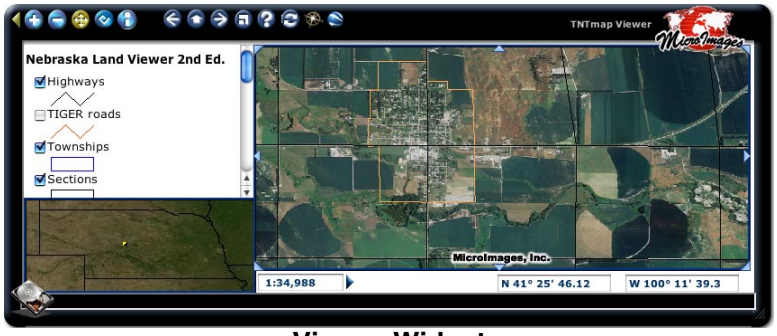
Google Earth with WMS Layers

TNTmap Open WMS Widget

TNTmap Open Widget

The TNTmap Open icon on the Control Panel widget opens the TNTmap Open WMS viewer, which usees and extends the Open Layers API. To expose the legend, which lets you turn layers on/off, click on the + icon at the upper right of the window. Click again to close the legend. The + icon at the lower right opens/hides the overview. When launched directly from the Control Panel, it will automatically load the same list of WMS layers you last viewed. To locate and select new WMS layers, you must use the Builder widget. The operation of this viewer is discussed in more detail on the color plate entitled *TNTmap 2006:72: Use TNTmap Open to View WMS Layers.*

TNTmap Viewer WMS Widget



Viewer Widget

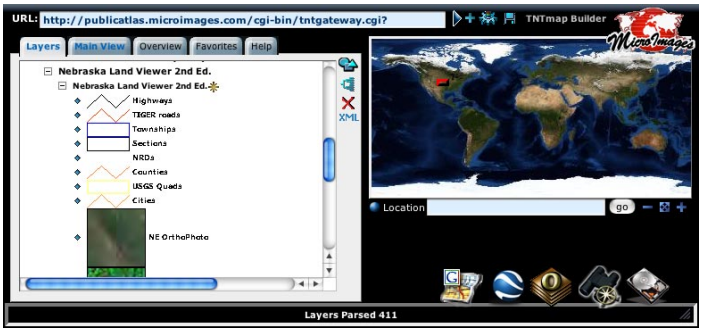
The TNTmap Viewer icon on the Control Panel widget opens this MicroImages custom WMS viewer. It provides the ability to view image and map layers selected from any WMS compliant web site(s). When launched directly from the Control Panel, it will automatically load the same list of WMS layers you last viewed. To locate and select new WMS layers, you must use the Builder widget.

As shown in the illustration this viewer uses legend entries for WMSs that provide them for their layers as does TNTmap Open. The check boxes in front of each layer name toggle the layers on and off instantly and the entire legend area can be toggled on/off. Standard image manipulation tools are provided for measuring features, zooming in/out, repositioning, and requesting information. View controls are available to go to the last view, initial view, and next view; hide the overview and/or legend panel, access help, and reload all layers; TNTmap Builder can be launched to add or delete layers; and Google Earth can be launched using the current layers.

HyperIndex links developed in the TNT analysis products can be followed. For example, if you are viewing the Lincoln Property Viewer 2nd Edition atlas, you can zoom in to view property boundaries superimposed on a color image. If you use the cursor to select a property, its HyperIndex link will automatically open the ownership records for that property from the Lancaster County Assessor's web site.

Use TNTmap Builder to locate and organize the WMS layers you wish to view in TNTmap Viewer. More information is provided in the color plate entitled *TNTmap Viewer 2006:72: Viewing WMS Layers* and its operation is explained in detail in the *TNTmap Viewer Help* available via the Help tabbed panel in the widget.

TNTmap Builder Widget



Builder Widget

The TNTmap Builder icon on the Control Panel opens a widget that functions as a simple WMS browser to help you locate web sites offering map and image content via a WMS. It then lets you select and add to a list one or more image and map layers offered by these WMSs. The list of layers you build from one or more WMSs in this widget can be viewed in Google Maps, TNTmap Open, and TNTmap Viewer widgets or in Google Earth.

TNTmap Builder can also save a layer list and other parameters as named "favorites" for later use in all four viewers. Favorites are somewhat analogous to bookmarks but are more powerful. They not only record where each WMS layer in the current layer list is located (like a web page bookmark) but also how you have set up the layers to be viewed, such as their order in the list, coordinate reference system, geographic area of interest, and so on. You can also add to your list of favorites directly from within TNTmap Viewer. This has the added advantage that the subsequent selection of the favorite will restart that viewer and view using additional information, such as the zoom factor.

The favorites created for Google Earth are KML files, for TNTmap Viewer they are standard OGC Web Map Context files, and for Google Maps and TNTmap Open they are HTM files. Any of these favorites files can be sent to others to launch these viewers to use this same content, used on a web site to define atlases or views automatically assembled from various WMSs, and so on.

Several color plates outlining the capabilities of TNTmap Builder are provided at www.microimages.com/TNTmap and explained in detail in the *TNTmap Builder Help* available via the Help tabbed panel in the widget.

TNTmap Builder 2006:72

Choose WMS Layers for Use in Popular Viewers

TNTmap Builder is a FREE means of browsing and selecting Web Map Service (WMS) content to be viewed in the viewer of your choice (Google Maps, Google Earth, World Wind, TNTmap Open, or TNTmap Viewer). TNTmap Builder can be used on Windows or Macintosh computers. It can be run as a web application or downloaded and installed. In either case once acquired, TNTmap Builder can be used independently of any contact with MicroImages' web site or any other MicroImages professional product. Whether TNTmap Builder is installed or run as a web application, the Windows version comes in three forms: the standard form, which is illustrated below, the mini form, and the quadrant form. The different forms are discussed on the color plate entitled *TNTmap 2006:72: Three Forms to Fit User Style and Device*. These three forms are also available if TNTmap is run as a web application on a Macintosh. Additionally, there is a Macintosh Dashboard widget form that can be downloaded and installed and is described on the color plate entitled *TNTmap 2006:72: Widget Viewing of WMS Content for Macintosh.*

You can start TNTmap Builder, click on the desired layers (the layers from your last used WMS will be listed), and view them in Google Earth or another viewer by clicking on the desired viewer icon, which means you can be viewing a complex set of layers in Google Earth after just two clicks. To choose layers from another WMS, use the Add Server to Layers List button or enter the URL. The global layers used for the Locator are the default for the overview panel in TNTmap Viewer. You can choose any WMS layers for this purpose. (The overview uses a box to indicate the area shown in the larger, main view canvas area in TNTmap Viewer and can be used for repositioning.)

Listing of layers will vary from one WMS site to another. Some sites have all available layers listed individually. MicroImages organizes their layers into atlases. If allowed by the TNTserver Administrator, you can expand an individual atlas and see the groups and layers it contains. All layers in an atlas can be selected for viewing by clicking on the atlas name. Individual layers can be selected for viewing by expanding its list (clicking on ⊞) and clicking on their names in the expanded list. There may also be logical groups within an atlas, and all layers in a group can be selected for viewing by clicking on the group name.

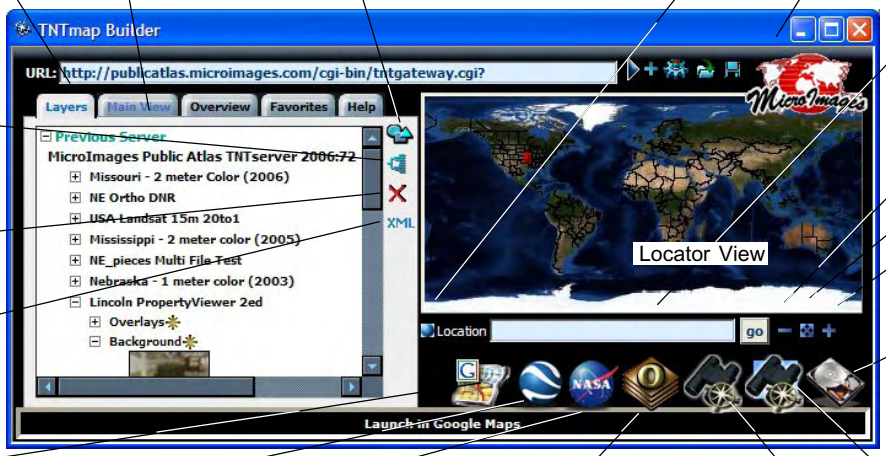
Layers available from the selected WMS are shown on the Layers panel. The initial default Layers list is the full list from MicroImages web site.

Switch Locator zooming mode between selected/mouse defined and geographic name search.

See the back of this page for information on buttons and fields across the top of the TNTmap Builder window.

Clicking on this icon opens the Modify Layer Properties window, which lets you specify the format for image retrieval, the format for Info requests, an Internet Explorer filter to use, and the percent opacity for layers from the selected server.

Clicking on this icon pops in a panel that lets you specify how layers appear in the selected server list. You can turn legends on/off, choose whether layers selected for viewing remain identified by highlight, and turn on/off viewing abstracts if they are available.



Clears all entries from the list.

Type location to zoom to in Locator View or select from list and click go.

Zoom Locator out.

Return Locator to global extents.

Zoom Locator in.

Opens a window with the response to a GetCapabilities request returned from the selected server in XML.

Opens TNTmap Save File window to save selected layers/extents for future use in World Wind, Google Earth, Google Maps, TNTmap Open, TNTmap Viewer, or save as an OGC context document.

Automatically launches TNTmap's version of the Google Maps API to overlay layers in the Main View panel. Order of overlay of GM map layer, satellite image layer, and WMS images can be specified.

Automatically launch Google Earth to use the layers in the Main View panel. GE then requests these layers as temporary Places directly from their WMSs.

Launch NASA World Wind to use the layers in the Main View panel. WW then requests and overlays these layers directly from their WMSs (Windows only).

Automatically launches TNTmap Open (TNTmap's version of the Open Layers API) and displays layers in the Main View panel.

Automatically opens a new TNTmap Viewer window to display layers in Main View panel.

Refresh an already open TNTmap Viewer window using layers now in the Main View panel.

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The buttons and fields across the top of the Builder window provide access to WMSs, local context files, and the settings for supported viewers. You can also assign a name to a URL you enter so it is saved and available for selection by name in this and future TNTmap Builder sessions from the Favorites panel either under *Saved Server URLs* or *Saved Context URLs*. The open feature for contexts and save feature for URLs are not available if running the web-application version.

Change Settings. Opens the Settings panel so you can so you can set parameters for use with Google Maps, Google Earth, World Wind, TNTmap Open, and TNTmap Viewer.

Open Local Context, Context List or Capabilities Document. Lets you browse to context or capabilities documents stored on your local drive or network (no URL) and adds the layers found to the Main View panel. Not available if running web-application version.

Enter the URL for a WMS, context file, or context collection you want to choose layers from.

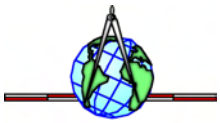
Use capabilities from this URL. Gets the capabilities from the WMS at the URL to the left.

Add Servers to Layers List. This button opens the panel below so you can choose a server from this list of samples identified by MicroImages. The layers advertised by the WMS of the selected server are added to those available on the Layers tabbed panel.

This panel remains open until you click on the x in the upper right.

Clicking on the logo opens the home page for MicroImages web site in your browser.

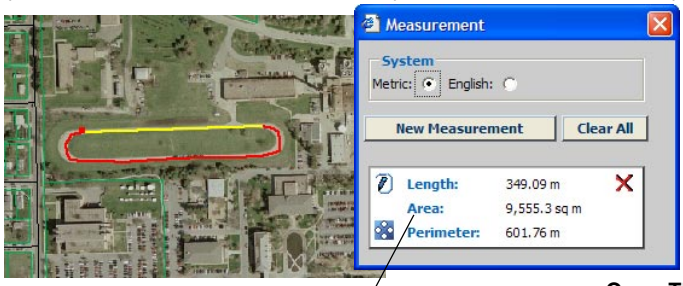
Save to Favorites. This button opens a prompt window so you can provide a name to associate with the entered URL at the left, which can be for a WMS server, a context file, or a context collection. The name will then appear on your Favorites panel under either *Saved Server URLs* or *Saved Context URLs*, respectively. Not available if running web-application version.



TNTmap Viewer 2006:72

Viewing WMS Layers

TNTmap Viewer is a client for viewing images and maps from Web Map Service (WMS) compliant servers published anywhere on the Internet. TNTmap Viewer can be run as a web application or installed. As a web application it runs with Windows Explorer; Firefox on Windows, Mac, and Linux platforms; and Safari on the Mac. Installable versions are available for Windows and Mac OS X. TNTmap Viewer can be launched by selecting an atlas for viewing from MicroImages' web site. The TNTmap Viewer window can be resized like any other window. TNTmap Viewer is part of TNTmap where it is coupled with TNTmap Builder to provide a WMS compliant browser. You can add additional WMS layers to the atlas you open using TNTmap Builder. These layers can be from one or many WMSs anywhere on the Internet or any private network. TNTmap Builder provides a list of sites, but you are not limited to this list. If you find another WMS, you can enter its URL at the top of the Builder.



Measurements update as you draw. A polygon in progress is automatically closed (yellow line) after three points are drawn. The length measurement is the length of the line you drew while the perimeter reflects the additional length of the yellow, closing line. Multiple measurements can be retained and revisited.

Recenter and Drag: click to recenter or hold and drag to reposition.

Measure

Navigate: follow HyperIndex links.

Open TNTmap Builder: opens and lets you browse to and select additional layers for viewing from any WMS. Does not appear in the installed version for Windows because TNTmap Builder will already be open in a separate window (all instances of TNTmap Viewer launched from the installed TNTmap Builder are closed when it is closed).

Zoom Out: the Zoom Out tool lets you click to zoom out 2X centered on the click position or pull out a box that outlines the area you want the canvas contents reduced to.

Go To Initial Area

Last View

Next View: returns you to the view you had prior to using the Last View button.

View in Google Earth: launches Google Earth if not running and zooms to this view.

Zoom In: the Zoom In tool lets you click to zoom in 2X or pull out a box that outlines the area you want to zoom to.

Links to Microimages' web site.

Load Context: lets you select a context file (previously defined view) to open in TNTmap.

Reload All Layers

Help: takes you to Help provided on MicroImages' web site.

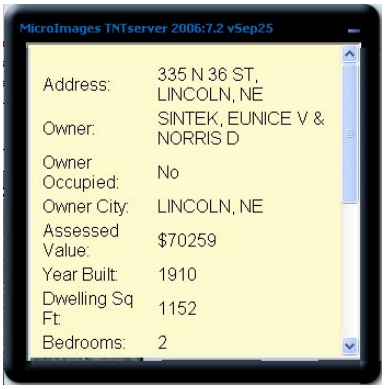
Overview On/Off: deletes or adds overview to lower left.

Pan: move 50% of the view in the direction of the arrow you click on.

Legend On/Off

Turn individual layers on and off.

InfoTip: opens a window (example below) with information about the layers at the position of your mouse click.



Current map scale. You can type a desired scale in this field and zoom to it by clicking the button to the right.

Coordinates at cursor position in CRS specified by TNTmap Builder or context file.

Overview: shows layers selected on Overview panel of TNTmap Builder zoomed to same approximate extents as the full extents of the layers selected for viewing. Area being viewed is indicated by a box (here appears more like a dot).

Status bar reports name of layer currently being loaded and other status information.

Window is resizable in both dimensions using any edge (in Windows) or the bottom right corner (on the Mac).

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TNTmap Builder 2006:72

Four Ways to Run

You can run TNTmap Builder on a Windows or Macintosh computer as a web application from MicroImages' web site (microimages.com/tntmap) or from any other web site that has it posted for use. You can also download an installable version from MicroImages' web site (or any other that has it posted) and run it as an executable program. Note from the illustrations that the difference in appearance of these four versions of TNTmap Builder is fairly subtle, and most features are shared by all versions. The color plate entitled *TNTmap Builder 2006:72: Three Forms to Fit User's Preference and Device* applies to all but the installed Macintosh Dashboard widget. Use of the Macintosh widget is described on the color plate entitled *TNTmap 2006:72: Widget Viewing of WMS Content for Macintosh*.

Contexts

The major functional difference between the installed and web application versions is that the installed TNTmap Builder (Mac and Windows) lets you save contexts locally so they can be accessed from the Favorites tabbed panel. A context is a means of saving a view for use at a later time and is described in more detail on the color plate entitled *TNTmap 2006:72: Saving and Using Contexts*.

Installed

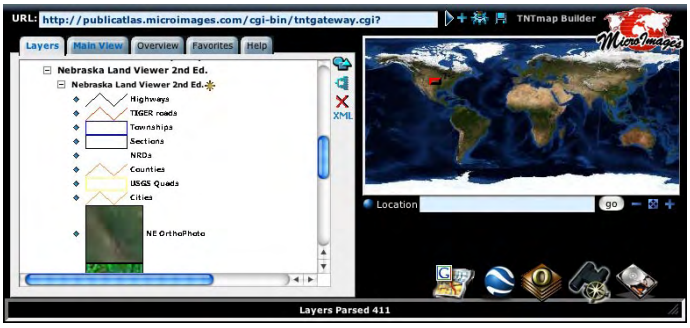
Note that there are fewer icons at the lower right of the Mac widget. Widgets do not support communication with another instance of an application, so loading layers currently on the Main View panel into an already open TNTmap Viewer window is not possible. Also note that NASA's World Wind application is not available for the Mac. You can save contexts built with installed TNTmap Builder and later access them from your Favorites panel. Again, contexts are described in more detail elsewhere.

Web Application

The web application version has been designed to be benign and operate within the confines of your browser without leaving anything behind that you did not intentionally save; for example, it does not save the cookie that would be required for your personal Favorites list to be available the next time you run TNTmap Builder. You can, however, save contexts to the location your browser is configured to save if you consent when prompted. These contexts can be used later by double-clicking on them or opening them in the desired viewer.

Installed: Windows Application

Installed: Macintosh Widget



Web Application: Windows

Web Application: Macintosh

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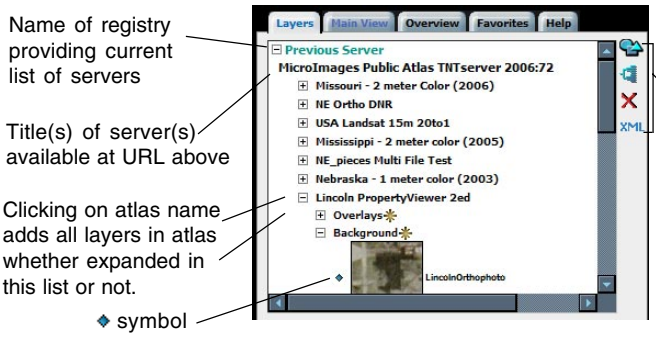
TNTmap Builder 2006:72

Features Located on Tabbed Panels

The standard form of TNTmap Builder provides its features as tabbed panels to maintain a convenient size. Some of these panels are linked together to make the results of an action perfectly clear. For example, when you click on layers in the Layers panel, you jump to the panel they were added to (Main View or Overview). Although layers available from MicroImages' web site are illustrated, once you have acquired TNTmap Builder, it can be used independently of any contact with MicroImages' web site or any other MicroImages professional product.

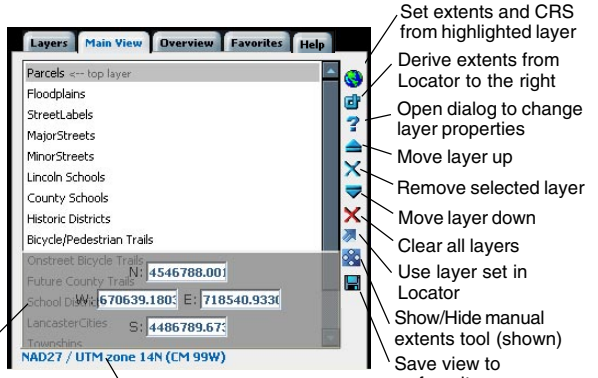
Layers Panel

Use this panel to select layers to appear for the Main View or the Overview. Layers selected from the Layers panel are added to either the Main View or Overview panel depending on which view panel was visited last. Clicking on layers when TNTmap initially opens adds them to the Main View panel. You can combine layers on this panel from a number of WMSs by changing the URL at the top of the window or using the Add Servers to Layers Panel button.

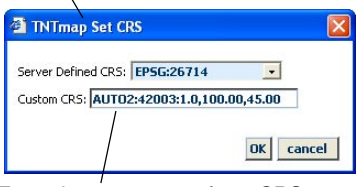


Main View Panel

This panel provides the list of layers you are building up for viewing in the viewer of your choice (see the color plate entitled *TNTmap 2006:72: Choose WMS Layers for Use in Popular Viewers*) and the active Coordinate Reference System (CRS). The layers may have come from multiple WMS sites and need not include any layers from the WMS at microimages.com. In addition to the list, there are a number of icons that let you manipulate the contents of the list. One of these icons lets you change the properties of the highlighted, selected layer including its title, format, and opacity among other properties. You can also set the Locator view to use the selected layers.



Changing the extents shown here will change the extents of the initial view opened in any viewer and change the extents for any saved context.



Clicking on the active CRS opens the TNTmap Set CRS window.

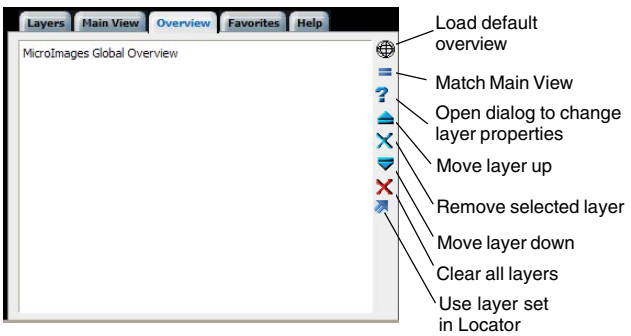
Enter the parameters for a CRS not on the list above. The field that was touched last is the CRS used.

Clicking on the specified CRS (the active CRS) at the bottom of this panel opens a window so you can pick from other CRSs advertised by the selected server. Some servers do not advertise all CRSs supported so a Custom CRS field is provided for you to enter the parameters for CRSs not on the list. The last field changed before you click on OK determines which CRS is used.

Overview Panel

This panel lists and manages the layer(s) selected for the overview image that will be shown for general area reference in the lower left corner of TNTmap Viewer. TNTmaps' default Overview is the same image and vector outline used for the Locator View. This default overview can be added to, removed (no overview), or replaced. The contents of this panel apply only to viewing in TNTmap Viewer.

(over)



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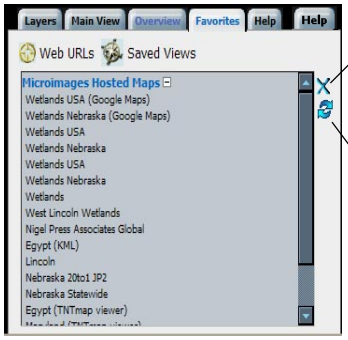
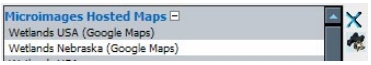
Favorites Panel

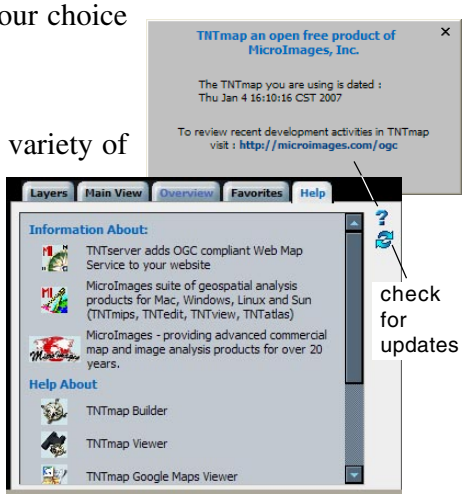


The installed version of TNTmap provides two lists of favorite layers/combinations of layers for viewing compiled either by you or MicroImages. You switch between the two lists by clicking on the Web URLs (MicroImages' list) or Saved Views (your list) heading at the top of the panel. You cannot accumulate personal favorites and there are no headings on this panel if you are running TNTmap Builder as a web application because this version leaves nothing behind when you exit. The single list on the panel is the same as that provided under Web URLs for the installed version. You can save contexts for later viewing using either the *Save to Favorites* button on the Main View panel or the *Save as TNTmap/Google Earth/Google Maps* button, which also lets you save to World Wind (Windows only) and TNTmap Open context files. (For additional information on contexts see the color plate entitled *TNTmap 2006:72: Saving and Using Contexts*.) If a context is saved to the contexts folder with a TNTmap installed on a Windows platform, it will appear on the Saved Views list. This folder is the location saved to when you use the *Save to Favorites* button on the Main View panel in the installed version. Only OGC context files (*.cml with the viewer not specified) should be saved to or placed in this directory. Contexts on the Saved Views list can be launched by clicking on any of the viewer icons When saving in the Mac OS X widget, saving is either to the Maps folder in your home directory or to the widget itself depending on your saving choices (see the color plate entitled *TNTmap 2006:72: Widget Viewing of WMS Content for Mac OS X*). When running as a web application, using either save method gives you the option to open the context or save it to disk.



The context files listed on the Favorites panel under Web URLs have a designated viewer. When you highlight a context on the Web URLs list, the generic Launch Context icon shown above changes to an icon that indicates the viewer it will launch in. The TNTmap Viewer icon appears for both TNTmap Viewer and the TNTmap implementation of Google Maps API, so Google Maps or TNTmap Viewer is included in context name. Only OGC Contexts (*.cml) should appear on your Saved Views list (saved from the Save to Favorites icon on the Main View panel or created elsewhere). Because no viewer is specified in this type of context file, you can choose to launch files on this list in any of the supported viewers (TNTmap Google Maps Viewer, Google Earth, World Wind, TNTmap Open, or TNTmap Viewer) by clicking on the desired icon at the bottom right of the TNTmap Builder window. Consequently, there is no launch icon on the Favorites panel when the Saved Views list is used. When you highlight a context on the Saved Views list, the request for layers is made to the specified WMS server(s) and the layers are added to the Main View panel. You can launch into the viewer of your choice without returning to the Main View panel.

Help Panel



Both the installed and web-application versions have a Help tab with links to a variety of web pages, color plates, and multi-page Help documents. The top information link takes you to a page with general information about TNTserver and links to download third-party products needed for complete functioning of TNTserver and TNTmap (Apache, Perl, and a Google Maps API Key) as well as a TNTserver download link and links to additional TNTserver documentation. The second link opens a web page that describes each of the products in the TNT professional suite. The MicroImages' globe logo link takes you to a web page with a general description of MicroImages and its products and services. The TNTmap Builder link opens an 9-page PDF help document that describes the features of TNTmap Builder in detail. The TNTmap Viewer link opens a 5-page PDF help document that describes the features of TNTmap Viewer in detail. The links for the TNTmap Google Maps Viewer, Google Earth, and World Wind (Windows only) open the corresponding color plates. Each of these color plates explains the basics of using TNTmap Builder to select WMS layers for use in these viewers. The back of each of these three color plates decribes how to use TNTmap Builder to save selected layers as context files for future use in the viewers. There are also links to contact MicroImages' client support or marketing and business departments.

TNTmap Builder 2006:72

Three Forms to Fit User's Preference and Device

You can use the FREE TNTmap Builder to browse and select Web Map Service (WMS) content to be viewed in the viewer of your choice (Google Maps, Google Earth, World Wind, TNTmap Open, or TNTmap Viewer). TNTmap Builder can be used for FREE and independently of any contact with MicroImages' web site or any other MicroImages professional product. TNTmap Builder has three forms for Windows and Mac OS X and can be used as a web application or installed as an executable program. All three forms provide the same functionality. These three different forms are provided to support different devices and user preferences. When you run the installed version of TNTmap, the last selected WMS is saved locally from one session to another. Thus, after you have chosen your favorite WMS, anytime you start TNTmap Builder you can just click on the desired set of layers and then click on the desired viewer icon, which means you can be viewing a complex set of layers in Google Earth or another viewer after just two clicks.

The components of the standard form have been described in detail on the color plates entitled *TNTmap Builder 2006:72: Choose WMS Layers for Use in Popular Viewers* and *Features Located on Tabbed Panels*.

Standard Form

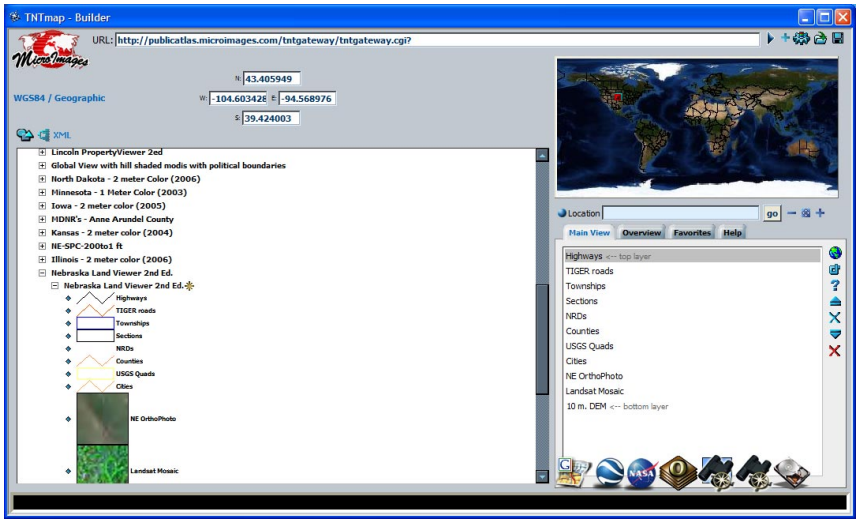
The standard form (above) organizes its different components on tabbed panels making its size convenient for general use and fits within the new Microsoft UMPC (Ultra Mobile PC) device dimensions (800 x 480 pixels). You can convert to the mini form by dragging in the right edge of the window.

Mini Form

The mini form of TNTmap Builder is designed for small portable devices, such as larger PDA or cell phone screens. You switch from the standard to the mini form by resizing the window horizontally—when the Locator side of TNTmap Builder becomes too small to accommodate the various icons for launching and saving views, these icons jump to the left side of the window and the Locator portion of the Builder disappears. You can get the Locator back again by resizing the window to be wider.

Quadrant Form

The quadrant form of TNTmap Builder is a power users' desktop version. It provides visual access to site selection, Coordinate Reference System specification, the Locator, the list of available layers from the currently selected WMS, and a view defining panel (Main View, Overview, or Favorites) at the same time so you can make new selections for all without having to flip between panels. The quadrant version is particularly useful for those who want to access layers from a number of different WMSs and build views to save as OGC context documents for use by others. See the detailed nine-page *TNTmap Builder Help* and the *TNTmap: Browsing and Selecting WMS Layers* plate for more information on operation of TNTmap Builder.



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16 January 2007

TNTmap 2006:72

Saving and Using Contexts

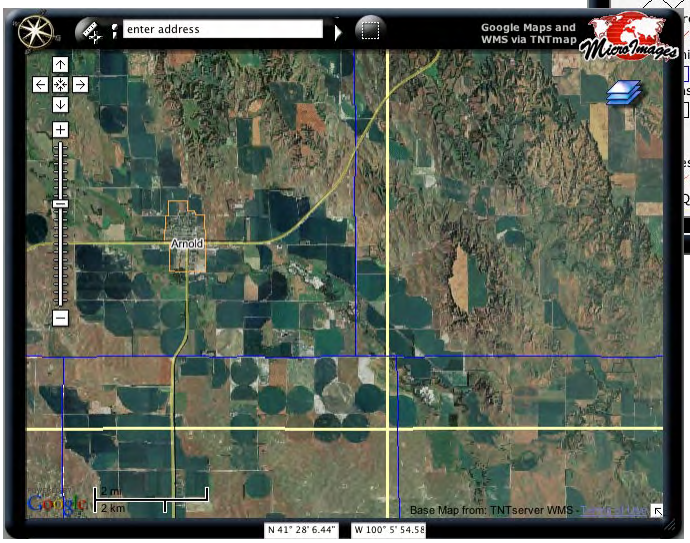
An OGC Web Map Context document describes how to recreate a web map that may be made up of layers selected from the Web Map Services (WMSs) of different sites. Context documents are portable, platform-independent XML files that save the state of a WMS viewing session, which means that when a context is opened later, you are zoomed to the same location with the same layers visible. All of the layer information is accessible, not just that within the initial view when the context is opened. An OGC Web Map Context document does not contain any information about which viewing software to use and has a *.cml extension.

MicroImages has extended this definition of context to also include files that provide the target viewing application plus any additional parameters that TNTmap Builder and the viewing application it supports may want in addition to the information contained in an OGC Web Map C ontext document. The extension of the context file varies with the viewer. TNTmap saves specific context files for Google Earth (*.kml), Google Maps (*.htm), World Wind (*.xml), TNTmap Open (*.htm), and TNTmap Viewer (*.htm) in addition to the generic OGC Web Map Context (*.cml). A *.cml file can be selected in TNTmap Builder and opened in any of these applications. These context files can also be opened in a number of other WMS-compliant viewers, such as the Canadian Geospatial Data Infrastructure (CGDI) Viewer and the Cadcorp SIS Map Browser.

Contexts that include all layers on the Main View panel as well as Overview layers can be saved from any version of TNTmap Builder and from the Mac OS X TNTmap Viewer widget. Overview layers are only used for TNTmap Viewer. When saved from the TNTmap Viewer widget, the extents of the current view are included in the context file. When saved from TNTmap Builder, the full extents of all layers defines the extents to view initially unless the Locator view is zoomed in further within these extents and you have clicked on the Derive Extents from Locator View icon. Then the Locator's extents are used.

If you are running an installed version of TNTmap, OGC context files (*.cml) saved in your contexts directory (Program Files/TNTmap, Windows) or your Maps directory (Mac OS X home directory) show up on the Favorites panel of TNTmap Builder under Saved Views. If you click on one of these contexts, the layers described in the context file are loaded on the Main View panel. You can then choose to view these layers or a subset of them in any of the TNTmap Builder-supported viewers: Google Earth, Google Maps, World Wind (Windows only), TNTmap Openor TNTmap Viewer. You are not confined to viewing the extents defined for the initial view in Google Maps, World Wind, or TNTmap Viewer. In other words, you can zoom out and retrieve additional data in these applications. The extents defined for the initial view are all that is available for viewing in Google Earth.

If you are running the web application version of TNTmap Builder, there are no Saved Views since by deliberate design TNTmap will not save anything on your local drives except through browser download with your consent. You can view a saved context file by typing its URL into the Builder and choosing a viewer.



The view above was saved as an OGC context file using the Save icon at the lower left of the TNTmap Viewer widget. This context was then loaded in TNTmap Builder and launched in TNTmap's version of Google Maps (left). Note that the view has been zoomed out and filled in with additional data acquired from the WMS(s) specified in the context file. The same view as above can be launched in Google Earth directly from the Viewer using the Save As icon provided for this purpose. When you zoom out in Google Earth, the area surrounding the saved view extents is filled in with the default Google Earth data.

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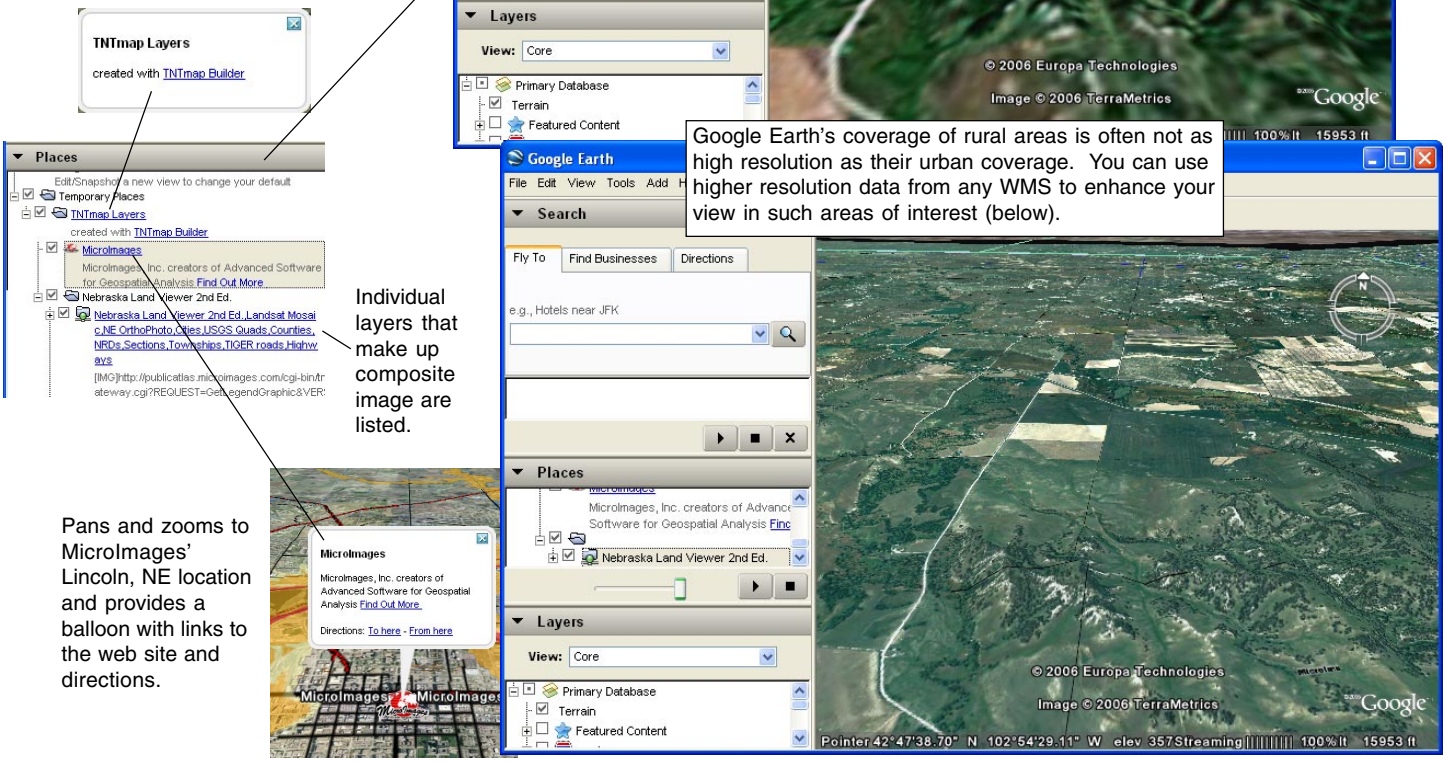
TNTmap 2006:72

Use Google Earth to View WMS Layers

Layers selected from a TNTserver site or from any other Web Map Service (WMS) compliant server (ISO 19128) can be displayed in TNTmap Viewer, TNTmap Open, Google Maps, Google Earth, or World Wind using TNTmap Builder. The display of selected layers can be immediate (the designated application is launched with the selected layers in place) and/or the web map context can be saved for subsequent use in any of these applications (see the back of this page for information on saving a web map context for Google Earth).

When you use the icon in TNTmap Builder to launch Google Earth, the layers currently selected for the Main View are added to the Temporary Places list in Google Earth under the heading TNTmap Layers, and you zoom to the approximate extents of your selected layers. The tilt and heading of your initial view will be the default, which is in the plane of the screen with north up, unless you have specified otherwise in your Google Earth settings (see the back of this page). All layers are merged into a single image for better display quality in Google Earth. Google Earth 4 is recommended for best viewing of vector layers. You can have multiple sets of layers from TNTmap Builder listed under Temporary Places. Each set will have a TNTmap Layers title, which is followed by an entry for MicroImages, and then the list of the one or more layers that were on the Main View list. Double-clicking on the title zooms you to the approximate extents of all the layers; clicking on any layer zooms Google Earth to the approximate extents of that layer.



Individual layers that make up composite image are listed.

Google Earth's coverage of rural areas is often not as high resolution as their urban coverage. You can use higher resolution data from any WMS to enhance your view in such areas of interest (below).

Pans and zooms to MicroImages' Lincoln, NE location and provides a balloon with links to the web site and directions.

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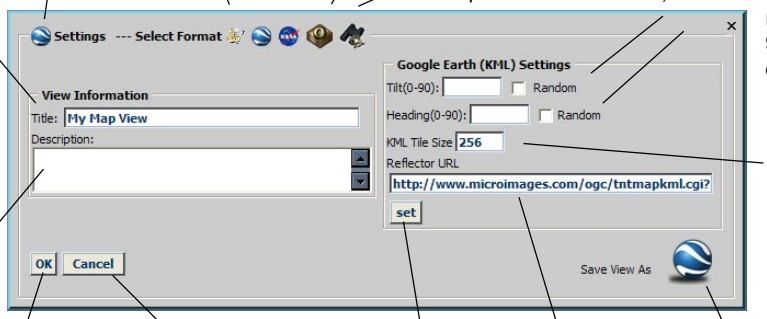
Save Layers for Automated Restart in Google Earth (*.kml Context)

The five Save As/Settings panels in TNTmap Builder let you save a context file for later, independent viewing of the currently selected layers in the Main View panel. This Web Map Service (WMS) content can be made up of layers from one or more WMSs. You can choose to save a context file for Google Maps (*.htm), Google Earth (*.kml), World Wind (*.xml), TNTmap Open (*.htm), or TNTmap Viewer (*.htm or *.cml). Double-clicking on a saved context file will launch the application that was selected when the context file was saved with the designated WMS layers in the correct location. The five Save As/Settings panels each provide the relevant options for one of the target web map viewing applications listed above. The color plate entitled *TNTmap 2006:72: Saving and Using Contexts* provides general information on these various viewing contexts and how they are used in TNTmap. This same panel can be opened from the Change Settings icon at the top of TNTmap Builder.

Name to use for layers listed in your Main View when its content is saved as a context file for automated reuse later.
Installed Version: you have the opportunity to alter this name when the file path is chosen if you forgot to alter it here or if you change your mind about the name you want.
Web Application Version: this name will be assigned if you permit this context file to be saved. It will automatically be saved to the generic place your browser uses for any files you trust and permit to be saved.

Enter the desired description for inclusion in the web map context file (*.kml).

Saves current settings as default parameters for Google Earth sessions. A context file *will not be saved*.
Installed Version: the tilt, heading, and other parameters are saved for automatic use for future Google Earth sessions launched from TNTmap.
Web Application Version: these settings only apply to the current session of TNTmap. They are not saved for use the next time you launch Google Earth from a new TNTmap session.



Closes Save As/Settings window without changing any settings.

Sets the KML reflector URL to the currently entered URL.

Set the tilt and heading angles for the initial display in Google Earth from a saved context and to use for subsequent instances of Google Earth opened from TNTmap Builder. If nothing is set for tilt, the initial view positions the layers parallel to the plane of the screen. If nothing is set for heading, North is set to the top of the screen. If Random is checked, the initial tilt and/or heading will be some random angle between 0 and 90 and the tilts of subsequent contexts will vary randomly.

Maximum image width before tiling. If the current image exceeds this width, this width is the maximum width of each tile that will be sequentially created for overlay in Google Earth.

Saves references to the layers currently on the Main View list in TNTmap Builder to a Google Earth context (*.kml). See Title description for installed and web application version behaviors.

URL for KML reflector[1] CGI. You can use the one written by MicroImages located on its web site or installed with TNTmap (tntmapkml.pl) or any other KML reflector you know the URL for.

[1] A KML reflector script gets the coordinates requested by Google Earth and uses them to generate a WMS request that is sent to the associated WMS. The resulting image is used to create a KML file that is used by Google Earth to update its view.

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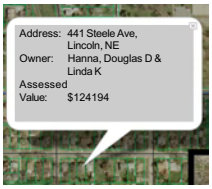
TNTmap 2006:72

Use Google Maps to View WMS Layers

Layers selected from a TNTserver site or from any other Web Map Service (WMS) compliant server (ISO 19128) can be displayed in TNTmap Viewer, TNTmap Open, Google Maps, Google Earth, or World Wind using TNTmap Builder. This display can be immediate (the designated application is launched with the selected layers in place) and/or the web map content can be saved for subsequent use (see the back of this page). When you launch into Google Maps using the icon in TNTmap Builder, you are using the Google Maps API together with extensions provided by the TNTmap web application or executable version. In theTNTmap version of Google Maps, you have the option of combining WMS layers (in other words, the layers selected for the Main View) with the Google Maps base layers (map, satellite, or hybrid) and/or the Google Maps overlay layer. You can also choose a WMS layer to be a base layer. For example, the transparent Google map layer can be overlaid on your georeferenced and rectified images or orthophotos offered by TNTserver or any other WMS. Another option would be to overlay your transparent, styled vector layer from TNTserver on the Google imagery in addition to or in place of the Google map layer. The Google Maps search tools are also supported for moving directly to any location indexed by Google (for example, house address, business, city, or state). A feature can be measured using the tools provided by TNTmap. Information about individual features can also be displayed from the layers as a response from a TNTserver to a GetFeatureInfo request (for TNT objects these are automatically the DataTips).

The Get Feature Info from the Web Map Server icon will change the cursor to a left arrow and question mark that returns DataTip information set up in TNTmips at the location you click for layers from TNTserver or similar information from other WMSs that support Get Feature Info requests.



Enter any address indexed by Google Maps.

Pull-out Zoom Box supplements Google Maps' zoom tools (at left of window) with an elastic box to define the area to enlarge to fill the current view canvas.

The Google Maps overlay layer.

Move highlighted layer up in list.

Use highlighted layer as base layer.

Move highlighted layer down in list.

Go to highlighted layer's extents.

Return list to original order.

Hide all overlays.

Delete all overlays.

WMS layers selected in TNTmap Builder for overlay. Any number of these layers may be turned on.

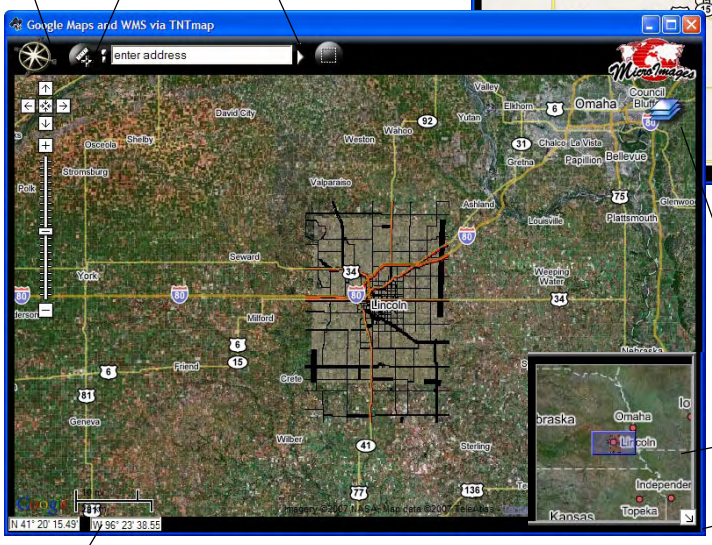
Base layers from Google Maps and any WMS layer selected to be a base layer.

Toggle between available base layers.

The Measure tool reports additive length of the line created as you click from one location to another.

Opens TNTmap Builder.

Go to address entered.



Layers list appears when you hover over this Layer Controls icon. The Layers list (shown above) closes when you move the mouse out of the list.

This is the standard overview provided by Google Maps that is derived from the layers in the current view. It does not use the layers on the Overview panel in TNTmap Builder.

This corner provides the ability to resize on the Macintosh. In Windows you can resize from any edge.

Geographic coordinate readout for cursor position is constantly updated.

The top illustration shows WMS layers over the Google map base layer. The bottom illustration shows the same WMS layers over the Google image layer with the Google overlay map on top.

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Save Layers for Automated Restart in Google Maps (*.htm Context)

The five Save As/Settings panels in TNTmap Builder let you save a context file for later, independent viewing of the currently selected layers on the Main View panel. This Web Map Service (WMS) content can be made up of layers from one or more WMSs. You can choose to save a context file for Google Maps (*.htm), Google Earth (*.kml), World Wind (*.xml), TNTmap Open (*.htm), or TNTmap Viewer (*.htm or *.cml). Double-clicking on a saved context file will launch the application that was selected when the context file was saved with the designated WMS layers in the correct location. The five Save As/Settings panels each provide the relevant options for one of the target web map applications listed above. The color plate entitled *TNTmap 2006:72: Saving and Using Contexts* provides general information on these various viewing contexts and how they are used in TNTmap. This same panel can be opened from the Change Settings icon at the top of TNTmap Builder.

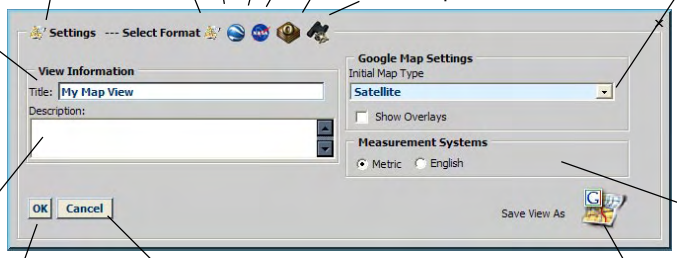
Name to use for layers listed in your Main View when saved as a context file for automated reuse later.
Installed Version: you have the opportunity to alter this name when the file path is chosen if you forgot to alter it here or if you change your mind about the name you want.
Web Application Version: this name will be assigned if you permit this context file to be saved. It will automatically be saved to the generic place your browser uses for any files you trust and permit to be saved.

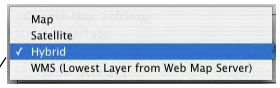
Enter the desired description for inclusion in the web map context file (*.htm).

Identifies the active Settings panel.

Clicking on these viewer icons switches to the panel with settings for that format.

Google Earth
World Wind
TNTmap Open
Google Maps
TNTmap Viewer





Choose the base layer for the initial view when this web map context opens in the TNTmap API for Google Maps[1]. The last choice in this list places the bottom layer from the Main View panel in the Base Maps section of the layers list and selects it.

Specify the type of units displayed for the measurement tool.

Closes Save As/Settings panel without changing any settings.

Saves current settings as your default parameters. A context file *will not be saved*.
Installed Version: units and initial map type are saved for automatic use for future Google Maps.
Web Application Version: these settings only apply to the current session of TNTmap. They are not saved for use the next time you launch Google Maps from a new TNTmap session.

Saves references to the layers currently on the Main View list in TNTmap Builder as a web map context file (*.htm) for Google Maps. See Title description for installed and web application version behaviors.

[1] Note this specifies the initial layer combination when the web map context file is launched in Google Maps. You can subsequently switch to any other combination of the layers selected in the Main View of TNTmap Builder and the Google Maps layers in this TNTmap version of Google Maps.

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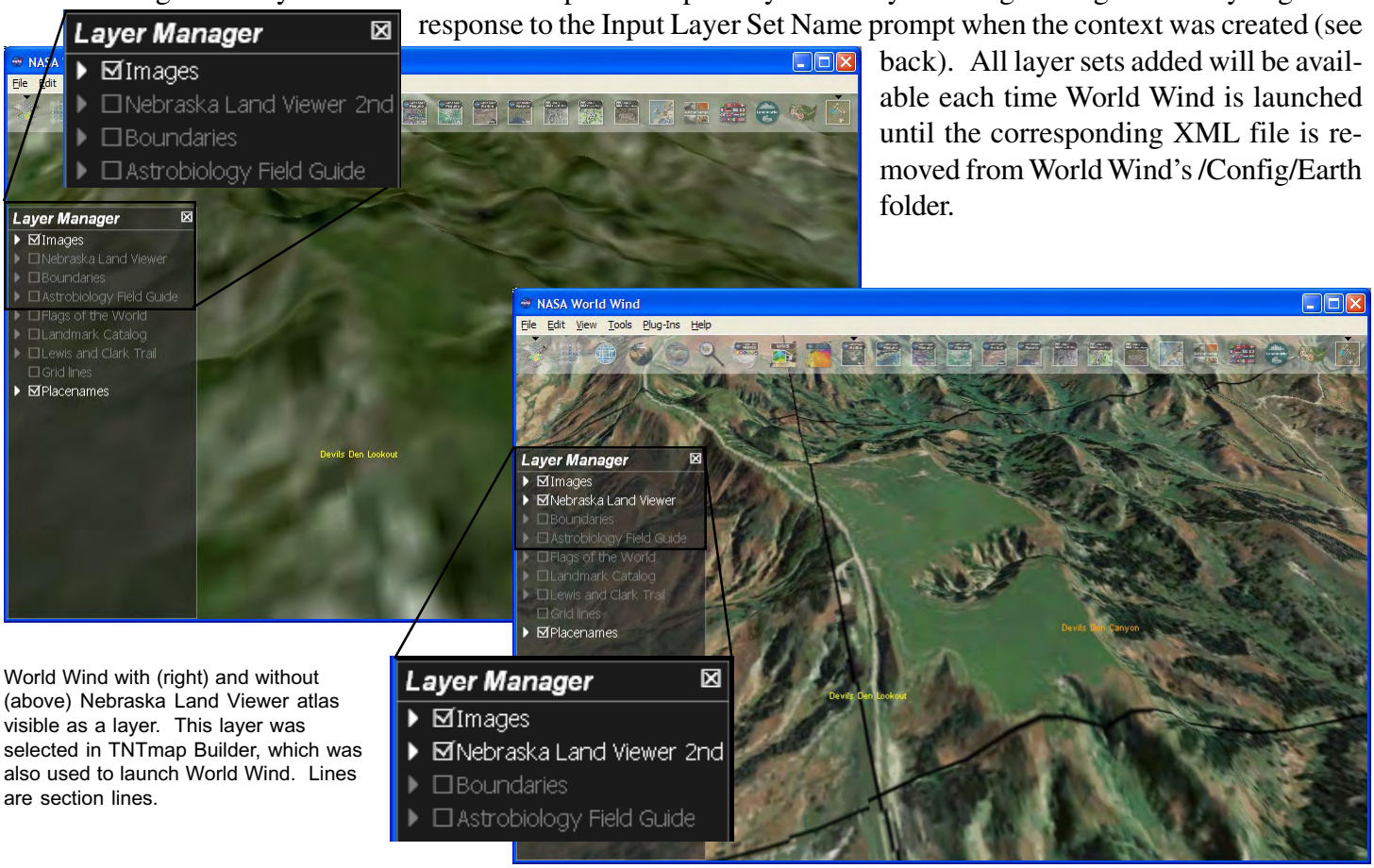
TNTmap 2006:72

Use World Wind to View WMS Layers

Layers selected from a TNTserver site or from any other Web Map Service (WMS) compliant server (ISO 19128) can be displayed in TNTmap Viewer, TNTmap Open, Google Maps, Google Earth, or World Wind using TNTmap Builder. This display of selected layers can be immediate (the designated application is launched with the selected layers in place) and/or the web map content can be saved for subsequent use in any of these applications (see the back of this page for information on saving web map content for World Wind). Only the installed version of TNTmap Builder can directly launch World Wind with the selected layers added. When a World Wind context file is saved from the web application version of TNTmap Builder, it is saved to your default browser location. You then need to move it to the NASA/World Wind/Config/Earth folder for the layer set to be available the next time you launch World Wind. If World Wind is already open, new layers are not added until your next World Wind session. The World Wind application is not available for the Macintosh at this time.

When you use TNTmap Builder to launch World Wind, the layers currently selected for the Main View are added to display over the World Wind Images layer set using the name you assigned when saving, and you zoom to the approximate extents of your selected layers. Note that Layer Manager display is optional in World Wind and that World Wind lists its layers in bottom to top order, which is the opposite of the order used in TNTmap Builder. You can right-click on any layer and choose to zoom to its extents.

To use this feature, you must download and install World Wind, which is available at http://worldwind.arc.nasa.gov. If your Main View list in TNTmap Builder contained individual layers, you will have separate layers in World Wind that can be turned off individually. You can have multiple sets of layers from TNTmap Builder included for World Wind viewing. Each layer set is listed and manipulated separately in the Layer Manager using the name you gave in response to the Input Layer Set Name prompt when the context was created (see back). All layer sets added will be available each time World Wind is launched until the corresponding XML file is removed from World Wind's /Config/Earth folder.



World Wind with (right) and without (above) Nebraska Land Viewer atlas visible as a layer. This layer was selected in TNTmap Builder, which was also used to launch World Wind. Lines are section lines.

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Save Layers for Automated Restart in World Wind (*.xml Context)

The five Save As/Settings panels in TNTmap Builder let you save a context file for later, independent viewing of the currently selected layers on the Main View panel. This Web Map Service (WMS) content can be made up of layers from one or more WMSs. You can choose to save a context file for Google Maps (*.htm), Google Earth (*.kml), World Wind (*.xml), TNTmap Open (*.htm), or TNTmap Viewer (*.htm or *.cml). Double-clicking on a saved context file will launch the application that was selected when the context file was saved with the designated WMS layers in the correct location. The five Save As/Settings panels each provide the relevant options for one of the target web map viewing applications listed above. The color plate entitled *TNTmap 2006:72: Saving and Using Contexts* provides general information on the various contexts and how they are used in TNTmap. This same panel can be opened from the Change Settings icon at the top of TNTmap Builder.

Name to use for layers listed in your Main View when its content is saved as a context file for automated reuse later.

Installed Version: you have the opportunity to alter this name when the file path is chosen if you forgot to alter it here or if change your mind about the name you want.

Web Application Version: this name will be assigned if you permit this context file to be saved. It will automatically be saved to the generic place your browser uses for any files you trust and permit to be saved.

Identifies the active panel.

Clicking on these icons switches to the panel with settings for that format.

Google Earth

World Wind

TNTmapOpen

Google Maps

TNTmap Viewer

Enter the desired description for inclusion in the web map context file (*.xml).

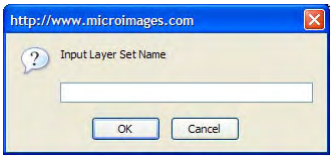
Closes Save As/Settings panel without changing any settings.

Saves references to the layers currently on the Main View list to a World Wind context (*.xml). See Title description for installed and web application version behaviors. You are led through a series of prompts (below) after you click on this button, which vary depending on whether you are running the installed or web application version of TNTmap Builder.

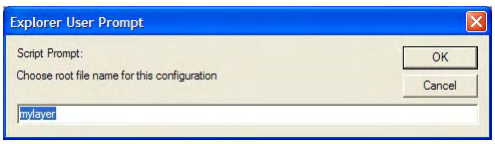
Saves current settings as default parameters for World Wind sessions. A context file *will not be saved*.

Installed Version: the tilt, heading, and other parameters are saved for automatic use for future World Wind sessions launched from TNTmap.

Web Application Version: these settings only apply to the current session of TNTmap. They are not saved for use the next time you launch World Wind from a new TNTmap session.

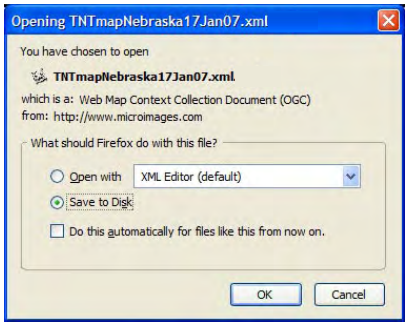


The name you enter here is the name that appears in World Wind's Layer Manager. Used for both the web application and installed versions of TNTmap Builder.



Installed version only. The name you enter here is the name used for the saved context file in your NASA/World Wind/Config/Earth folder.

Web application version only. Instructions to move the context file you download. Move to your NASA/World Wind/Config/Earth folder.



Web application version only. Choose Save to Disk in this window, then click OK. You will then find a file named TNTmapYourName.xml on your desktop or wherever your browser is configured to save. Move that file to the / Config/Earth folder where World Wind is installed. This layer set will appear the next time you run World Wind.

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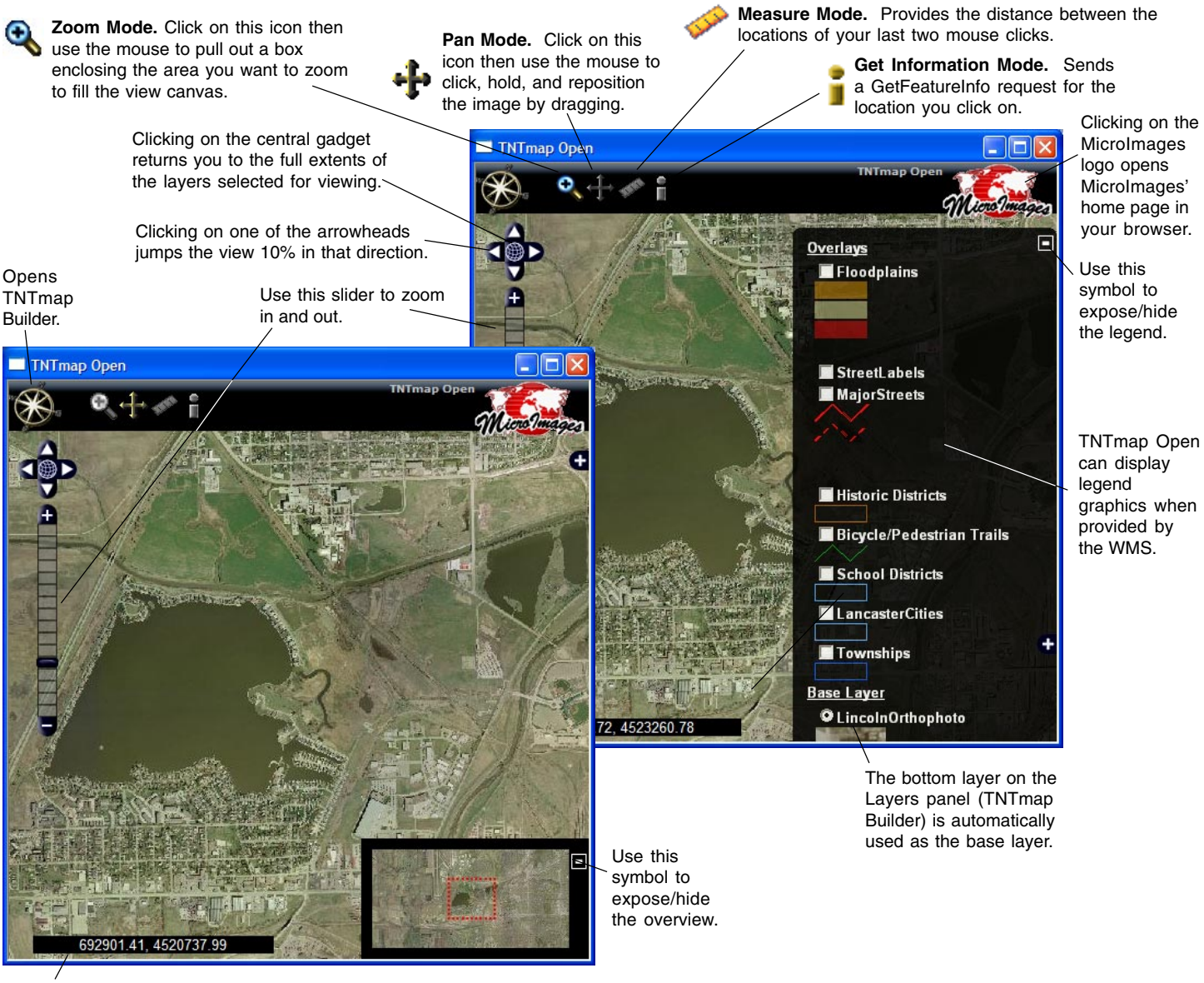
TNTmap 2006:72

Use TNTmap Open to View WMS Layers

Layers selected from a TNTserver site or from any other Web Map Service (WMS) compliant server (ISO 19128) can be displayed in TNTmap Viewer, TNTmap Open, Google Maps, Google Earth, or World Wind using TNTmap Builder. This display can be immediate (the designated application is launched with the selected layers in place) and/or the web map content can be saved for subsequent use (see the back of this page). When you launch into TNTmap Open using the icon in TNTmap Builder, you are using the OpenLayers API together with extensions provided by the TNTmap web application or executable version. OpenLayers is an Open Source JavaScript toolkit initially developed by Metacarta then placed in the public domain for free use under the BSD License (http://openlayers.org).

There are four modes for mouse left-click actions: zoom, pan, measure, and get information. Information about individual features can be displayed from the layers as a response from a WMS server to a GetFeatureInfo request by single-clicking over the view canvas (for TNT objects the DataTips set up in your TNT product are automatically used) in this last mode. Double-clicking on the view canvas zooms in 2X in both zoom and pan modes.



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Save Layers for Automated Restart in TNTmap Open (*.htm Context)

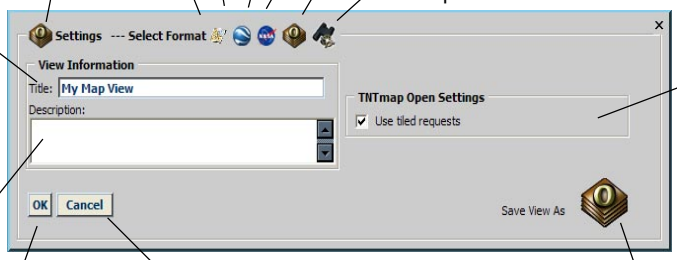
The five Save As/Settings panels in TNTmap Builder let you save a context file for later, independent viewing of the currently selected layers on the Layers panel. This Web Map Service (WMS) content can be made up of layers from one or more WMSs. You can choose to save a context file for Google Maps (*.htm), Google Earth (*.kml), World Wind (*.xml), TNTmap Open (*.htm), or TNTmap Viewer (*.htm or *.cml). Double-clicking on a saved context file will launch the application that was selected when the context file was saved with the designated WMS layers in the correct location. The five Save As/Settings panels each provide the relevant options for one of the target web map applications listed above. The color plate entitled *TNTmap 2006:72: Saving and Using Contexts* provides general information on these various viewing contexts and how they are used in TNTmap. This same panel can be opened from the Change Settings icon at the top of TNTmap Builder.

Name to use for layers listed in your Main View when saved as a context file for automated reuse later.
Installed Version: you have the opportunity to alter this name when the file path is chosen if you forgot to alter it here or if you change your mind about the name you want.
Web Application Version: this name will be assigned if you permit this context file to be saved. It will automatically be saved to the generic place your browser uses for any files you trust and permit to be saved.

Identifies the active Settings panel.

Clicking on these viewer icons switches to the panel with settings for that format.

Google Earth
World Wind
Google Maps
TNTmap Open
TNTmap Viewer



Determines whether or not TNTmap Open requests tiled images from the selected WMS(s).

Enter the desired description for inclusion in the web map context file (*.htm).

Closes Save As/Settings panel without changing any settings.

Saves current settings as your default parameters. A context file *will not be saved*.
Installed Version: whether or not to use tiled requests is saved for automatic use for future TNTmap Open sessions.
Web Application Version: these settings only apply to the current session of TNTmap. They are not saved for use the next time you launch TNTmap Open from a new TNTmap session.

Saves references to the layers currently on the Main View list in TNTmap Builder as a web map context file (*.htm) for TNTmap Open. See Title description for installed and web application version behaviors.

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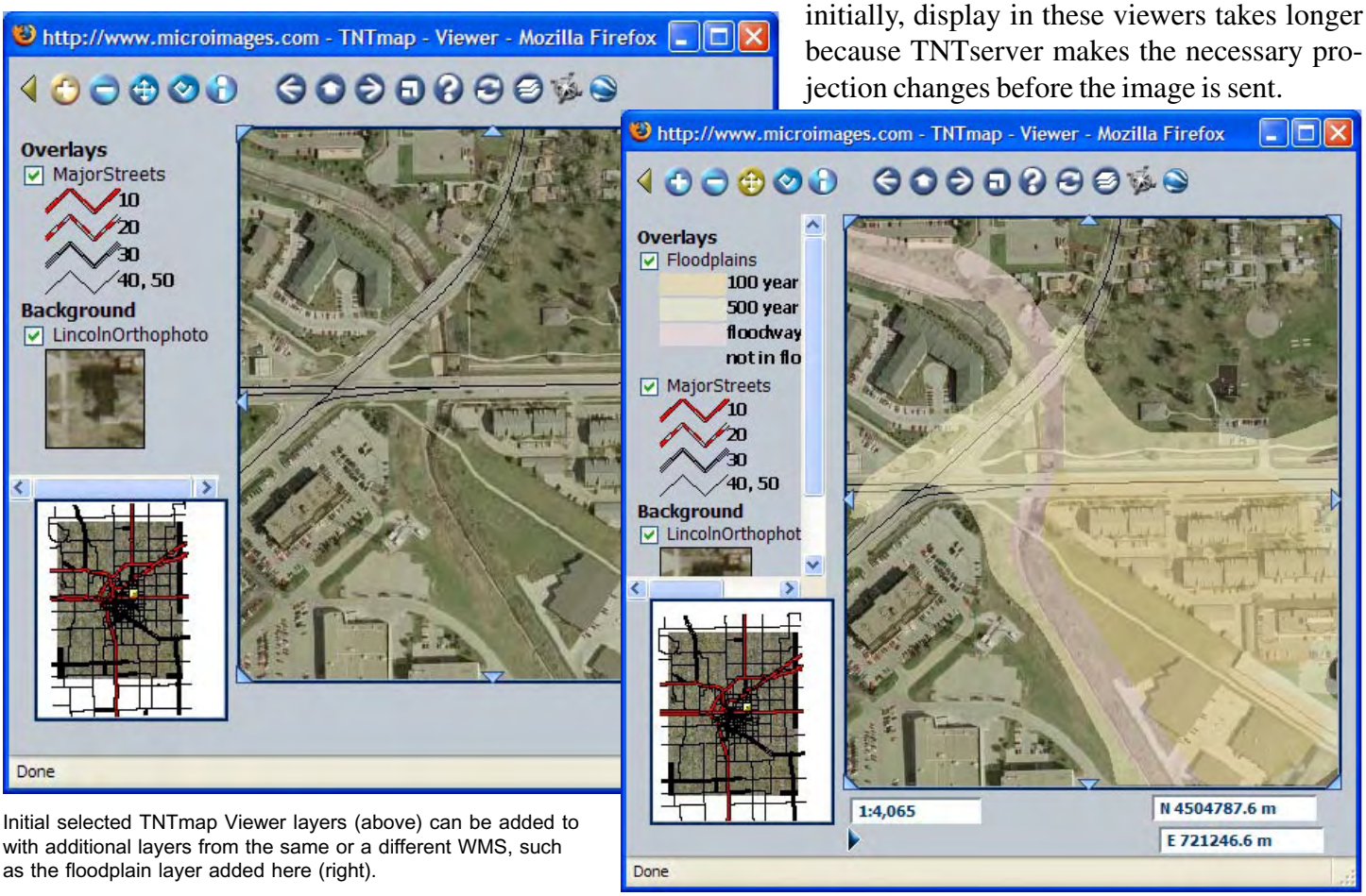
TNTmap 2006:72

Use TNTmap Viewer to View WMS Layers

Layers selected from a TNTserver site or from any other WMS compliant server can be displayed in TNTmap Viewer, TNTmap Open, Google Maps, Google Earth, or World Wind using TNTmap Builder. The display of selected layers can be immediate (the designated application is launched with the selected layers in place) or the web map content can be saved for subsequent use in any of these applications (see the back of this page for information on saving a web map context for TNTmap Viewer).

You can choose to open a new instance of TNTmap Viewer for the current layer set or add layers to an existing view from TNTmap Builder (the icon with the blue rectangle behind the binoculars adds to an existing view) for all versions except the Macintosh widget (see the color plate entitled *TNTmap Builder 2006:72: Four Ways to Run*). Google Maps and TNTmap Open open a new window each time you click on their launch buttons, Google Earth adds all layer sets to the temporary places in a single window, and World Wind has to be closed and reopened for subsequently added layers to appear. Note that both the initial layers and the newly added layers must be in the Main View list to view them all when you reuse an already open TNTmap Viewer. TNTmap Viewer and TNTmap Open are the only viewer choices that provide legend graphics, as shown in the illustrations below, if they are available and you have requested them (Mixed Legend or Images & Text Legend is selected on the Settings panel, see back of page).

TNTmap Viewer does not care what Coordinate Reference System (CRS) its layers are in. It automatically reconciles the CRSs for all layers and displays them in the CRS you have selected in TNTmap Builder. Google Maps requires layers in Mercator projection, and Google Earth requires Lat/Lon. If layers are not in these projections initially, display in these viewers takes longer because TNTserver makes the necessary projection changes before the image is sent.



Initial selected TNTmap Viewer layers (above) can be added to with additional layers from the same or a different WMS, such as the floodplain layer added here (right).

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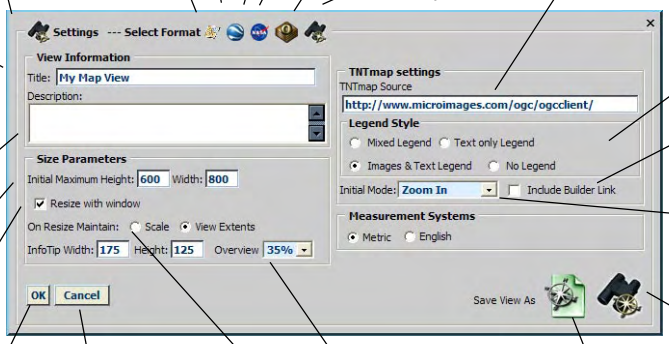
Save Layers for Automated Restart in TNTmap Viewer (*.cml, *.htm Context)

The five Save As/Settings panels in TNTmap Builder let you save a context file for later, independent viewing of the currently selected layers on the Main View panel. This Web Map Service (WMS) content can be made up of layers from one or more WMSs. You can choose to save a context file for Google Maps (*.htm), Google Earth (*.kml), World Wind (*.xml), TNTmap Open (*.htm), or TNTmap Viewer (*.htm or *.cml). Double-clicking on a saved context file will launch the application that was selected when the context file was saved with the designated WMS layers in the correct location. The five Save As/Settings panels each provide the relevant options for one of the target web map viewing applications listed above. The color plate entitled *TNTmap 2006:72: Saving and Using Contexts* provides general information on the various contexts and how they are used in TNTmap. This same panel can be opened from the Change Settings icon at the top of TNTmap Builder.



Name to use for layers listed in your Main View when saved as a context file for automated reuse later.
Installed Version: you have the opportunity to alter this name when the file path is chosen if you forgot to alter it here or if you change your mind about the name you want.
Web Application Version: this name will be assigned if you permit this context file to be saved. It will automatically be saved to the generic place your browser uses for any files you trust and permit to be saved.

Identifies the active panel.

Clicking on these viewer icons switches to the panel with settings for that format.

Google Maps

Google Earth

World Wind

TNTmap Open

TNTmap Viewer

Identifies location of TNTmap.

Choose the legend type to show in TNTmap Viewer[1].

See[2].

Set initial mode for TNTmap Viewer operation. Choose from Zoom In, Get InfoTip, Inverse Zoom, Recenter, and Measure.

Enter the desired description here for inclusion in the web map context document (*.cml or *.htm).

Sets the default maximum initial height/width of the view canvas in TNTmap Viewer.

When turned on, the view canvas will resize when the window is resized.

Closes Save As/Settings panel without changing any settings.

Overview size relative to view canvas.

Determines whether scale or extents are maintained when TNTmap Viewer is resized.

Saves references to the layers currently on the Main View list in TNTmap Builder to a DHTML TNTmap context document (*.htm). See Title description for installed and web application version behaviors.

Saves references to the layers currently on the Main View list in TNTmap Builder to an OGC web map context document (*.cml). See Title description (above left) for installed and web application version behaviors.

Saves current settings as your default parameters. A context file *will not be saved*.
Installed Version: the tilt, heading, and other parameters are saved for automatic use for future Google Earth sessions launched from TNTmap.
Web Application Version: these settings only apply to the current session of TNTmap. They are not saved for use the next time you launch Google Earth from a new TNTmap session.

Notes:

[1] The *Mixed Legend* choice uses images if they are available and text if there are no images while the *Images & Text Legend* choice uses both if they are available. The simpler the type of legend you select, the faster the response time. There is no guarantee that legends will be available as they are not required for WMS compliance.

[2] **Installed Version:** when the box is checked, an icon (right) is included in TNTmap Viewer to launch TNTmap Builder. When opened this way, TNTmap Builder includes the layers being viewed on the Main View list. You can then add/remove layers and update in the existing or a new TNTmap Viewer window or open the layers in Google Earth, Google Maps, or World Wind.
Web Application Version: this icon and functionality are automatically included.

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TNTmap Viewer 2006:72 Help

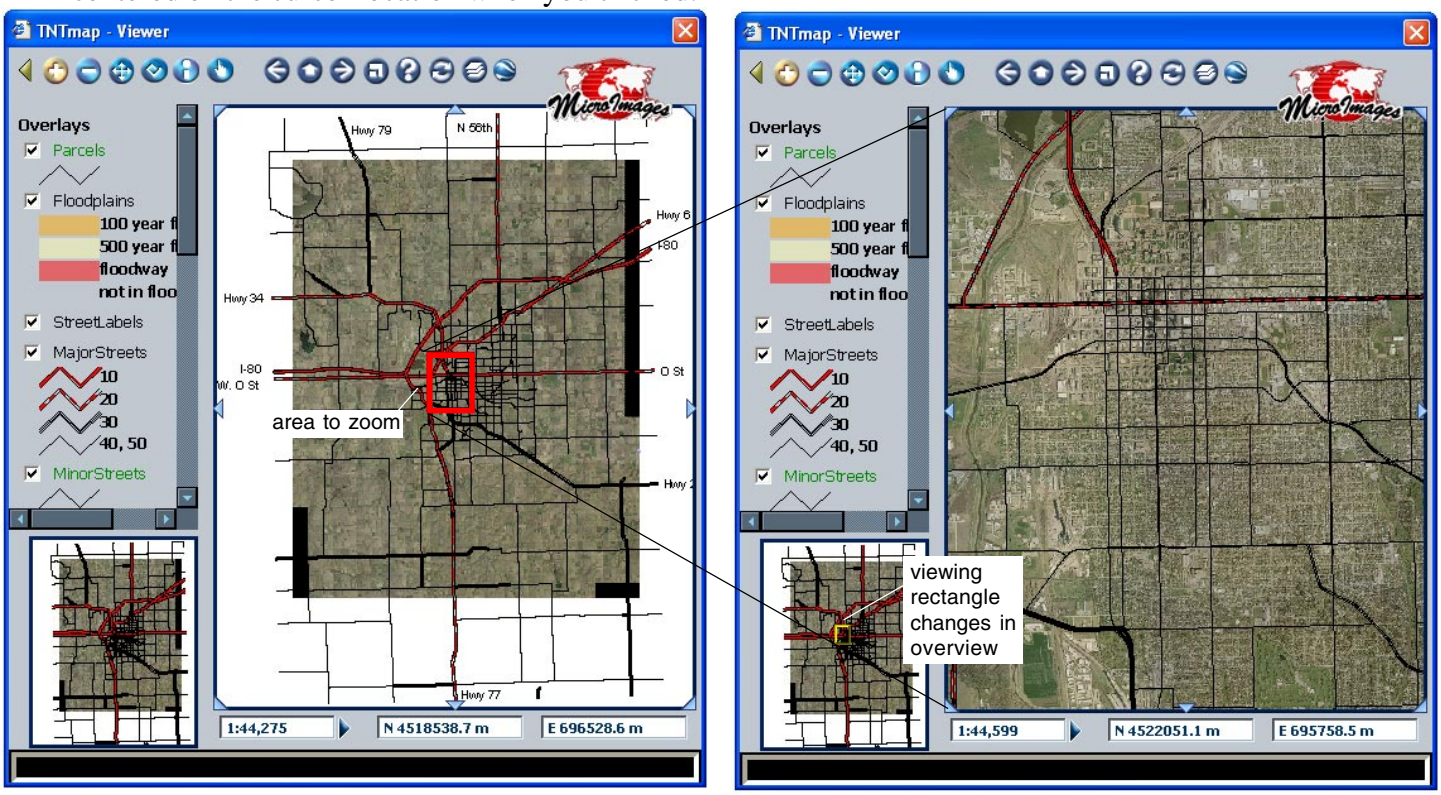
TNTmap Viewer is launched when you select an atlas for viewing from MicroImages' web site (www.microimages.com/tntmap) or from TNTmap Builder with the WMS layers you have selected. TNTmap Viewer runs in an Internet browser including Internet Explorer, Safari, Firefox, and Mozilla. TNTmap Viewer provides tools so you can zoom, navigate, measure, and acquire other information about the layers in the atlas selected. You can also open your current view as an overlay in Google Earth. Using the companion TNTmap Builder, opened via an icon in the TNTmap Viewer window, you can also acquire and add image and map content from any other web site providing a Web Map Service.

Viewing Modes

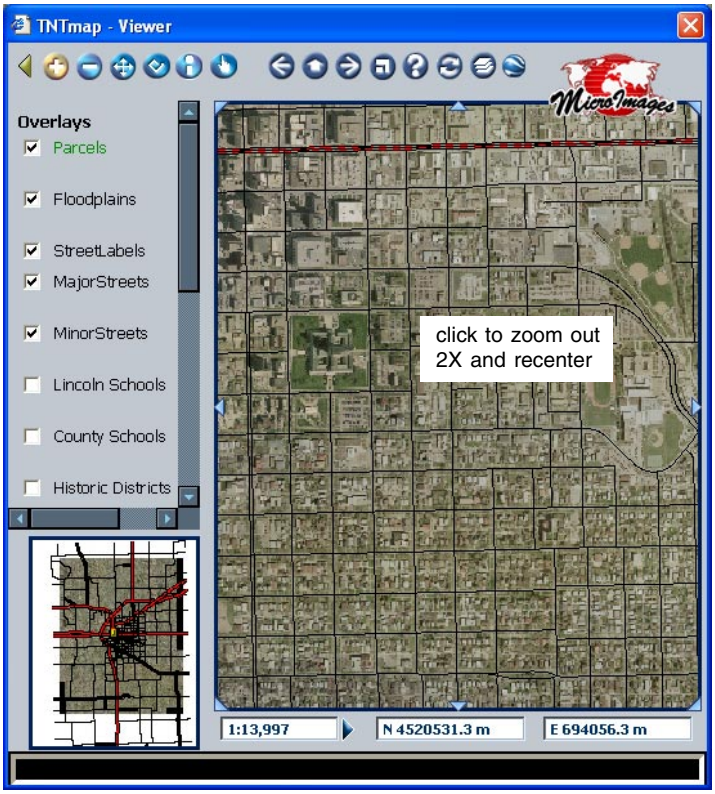
Viewing modes are activated by clicking on one of the tool icons at the upper left of the TNTmap Viewer window. When a tool is active, it changes from blue to gold.

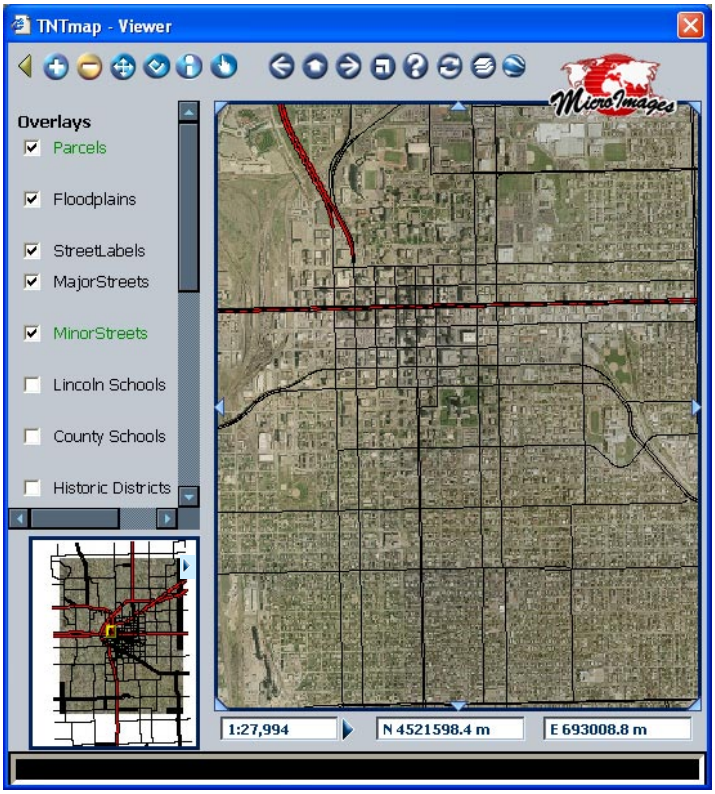
Legend On/Off. Turns the legend at the left of the window on and off. When off, the view canvas expands to the full width of the window. The overview remains in place at the lower left unless there are no layers on the Overview panel of TNTmap Builder or you use the Overview On/Off toggle.

Zoom In. When the Zoom In tool is active, it operates in two ways. You can click and zoom in 2X centered on the position you clicked in the view or you can click, hold, and pull out a box around the area you want to zoom to the size of the view canvas. You can zoom in on the view canvas or the small overview at the lower left. If you hold the Alt key and click, you will zoom out; holding the shift key and clicking repositions the view centered on the cursor location when you clicked.

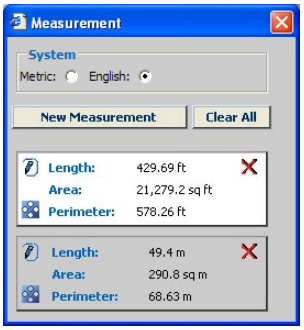


Zoom Out. The Zoom Out tool also has two modes of operation. You can click and zoom out 2X centered on the position you clicked. You can also draw a box that represents the area the current canvas contents will occupy when the view zooms out; the rest of the view canvas will be filled in with surrounding data. If you hold the Alt key and click, you will zoom in. Holding the shift key and clicking repositions the view centered on the cursor location at the time you clicked.



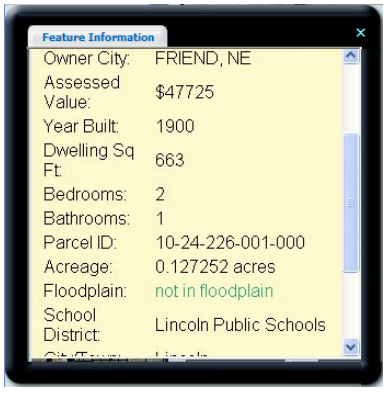


Drag Map. The Drag Map tool lets you click, hold, and drag the displayed image in any direction. Areas not initially in the view are filled in after you release the mouse.



Measure. The Measure tool lets you make linear and area measurements by drawing over or around the features you want to measure. Click anywhere in the view canvas to start drawing. Details for each measurement you make appear in a separate Measurement window. The Measure tool is simple to use but has many features that are discussed in more detail in a following section.

Show Feature Info. When this tool is selected, clicking on the image in the view opens a window with information about the feature at the location clicked. The information provided is the response to a GetFeatureInfo request, which for layers prepared in MicroImages' professional products is the information set up for viewing as a DataTip. See the Quick Guide entitled *Multiline DataTips* for how to produce DataTips with more than one line for a given layer. Any links to files or other web sites for the location also appear in this window. If the link is a hierarchical link (to another layout), clicking on it will open an additional TNTmap Viewer window with the linked layout displayed. Links can also be followed with the Navigate tool, which only appears when links are present.



Navigate. This icon appears at the right of the toolbar *only* when MicroImages' special HyperIndex® links are available in an atlas. If the link is to other map and image data, a new instance of TNTmap Viewer is launched, which displays the linked map and image data when you click on the link. If the link is to a web site or an external file, the appropriate program is opened. If your browser blocks pop-ups, you will have to hold down the Ctrl key when you click so this new window can be opened.

Viewing Actions

Last View. Returns you to your previous view.

Go To Initial Extents. Redisplays the same area of the atlas as when the current instance of TNTmap Viewer was opened. Layers that you have turned on or off while viewing remain in the same state as you set them.

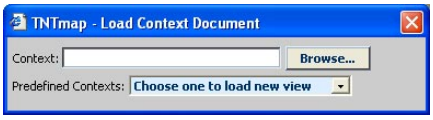
Next View. Takes you forward to the view you had prior to using the Last View button.

Overview On/Off. Toggles the overview at the lower left on and off.

Help. Takes you to a web page that provides access to this help along with other information about TNTmap.

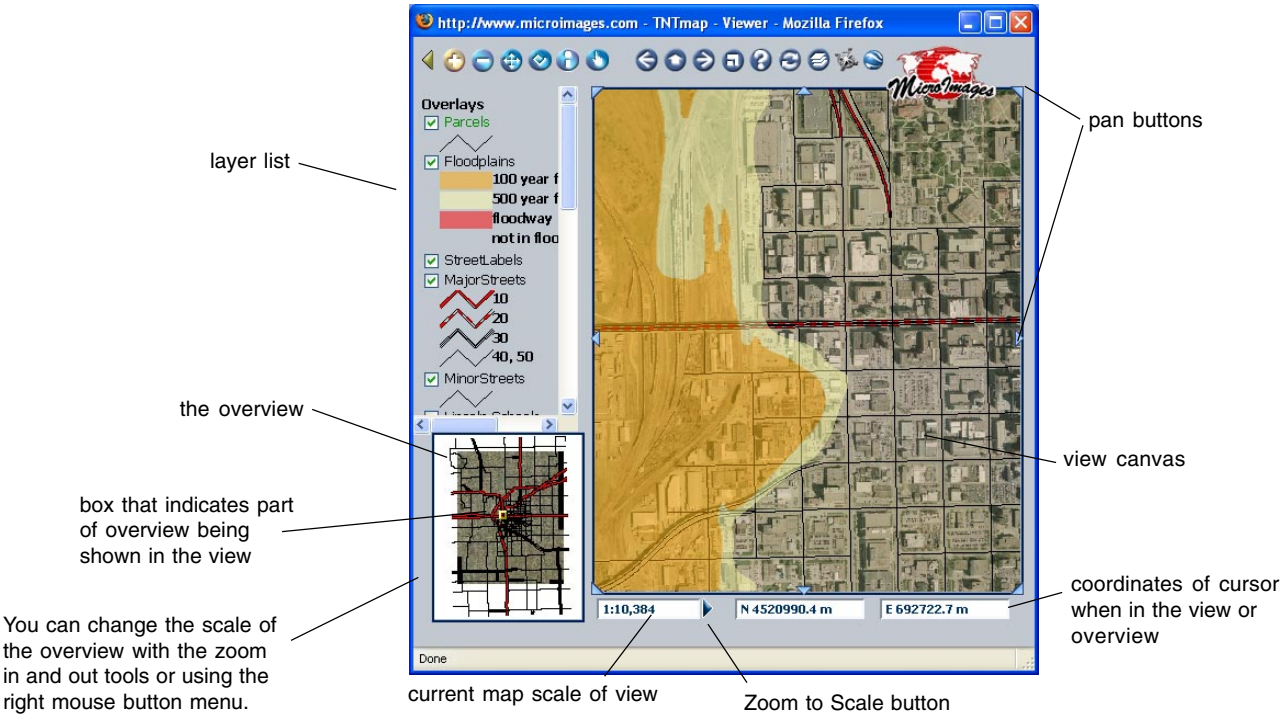
Reload All Layers. Retrieves new versions of all layers currently turned on from MicroImages' or other Web Map Services and refreshes the view.

Load new view. Opens the TNTmap - Load Context Document window so you can enter the location of or browse to a Context Document known to you or pick from known, predefined Context Documents.



Open TNTmap Builder. Opens a TNTmap Builder window so you can select layers to add to the current view or open other individually selected layers or predefined atlases from MicroImages' site in a new instance of TNTmap Viewer. You can also select layers for a new or existing view from any Web Map Service (WMS) compliant server. You can choose a WMS from the list provided or type in the URL for others you know of. This icon is not present if you opened TNTmap Viewer from TNTmap Builder installed on a Windows computer because an associated TNTmap Builder is already open. Closing an installed version of TNTmap Builder on a Windows machine, closes all TNTmap Viewers opened from it.

Open in Google Earth. Launches Google Earth with the entire atlas overlaid in place regardless of which layers you are currently displaying or the area showing in the current view. If multiple layers are present in TNTmap, they are composited into a single layer for better display in Google Earth. If you just want an individual layer or you want to use layers from other WMS-compliant sites, use TNTmap Builder to navigate to those sites and select layers for overlay.



Pan Buttons. There are eight pan buttons around the view area, one at each corner and one in the middle of each edge. Clicking on any of these buttons pans the view 50% in the direction of your click, such that 50% of the new view area overlaps the previous view.

Zoom to Scale Button. A click on this button will zoom you to the map scale you entered in the map scale field at the immediate left.

Legend

A list of layers currently available for the view is presented at the left of the Viewer if the layers are loaded separately rather than acquired as a composite image (by clicking on the *Render As Group* icon in TNTmap Builder). You can use the check boxes in this list to turn layers on and off. Color coding of the layer names indicates current layer visibility. You can change how the legend is displayed by clicking on the Save As TNTmap/Google Earth/Google Maps Formats icon in TNTmap Builder. The choices are: mixed legend (images only unless there is no image, then text is used), text only, images and text, and no legend. The more complex the legend, the longer it takes to retrieve. Also, there is no guarantee that legend images are available.

Green. If a layer name is green, that layer is present but not visible at the current zoom because the density of its elements would obscure other layers.

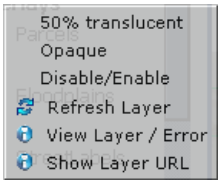
Blue. If a layer name is shown in blue, that layer does not overlap the area currently being shown in the view canvas.

Red. The initial state of all layers is red with a light background indicating the layers have not yet been loaded. Layers shown in red with a dark background were not successfully acquired from the designated WMS.

Black. Layers shown in black are visible provided they are not obscured by another overlay.

Right Mouse Button Menus

Each layer name, the overview, and the view canvas have menus that pop in when you right-click.



Layer Name Right Mouse Button Menu

- Choose between 50% transparent and opaque for each layer,
- Turn layer requests on and off (when a layer is simply hidden, a request is still sent),
- Refresh individual layers
- View individual layers or errors encountered while layer is being loaded, and
- Show layer URL, which opens a window that displays the layer's URL.

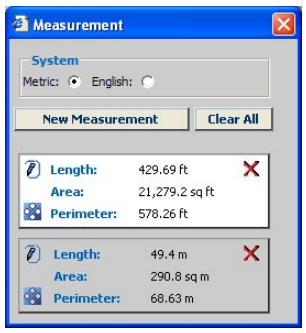
View Canvas and Overview Right Mouse Button Menu

- Zoom in and out without changing the active tool,
- Recenter without changing the active tool, and
- Get feature information regardless of the active tool.
- Go to previous, next, and initial views, and
- Refresh all layers.
- The view right mouse button menu also has Cancel Point and End Line entries when measuring.

Windows Explorer Right Mouse Button Menu

- The Add to Favorites, Copy Shortcut, and Copy URL choices occur only if the web application TNTmap Viewer is open in Windows Explorer and you are viewing a published context. Add to Favorites lets you name an entry to be added to your Windows Explorer Favorites menu. Subsequently when you make this choice, TNTmap Viewer will open in Windows Explorer with the same atlas displayed. After using Copy Shortcut or Copy URL, you can paste the shortcut or URL where you want.

The Measure Tool



Measure. The Measure tool lets you make linear and area measurements by drawing over or around the features you want to measure. Click anywhere in the view to add the first point. The Measure tool is simple to use and has many features.

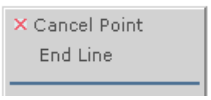
- **Drawing.** A vertex is added to the line you are drawing at each location you click. The measurements are updated as you draw. Each measurement has three values: length, area, and perimeter. Length is the length of the line you draw, while the perimeter value adds in the length of the closing segment.
- **Automatic Closure.** Once there are three vertices, a temporary closing segment is also added in yellow. The closing segment automatically adjusts as additional vertices are added.
- **Finish Line.** When done drawing, double-click or right-click and choose Finish Line from the right mouse button menu. You can also single-click on the start of the line or click on New Measurement in the Measurement window. When a line is finished, the closing segment turns green and all vertices are shown in cyan.
- **Units.** The default is Metric (meters, kilometers, hectares). You can change to English units (feet, miles, acres) if desired. If you change between unit systems, your new choice is effective for the current measurement and subsequent measurements; it does not change the values for previous measurements. You can still change earlier measurements by making them active and changing the units.
- **New Measurement.** Clicking on New Measurement finishes the previous measurement, clears that measurement from the view, and poises the tool to begin a new measurement. Additional measurements are added to the Measurement window until you close it. You can choose another tool and the Measurement window remains open. If you switch back to the Measure tool, new measurements are added to the already open Measurement window.
- **Clear.** The Clear button removes all measurements from the Measurement window. To remove a single measurement, click on the Remove Polyline/Polygon icon for that measurement.
- **Icons.** There are three icons with each measurement: Edit this element, Zoom to Measurement Area, and Remove Polyline / Polygon.

The first icon (pencil at upper left of the measurement entry) lets you reshape the line/polygon for that measurement by clicking on and dragging existing vertices or adding new vertices and dragging, which updates the measurement values.

The Zoom to Measurement Area icon (lower left) will zoom in so that the shape drawn for that measurement fills the view with a 10% margin of the surrounding area added.

The Remove Polyline / Polygon icon (upper right) removes the measurement from the Measurement window and the shape you have drawn from the view.

- **Right Mouse Button Menu.** There are two additions at the top of the right mouse button menu when you are measuring over the view canvas: Cancel Point and End Line. Cancel Point removes the last vertex added to the line you are drawing.



TNTmap Builder 2006:72 Help

TNTmap Builder lets you choose layers to display from any Web Map Service (WMS) compliant site for display in TNTmap Viewer, Google Maps, Google Earth, or World Wind. TNTmap Builder and its companion TNTmap Viewer (see *TNTmap Viewer 2006:72 Help* on our web site) together comprise TNTmap, which is open source, dynamic HTML and JavaScript and is WMS compliant. TNTmap can be run from MicroImages' or any other web site as a web application, which runs on any operating system, or it can be downloaded and installed (Windows and Mac OS X). TNTserver is not required for the operation of TNTmap or to provide data for it. Your selected layers can come from any WMS. However, many layers of potential interest are available from TNTservers at MicroImages' web site and other web sites around the world. Layers selected for viewing can be retrieved as individual layers or as a composite of selected layers at the scale required for the TNTmap Viewer view canvas size.

The TNTmap Builder window in its standard form has four tabbed panels on the left and the Locator, an information bar, and viewer launching options on the right. The panels are Layers, Main View, Overview, and Favorites. All of these features can be viewed simultaneously if you view the quadrant version of TNTmap Builder (see the color plate entitled *TNTmap Builder 2006:72: Three Forms to Fit User Preference and Device*). Functional consideration of TNTmap Builder, however, breaks down to three operations: how do you get layers to choose from, how do you select from those layers for viewing, and how is viewing them initiated. The additional features that let you refine the basic operations are not necessary to get up and running with TNTmap Builder. See the end of this document for installation and configuration information.

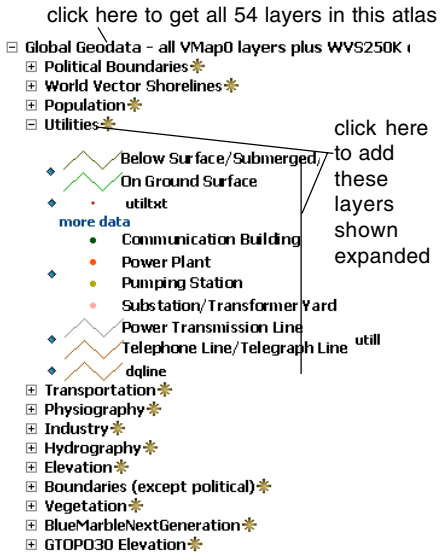
Layers Panel

Generic WMS. The server layers list on the first tabbed panel of the TNTmap Builder window provides a list of all layers published by the WMS at the URL at the top of the window, which initially defaults to the public atlas TNTserver on MicroImages' web site. If more than one registry is available at this URL, as at the MicroImages' site shown below) you may initially get a list of registries. Information from each registry is requested individually, which provides faster response times. You can switch from one registry to another in the process of selecting the layers you want to view. When a new server is selected, its layers are added to those already on the Layers panel. You can choose another server identified by MicroImages as having useful geospatial layers from the list that comes up when you click on the Add Servers to Layers Panel button at the upper right of the Builder.

All layers provided by a WMS may be listed individually or they may have logical, hierarchical groupings such that many layers are listed under a single entry when the layer list for a WMS is initially loaded. Whether layers are listed individually or grouped depends on the WMS. The icon to the left of the layer name indicates whether there are additional layers or groupings beneath it. A diamond (◆) to the left of a layer name indicates that layer has no layers beneath it. A plus symbol (⊞) to the left of a name indicates there are additional layers beneath and clicking on the plus will expand the list. There is no limit to the number of hierarchy levels for a WMS, however, many have no layer hierarchy at all.

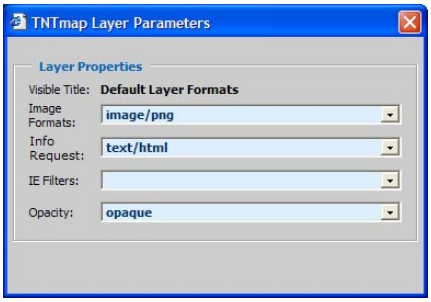
When a WMS presents its layers as part of a hierarchy, you can choose to add from any level of the hierarchy by clicking on a that level's entry in the hierarchy. When you click on an individual layer (◆ in front), just that layer is added. When you click on a level that has layers under it (⊞ in front), all the layers under it are added to the currently active selected layers panel (either Main View or Overview panel). The Main View panel is initially active for reception of layers selected on the Layers panel. You can click on levels as far up the hierarchy as desired, and all the levels and layers below will also be added.

TNTserver WMS. When a WMS is being hosted by a TNTserver, you will find some atlases posted as hierarchical groups of layers. In the terminology of the TNT products, a WMS level with a number of layers under it that do not have layers under them is called a group. Groups are further organized into layouts. An atlas may consist of one or more layouts. The screen capture at the right of a Layers panel list from a TNTserver shows a single-layout atlas comprised of 54 geodata layers organized into 12 groups, each with two or more layers. One of these groups (Utilities) is shown expanded, which reveals the five geodata layers it contains. Clicking on one of these five layers will add just that layer to the Main View panel. Clicking on Utilities (or any other group name) will add the layers in that group to the Main View panel. Clicking on the atlas name (in the illustration, Global Geodata - all VMap0 layers plus WVS250K) will add all the layers from all 12 groups to the Main View list (provided it is the active list). TNTmap Builder automatically switches to the active list panel when layers are selected.

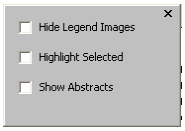


Render As Group. As mentioned previously, layers selected for viewing can be retrieved as individual layers or as a composite of selected layers. Compositing is done on a group by group basis by the TNTserver. Retrieval as individual layers is described above, simply click on the layer name. Multiple layers are retrieved as a composite layer if you click on the Render as Group icon. When you click on this icon next to the group name, a single entry with the group name is added to the selected layers at the right. A composite image is generated by TNTserver from all the layers in the group at the appropriate scale for the current image request. When layers are acquired as a composite image, you cannot turn on/off the individual layers that make up the composite in TNTmap Viewer as you can when each is added as a separate layer. You can, of course, turn the composite layer on/off. For better rendering in Google Earth, all selected layers are rendered as a single image regardless of whether this option was used.

Set Default Image Properties for this Server. Clicking on this icon opens the Modify Layer Properties window, which lets you specify the format for image retrieval (jpeg, jp2, png, png;Color Palette, png;True Color, png;Color Palette+Interlaced, png;True Color+Interlaced, vnd.google-earth.kml+xml, and svg + xml), the format for Info requests (html), an Internet Explorer filter to use (none, remove white, remove black, enable 24 bit PNGs, and engrave(relief), and the percent opacity for layers from the selected server.

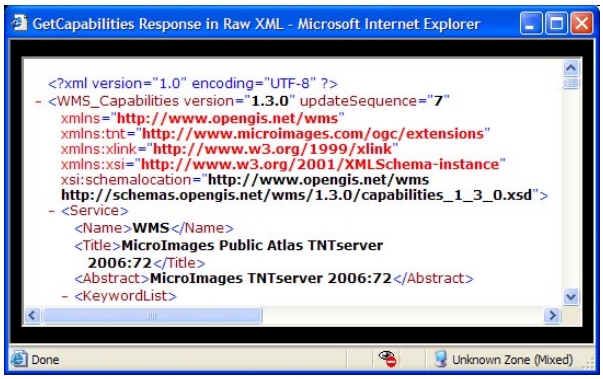


Display Choices. Clicking on this icon pops in a panel that lets you specify how layers appear in the selected server list. You can turn legends on/off (illustrations on page 1 and this page have legends on), choose whether layers selected for viewing remain identified by highlight, and turn on/off viewing abstracts if they are available.



Clear Layer List. When you switch from one WMS to another, the layers from the new WMS are added to those available from the previously selected WMS(s). This button lets you clear the list and start over.

View servers capabilities source XML. Opens a window with the response to a GetCapabilities request from the selected server in XML. This information can be useful when troubleshooting WMS performance from various sites.



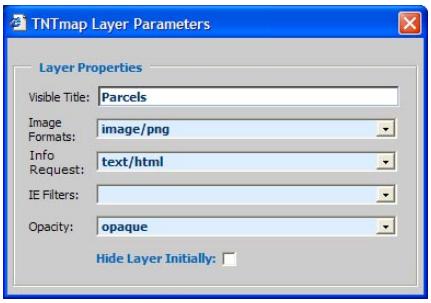
Main View Panel

The Main View panel shows the layers you have selected for viewing in TNTmap Viewer or other WMS client. It is active (will receive initially selected layers) and blank when TNTmap Builder opens. As you select layers from various WMSs they are added to the Main View list if it is the active list. You switch between and add layers to the Main View list and the Overview list by clicking on the tab with the same name, which makes a panel the active panel when you return to the Layers panel and select more layers. Layers can be moved up or down or removed in either list. The list is shown in the order the layers will be displayed, which means the layer at the bottom of the list (added first) will be the bottom layer in TNTmap Viewer. The top and bottom layers are identified in the list to avoid confusion. Once you have the desired layers selected, click on the button for the desired client (Google Maps, Google Earth, World Wind, and TNTmap Viewer) at the lower right of the window to view these layers. If you already have TNTmap Viewer open, you can choose to update that display using the Update in existing window button (icon with blue rectangular background) instead of opening a new view after making desired changes, such as reordering or adding/deleting layers or choosing a new layer to zoom to.

Set extents and Coordinate Reference System from this layer. Sets the area for the initial or updated display to match the area of the highlighted layer. You could, for example, select several global layers and a layer covering a single state or province. If you do not choose to use a particular layer to determine the extents to be viewed or if you select a global layer and click on this icon, your initial view in TNTmap Viewer will be scaled to fit all the data (which means a global view). If you highlight a state or province layer and click on the globe, you will be zoomed in to that boundary, with a little margin, when when you open TNTmap Viewer. The Coordinate Reference System (CRS) that is used to determine this area is derived from the layer and WMS.

Derive view extents from Locator at the right. Uses the current extents of the Locator view (upper right of TNTmap Builder window) to determine the area shown initially in TNTmap Viewer. Use of the Locator is described later.

Layer Properties. A window opens to let you change the name used for the layer in TNTmap Viewer from what appears in the Main View Layers list (name does not change in Main View Layers list), choose between image formats (jpg, jp2, png, png Color Palette, png True Color, svg+xml), set the format for information requests (text/html is the only option currently), set IE filters [remove white, remove black, enable 24-bit PNGs, and engrave (relief)], and set percent opacity (from 10% to opaque). You can also elect to hide the layer initially and toggle it on later in TNTmap Viewer so that it does not initially obscure other layers.



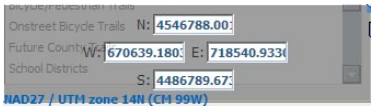
Move Layer Up. Moves the highlighted, or active, layer up on on the list, thus changing its order in TNTmap Viewer.

Remove Active Layer. The blue X icon removes just the active, or highlighted, layer. The red X icon removes all layers from the list.

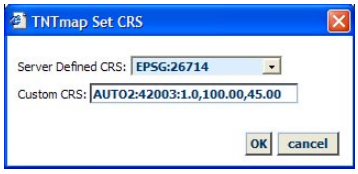
Move Layer Down. Moves the highlighted layer down in the list.

Clear all layers. The red X icon removes all layers from the list. The blue X icon removes just the active, or highlighted, layer.

Set Locator view to use this layer set. Uses the layers listed on this panel for the Locator view at the upper right of the standard and quadrant forms of TNTmap Builder.



Show/Hide Manual Extents Tool. Pops in a tool so you can enter the extents in the CRS shown at the bottom of the Main View panel. A blue box over the Locator image indicates the entered extents. The red box in the Locator reflects the highlighted layer's extents. You can change this CRS but be aware the CRS selected here is the one TNTserver will use to generate the images sent to the viewing client.



Active Coordinate Reference System (CRS). Clicking on the specified CRS at the bottom of this panel opens a window so you can pick from other CRSs advertised by the selected server. Some servers do not advertise all CRSs supported so a Custom CRS field is provided so you can enter the parameters for CRSs not on the list. The last field changed before you click on OK determines whether the server defined or custom CRS is used.

Save to Favorites. The Save to Favorites button on the Main View panel appears only if you are using an installed version of TNTmap Builder because the web application version leaves nothing behind on your machine when you exit. When you click on this icon, you are prompted for a name to assign to the layers currently on the Main View panel, and an OGC context file (*.cml) is created in your Program Files/MicroImages/TNTmap/contexts directory. That name is also added to the Saved Views list on the Favorites panel of TNTmap Builder. Since this list is saved, it persists from one TNTmap Builder session to another. Selecting a saved favorite from this list adds the associated layers to the Main View panel, and you can select your viewer of choice after that from the icons at the right.

Viewing and Saving Layers Currently on the Main View Panel

To view the layers you have selected, click on the Launch button for the desired viewer at the bottom right of the TNTmap Builder window (or the Update in existing window button if you already have TNTmap Viewer open and want to change the layers displayed in that view). There is no guarantee you will see the layers you have selected from any WMS. Many of them simply do not work or work sporadically. If there is a problem loading a layer, the layer name will be shown in red in the TNTmap Viewer legend. If you want to check whether the problem is with TNTmap or the selected WMS site, try one of the other clients available for viewing WMS layers (see the list of other available clients at www.microimages.com/tntmap/wmsclients).

Launch in Google Maps. Clicking on this icon opens the layer(s) on the Main View panel using the Google Maps API together with extensions provided by TNTmap. See the color plate entitled *TNTmap 2006:72: Use Google Maps to View WMS Layers.*

Launch in Google Earth. Launches Google Earth if installed on your machine and zooms to the approximate extents of the layers on the Main View panel. The layers appear under the My Favorites heading at the left of the Google Earth window. If Google Earth is already running, the layers will ge added to the open view. See the color plate entitled *TNTmap 2006:72: Use Google Earth to View WMS Layers.*

Launch in World Wind. Prompts for a name of the layer set to provide the name for the saved xml file. This file is saved in your World Wind Config/Earth directory. World Wind is only automatically launched if you are running the installed version of TNTmap Builder. If you are running the web application version, you need to move the files saved by your browser to the World Wind Config/Earth directory and launch World Wind yourself. The World Wind application is not currently available for Mac OS X. See the color plate entitled *TNTmap 2006:72: Use World Wind to View WMS Layers.*

Launch in TNTmap Open. Launches TNTmap Open with the full extents of the layer(s) on the Main View list displayed using the Open Layers API together with extensions provided by TNTmap. See the color plate entitled *TNTmap 2006:72: Use TNTmap Open to View WMS Layers.*

Launch in TNTmap Viewer. Clicking this icon displays the layers on the Main View panel in TNTmap Viewer using the extents defined in TNTmap Builder or the full extents of all the layers if not specified. See the color

plates entitled *TNTmap 2006:72: Use TNTmap Viewer to View WMS Layers* and *TNTmap Viewer 2006:72: Viewing WMS Layers*.

Update in existing TNTmap Viewer window. Places layers currently on the Main View list in an open TNTmap Viewer window. See the color plates entitled *TNTmap 2006:72: Use TNTmap Viewer to View WMS Layers* and *TNTmap Viewer 2006:72: Viewing WMS Layers*.

Save As TNTmap/Google Earth/Google Map Formats. Opens a dialog that lets you set a number of parameters for the layer set, including tilt and heading if saving to Google Earth, and lets you pick the format to save to. Your choices are: Google Maps (*.htm), Google Earth (*.kml), NASA World Wind (*.xml), TNTmap Open (*.htm), and TNTmap (as *.htm or an OGC context file *.cml). You can click on OK at the bottom left of the panel to save changes to parameters for use with subsequently opened views in the current session without saving any layer information. If you want to review or change parameters for the various viewers without creating a context file, you can also click on the Change Settings icon at the top of the window. The backs of the four plates listed for other viewers and the first plate listed for TNTmap Viewer explain the parameters on each of the tabs of this Settings panel. You switch from one format to another by clicking on the corresponding icon at the top of the panel. The icon for the current panel is shown at the upper left.

Overview Panel

Make the Overview panel active by clicking on the Overview tab. This panel is used to list and manage the layer(s) selected for the overview image that will be shown for general area reference in the lower left corner of TNTmap Viewer. The Overview is not used in other viewers. (TNTmap's implementation of the Google Maps API uses the base layer and Google Maps Overlay in its overview while TNTmap Open uses the bottom layer only.) TNTserver automatically places a layer in this list. This layer is the Blue Marble global image with a vector overlay of national boundaries plus states/provinces where available. You can delete this layer using the Remove Layer or Clear all layers icon (blue or red X at right edge of panel). You can then add any layer(s) you wish from any WMS to provide the contents of the Overview in TNTmap Viewer. For example, use a map of the general area covered by the layers in the Main View Layers list. Layers are added and managed in this list just as for the Main View list outlined above with the exception of the top two icons.

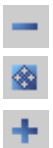
Note that the Overview image is shown in TNTmap Viewer by default. An "Overview On/Off" icon in TNTmap Viewer can be used to toggle the Overview on and off. Also, if you have limited the area to be viewed using the globe icon or entered extents, the Overview image will be zoomed to those extents.

Load Default Overview. Adds the default global Overview layer described above. This button replaces the *Set extents and Coordinate Reference System from this layer* button that is present when the Main View panel is active.

Match Main View. Adds all the layers in the Main View Layers list to the Overview Layers list. This button replaces the *Derive view extents from Locator to the right* button that is present when the Main View panel is active.

Layer Locator View and Controls

The upper right corner of the Builder provides a Locator image to show you the geographic extents of any layer offered by any WMS. These extents are included in the XML metadata of the layers returned in response to your current selection of the WMS shown on the Layers panel. The image used in this Locator is installed with TNTserver and retrieved with a GetMapRequest from TNTmap Builder. The default content is a global view of the Blue Marble global image with a vector overlay of national boundaries plus states/provinces for Canada, the United States, and Brazil.



If you pause the cursor over any layer name in the Layers, Main View, or Overview lists, a red outline on the locator image shows you the geographic extents of that layer. You may also see a blue outline if the Manual Extents tool ( ) has been used. Use the plus icon ( ) above the image or pull out an elastic box on it with the cursor to zoom in to use this red outline box to review the coverage of layers with local extents. The field above the image is for entry of place names to zoom to provided by the Google Maps API. The *Zoom to global extents*

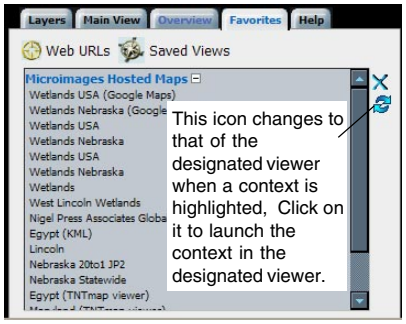
icon ( ) returns the locator to its original view. You can zoom out with the minus icon ( ).

The Locator can also be used to define the geographic area that TNTmap Viewer will automatically zoom in to when first opened. The *Derive view extents from Locator to the right* icon ( ) at the right of the Main View and Overview panels sets up the extents of the initial view to match what is currently shown in the Locator.

Favorites Panel

Both installed and web application versions of TNTmap Builder have a Favorites tabbed panel. Only the installed versions (Windows and Mac OS X) have the Web URLs and Local Contexts headings. The context files listed on the Favorites panel in the web map application and under the Web URLs heading in the installed versions are context files generated by MicroImages for geospatial data and atlases of potential interest located on MicroImages' web site. These context files specify the viewer in which they will be launched. In the web application versions, the designated viewer is indicated by an icon next to the context name. Clicking on either the icon or context name will launch the designated viewer with the layers specified by the context file. In the installed versions when a context is highlighted, the designated viewer is indicated by the launch icon to the right of the list. Click on this icon to launch the desired context in the designated viewer, or you can double-clicking on the context name. There are three types of context documents that TNTmap Builder saves with an htm extension: those intended for TNTmap's version of Google Maps, TNTmap Open, and TNTmap Viewer. This dynamic icon does not establish which of the three is the intended viewer ao it is a good idea to include the viewer name in the name of the context file.

web application

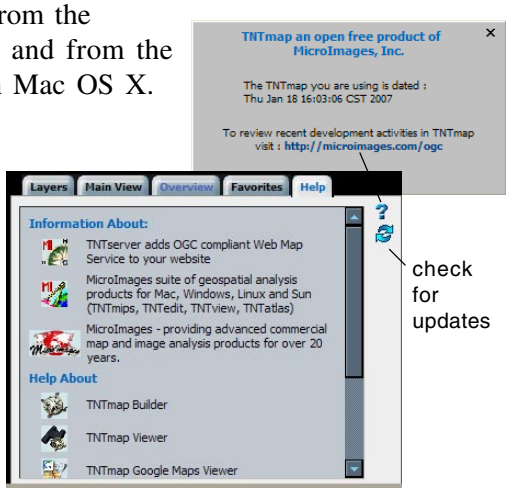


installed

The list available by clicking on the Local Contexts heading in installed versions of TNTmap Builder contains context files you have saved using TNTmap Builder, TNTmap Viewer (Mac OS X only), or some other WMS viewer if the files have been copied to thte appropriate place (the Maps folder in your home directory). You switch between the list provided by MicroImages (Web URLs) and your personal favorites (Saved Views) by clicking on the desired heading. You can manage what appears on your personal favorites list by removing unwanted context files from the \Program Files\MicroImages\TNTmap\contexts folder on Windows systems and from the Maps folder in your home directory using the TNTmap Builder widget with Mac OS X.

Help Panel

The Help tabbed panel has links to a variety of web pages, color plates, and multi-page Help documents. The top information link takes you to a page with general information about TNTserver and links to download third-party products needed for complete functioning of TNTserver and TNTmap (Apache, Perl, and a Google Maps API Key) as well as a TNTserver download link and links to additional TNTserver documentation. The second link opens a web page that describes each of the products in the TNT professional suite. The MicroImages' globe logo link takes you to a web page with a general description of MicroImages and its products and services. The TNTmap Builder link opens the separate 9-page PDF help document that describes the features of TNTmap Builder in detail (same as the TNTmap Builder section of the *Technical Reference Manual for the Installation, Management, and Operation of TNTserver 2006:72 and TNTmap 2006:72*. The TNTmap Viewer link opens the separate 5-page PDF help document that describes the features of TNTmap Viewer in detail. It is the same as the TNTmap Viewer section of the Technical Reference Manual. The links for the TNTmap Google Maps Viewer, Google Earth, and World Wind (Windows only) open the corresponding color plates. Each of these color plates explains the basics of using TNTmap Builder to select WMS layers for use in these viewers. The back of each of these three color plates decribes how to use TNTmap Builder to save selected layers as context files for future use in the viewers. There are also links to contact MicroImages' client support or marketing and business

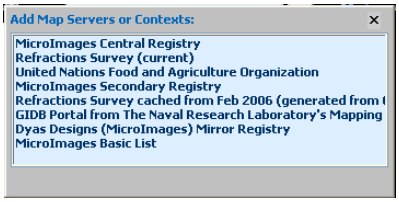


departments.

Other Window Components

URL. This URL is for the server that provides the WMS. The default server to use when TNTmap Builder starts is set in your TNTmap Configuration (see following section). You can enter the URL for any server that provides a WMS and click on the Use Capabilities from this URL to see the WMS layers available or the list of servers, if available and your TNTmap is configured to show you this list, from the WMS at the URL entered. You can also enter a URL for a context or context collection file. If you use the Browse button, this field will contain the file path to the selected context or context collection file.

Use Capabilities from this URL. Sends a WMS capabilities request to a server URL you have entered manually. A request is automatically sent when you choose a server from the registry list that opens when you click on the Add Servers to Layers Panel icon. A list of layers available from the designated server is returned. It is important to understand why accessing and building up a new registry in TNTmap may be quite slow. A registry is not a simple list of URLs pointing to WMSs. Each registry contains *extensive* XML metadata, legend images, and other information about each layer offered by every web site it lists. Appending a new registry to the default registry list loaded into TNTmap Builder requires that all this data about every WMS site listed by the new registry be downloaded and parsed into a useful structure. This must be done each time you choose to use it since a registry's content changes and most end-users of the web application version of TNTmap will set their browser to block saving anything on their local machine. Furthermore, at present there is no widely accepted hierarchical structure for a registry to permit access by topic or geographic area of interest. As a result, some registries have grown to be very large. The U.S. Naval Research Laboratory's Geospatial Information Database (GIDB, see dmap.nrlssc.navy.mil/dmap) registry lists many, many WMSs and many thousands of layers and takes a substantial time to add to the TNTmap default list. What you may think of as a single TNTatlas published by a TNTserver can represent literally hundreds or more independent layers if the same kind of content is published by some other WMS.



Add Servers to Layers Panel. Opens the Add Map Servers or Contexts dialog, which lets you choose from the registry files identified by MicroImages. After selecting a registry from the list, the contents of that registry are automatically appended to the list of servers that can be selected for use in the main TNTmap Builder window. You can add more than one registry if desired and all entries will be appended to the end of the list available from the Select Server option menu.

Change Settings. Opens the same Settings panel opened when you click on the Save As icon at the bottom right of the Builder. The viewer to which the current settings apply is identified by the icon at the top left. Use the icons on the top in the middle to select the viewer you want to change settings for. Details about these settings are described on the backs of the color plates that describe using these viewers to view WMS layers entitled *TNTmap 2006:72: Use Google Maps to View WMS Layers*, *Use Google Earth to View WMS Layers*, *Use World Wind to View WMS Layers*, *Use TNTmap Open to View WMS Layers*, and *Use TNTmap Viewer to View WMS Layers*.

Open. (Windows installed version only.) Opens a window so you can select saved context files on your machine or on a private network for use. Selectable file types are context files (*.cml), context collections (*.ccml), and capabilities documents (*.xml). Selecting one of the first two types adds the layers described to the Main View panel. The layers described in a capabilities document are added to the Layers panel.

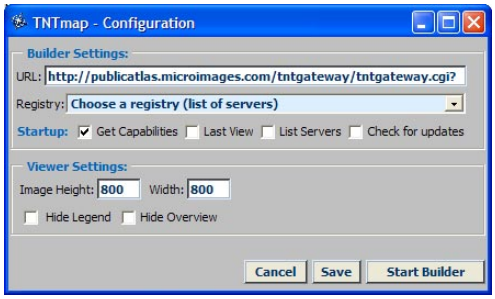
Save to Favorites. (Windows and Mac installed versions.) Opens a Prompt window so you can name the url at the left of the button as you want it saved on your Select Server or Map Context list. The web application version of TNTmap saves nothing on your drive when you exit it. Thus, this feature is only available when running the executable TNTmap Builder installed and run from your local machine.

Switch Locator Zooming Mode. There are two modes for zooming to a specified location in the Locator window: using predefined areas (selected from list) or user-defined areas (mouse selected in Locator) and searching for a geographic name you have entered using the geonames.org geographical database. You switch between

these modes by clicking on this icon. If using the former mode, the entry in the field to the right will be Global Extents if you have not zoomed in the Locator and User Defined if you have used the mouse to draw out a box around the area you want to zoom to the Locator dimensions. If you pick from the list, the area selected will show here. When using the latter method, you type in the name of the place you want to zoom to and the Locator recenters on the first result from the geonames.org search with a zoom that encompasses the first 20 results. If you want to use the extents you have zoomed to to define the extents of your initial view, click on the *Derive view extents from Locator to the right* button on the Main View panel.

Installation and Configuration for Personal Use

Installation and configuration of TNTmap for Windows and Mac OS X differ somewhat. Installation on Mac OS X 10.4 or newer is handled by the operating system and is the same as other widget installation. The configuration panel is on the back side of the control panel widget (see the color plate entitled *TNTmap 2006:72: Widget Viewing of WMS Content for Mac OS X*).



Installation on Windows platforms uses a wizard that provides a default location for installation that can be changed and provides options to create a quick-launch icon and to register TNTmap Viewer to open OGC Web Map Context Documents (*.cml) and context collections (*.ccml). When installation is complete, you have the option to open the Configuration window (right). You can change the configuration later from the Start menu (Start/MicroImages/TNTmap/Configure assuming you installed in the default location). The Configuration window may sometimes open behind another application, so be sure to check your system tray if it does not appear.

The URL at the top of the window is for the WMS server that will be contacted when the Builder is launched. The URL for MicroImages' public atlas site is http://publicatlas.microimages.com/cgi-bin/tntgateway.cgi?. The URL shown when you open the Configuration window is the last server to which you were connected for a GetCapabilities request. You can append the list of layers available from that server by also choosing a registry. These three Startup options are not mutually exclusive. If the Get Capabilities option is checked, the information about all layers by all servers at that site is requested when the Builder is launched. If many layers are provided, this may take some time. If the List Servers option is also checked, the Get Capabilities request is made only for the last server in the list if multiple servers are available from that site. If Last View is checked, the layers selected the last time you launched TNTmap Viewer are automatically added to the Main View and Overview panels. If this is the only option checked, the Layers panel will be blank. When the List Servers option is on, TNTserver looks for an xml file that lists servers for the site. No Get Capabilities request is sent unless that option is also on as described above. A Get Capabilities request is also sent if a list is not located. The information about the layers from an individual server are requested when you click on that server. Thus, you do not waste time waiting to receive this information from servers you are not interested in. There is also a Check for updates startup option.

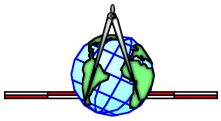
If you turn on the Check for updates option, each time TNTmap Builder is launched it will check MicroImages' web site to see if a newer version of TNTmap is available. If your installation is current, TNTmap Builder opens without any additional input. If a newer version is available, a panel opens that gives you the opportunity to update. You can also turn off automatic checking for updates on this panel. If you want to turn it on again later, go to TNTmap Configuration (Start/MicroImages/TNTmap/Configure on Windows platforms and the flip side of the Control Panel for the Macintosh widget). You can also check for updates using the designated icon at the right of the Help panel.

The TNTmap Viewer Settings let you choose an approximate window size, which is modified to fit the dimensions of the set of layers selected for viewing. You can also set whether to show/hide the legend and the overview when TNTmap Viewer launches.

Installation and Configuration for Publishing

In additon to the TNTmap components automatically installed with TNTserver, if you are going to make viewing in

Google Earth, Google Maps, World Wind, and/or TNTmap Open available for use by others from your site, you need to also install Perl script (http://activestate.com/store/productdetail.aspx?prdGuid=81fbce82-6bd5-49bc-a915-08d58c2648ca and click on the Free Download text near the top of the page, not on the Download button). There is a button in the TNTserver License Configuration window if you have a routable web address that takes you to a page on MicroImages' web site (http://www.microimages.com/product/tntserver.htm) with a link to this download (see the color plate entitled *TNTserver 2006:72: Installation*). This same page provides links for Apache download and to acquire a Google Maps API key code, which is necessary if you want to run TNTmap's implementation of Google Maps from your web site. If you are only making TNTmap Viewer available for use with your TNTserver or if your access to Google Maps, Google Earth, World Wind, and TNTmap Open is provided only through context files that are published, you do not need to install Perl script. Using Google Earth and Google Maps requires connection to the Internet. World Wind is designed to work with cached images, so an Internet connection may not be necessary for viewing with this application. TNTmap Open does not require an Internet connection either as long as the WMS referenced is local.



TNTserver

Open Geospatial Consortium (OGC) Specifications

Web Service	Name	Current Specification	Last Revision	Document ID	Described Operations	Mandatory Operation	TNT Support
WMS	Web Map Service	1.3.0 ISO 19128:2005	15 Mar 06	06-024	GetCapabilities GetMap GetFeatureInfo	Yes Yes No	Yes Yes Yes
SLD	Styled Layer Descriptor	1.1.0 (draft)	19 Oct 05	05-078	DescribeLayer GetLegendGraphic GetStyles PutStyles	Yes No No No	No No No No
WFS	Web Feature Service **MicroImages New Feature Request Number	1.1 ISO 19142 (30.20)	3 May 05	04-094	GetCapabilities DescribeFeatureType GetFeature GetGmlObject Transaction LockFeature GetFeatureWithLock	Yes Yes Yes No No No No	7738** 7738 7738 No 7739 7739 7739
WCTS	Web Coordinate Transformation Service *Caution! Specifications less than 1.0 are only proposed, not approved.	0.3.0 *	13 Apr 05	05-013	GetCapabilities Transform IsTransformable GetTransformation DescribeTransformation DescribeCRS DescribeMethod	Yes Yes No No No No No	Yes Yes Yes No No Yes No
WTS	Web Terrain Service	0.5.0 *	7 Nov 03 +	03-081r2	GetCapabilities GetView	Yes Yes	7741 7741
WCS	Web Coverage Service	1.1.0	17 Oct 06	06-083r3	GetCapabilities DescribeCoverage GetCoverage	Yes Yes Yes	7742 7742 7742
W3DS	Web 3D Service	0.3.0 *	2 Feb 05	05-019	GetCapabilities GetScene	Yes Yes	No No
WPS	Web Processing Service	0.4.0 *	16 Sep 05	05-007r4	GetCapabilities DescribeProcess Execute	Yes Yes Yes	7740 7740 7740
WICS	Web Image Classification Service	0.3.3 *	8 Feb 05	05-017	GetCapabilities GetClassification TrainClassifier DescribeClassifier	Yes Yes No Yes	7747 7747 7747 7747
WNS	Web Notification Service +Caution! Proposed specification last revised in 2003 or before may indicate lack of interest.	0.0.9 *	18 Nov 06	06-095	GetCapabilities RegisterUser DoNotification DoCommunications DoReply	Yes Yes Yes No No	No No No No No
CSW	Catalog Services for the Web	2.0.1	20 May 05	04-021r3	GetCapabilities DescribeRecord GetDomain GetRecords GetRecordById Harvest Records Transaction	Yes Yes No Yes No No No	8070 8070 8070 8070 8070 8070 8070
FPS	Feature Portrayal Service	0.0.30 *	12 Sep 05	05-110	GetCapabilities GetPortrayal	Yes Yes	No No

OGC Specifications not covered in detail:

WOS	Web Object Service	0.0.3 *	15 Jan 03 +	03-013		No

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Web Service	Described Operations	Operation Description	Coordinating Editor
WMS	GetCapabilities	Obtain metadata of the available list of layers and CRSs supported	Jeff de La Beaujardiere NASA Goddard Space Flight Center delabeau@iniki.gsfc.nasa.gov
	GetMap	Retrieve an image consisting of one or more layers defined by a CRS and a bounding box	
	GetFeatureInfo	Return information about the layers given a single reference point	
SLD	DescribeLayer	Describe the layers requested, mainly to determine if the 'layer' comes from a WFS or a WCS	William Lalonde CubeWerx, Inc.
	GetLegend	Generates a legend graphic based on the layer and parameters sent	
	GetStyles	Retrieve user defined styles from a WMS	
	PutStyles	Store user defined styles into a WMS	
WFS	GetCapabilities	Obtain metadata of the available list of feature types, layers and database tables and operations supported	Panagiotis A. Vretanos CubeWerx, Inc. pvretano@cubewerx.com
	DescribeFeatureType	Return XMLSchema describing the specific feature type requested	
	GetFeature	Retrieve the features requested in the format specified by the "DescribeFeatureType" operation	
	GetGmlObject	Retrieve element instances by traversing XLinks that refer to their XML IDs	
	Transaction	Operation to modify features using primitives create, update and delete	
	LockFeature	Operation to lock features of a feature type. Supports serialized transactions.	
	GetFeatureWithLock	Retrieve and lock the features requested in the format specified by the "DescribeFeatureType" operation	
WCTS	GetCapabilities	Obtain metadata of the available operations, CRSs and transformations	Arliss Whiteside BAE Systems Arliss.Whiteside@baesystems.com Frank Warmerdam DM Solutions Group warmerdam@pobox.com
	Transform	Perform transformations between the Source CRS to the Target CRS	
	IsTransformable	Query the WCTS server as to the possibility of the specified transform on the requested data	
	GetTransformation	Retrieve the definition of the transformation(s) from one CRS to another	
	DescribeTransformation	Retrieve the definitions of one or more identified coordinate operations	
	DescribeCRS	Retrieve the definitions of one or more identified CRSs	
	DescribeMethod	Retrieve the definitions of one or more identified operations method, primarily for user defined CRSs	
WTS	GetCapabilities	Obtain metadata of the available layers and terrains	Joshua Lieberman Syncline.com jlieberman@syncline.com
	GetView	Generate an image based on the point of view of the observer, layers and the terrain selected	
WCS	GetCapabilities	Obtain metadata of the available coverages (layers)	John D. Evans NASA / GST, Inc. jdevans@gst.com
	DescribeCoverage	Return a full description of one or more coverages (layers)	
	GetCoverage	Returns a coverage (raster data) in a well known format	
W3DS	GetCapabilities	Obtain metadata of the available scenes (layers)	Udo Quadt, Institute for Cartography and Geoinformation University of Bonn quadt@ikg.uni-bonn.de
	GetScene	Return a 3D scene graph of the specified geographical area	
WPS	GetCapabilities	Obtain metadata of the available data manipulation processes	Peter Schut Agriculture and Agri-Food Canada schutp@agr.gc.ca
	DescribeProcess	Retrieve the input / output types and the parameter descriptions needed to perform the process requested	
	Execute	Execute the process given the input data and the necessary parameters	
WICS	GetCapabilities	Obtain metadata of the available classifiers and type of classifiers	Arliss Whiteside BAE Systems Arliss.Whiteside@baesystems.com
	GetClassification	Return an image based on a set of images and a specified classifier	
	TrainClassifier	Select a classifier and send training data and return training parameters	
	DescribeClassifier	Receive detailed information about the selected classifier	
WNS			Ingo Simonis, Univ. of Muenster simonis@uni-muenster.de
CSW	GetCapabilities	Obtain metadata about how to retrieve catalog data	Doug Nebert U.S. Federal Geographic Data Committee ddnebert@usgs.gov
	DescribeRecord	Allow client to discover elements of the information model	
	GetDomain	Obtain runtime information about the range of values of a property or request parameter	
	GetRecords	Resource discovery by means of the operations 'search' and 'present'	
	GetRecordById	Retrieve the default representation of catalog records using their identifier	
	HarvestRecords	Update catalog by 'harvesting' catalog information from other OGC Web Services	
	Transaction	Interface for creating, modifying and deleting catalog records	
FPS	GetCapabilities	Obtain metadata of the available formats and operations supported	Arliss Whiteside (see WICS) Bill Woodward ObjectFX Corporation
	GetPortrayal	Retreive styled feature data from a WFS or WCS in a map-like image	

Open Geospatial Consortium (OGC) Certified WMS Compliant Products

Derived from data posted by the OGC at http://www.opengeospatial.org/resource/products/#top on 1 February 2007. Products compliant with OGC specifications other than WMS are not listed here. Only the latest OGC compliant version of any product is listed.

Company Name	Product Name	V1.1.1 OGC Certified Compliance	V1.3.0 Compliance Claimed [1]	Country of Origin [2]
ABACO srl	DbMAP ASJ 2.5	yes		Italy
Autodesk	Autodesk MapGuide Enterprise 2007	yes		USA
BILGI GIS	GeoKIT WMS 2.0	yes	yes	Turkey
Blue Marble Geographics	GeoMapServer 1.0	yes		USA
Cadcorp	Cadcorp SIS Map Server 6.2 [3]	yes	yes	UK
Carmenta AB	SpatialAce Web Map Server 2.1	yes		Sweden
CubeWerx, Inc.	CubeServ Cascading Web Map Server 4.0.2	yes		Canada
Delorme Publishing Inc.	XMap Web 3.0	yes		USA
Demis bv	Demis Map Server 4.0	yes	yes	Netherlands
eSpatial	iSmart 5.0	yes		Ireland
ESRI	ArcGIS Server 9.2, ArcIMS 9.2	yes		USA
GeoTask AG	g.business integrator	yes		Germany
http://topp.openplans.org	GeoServer 1.3	yes		USA
Intergraph Corporation	GeoMedia Web Map 05.01	yes		USA
IONIC Software s.a.	RedSpider Web 3.3	yes		Belgium
lat/lon	deegree Web Map Service 1.1.2	yes		Germany
Luciad NV	LuciadMap 5	yes	yes	Belgium
MapInfo Corporation	MapXtreme 2005 6.6 [4]	yes		USA
Mapsolute GmbH	MapTP Web Map Server 1.0	yes		Germany
MicroImages, Inc.	TNTserver 2006:72	yes	yes	USA
NETCAD	NETCAD WEBGIS 3.0	yes		Turkey
Oracle Corporation	Oracle Application Server MapViewer, 10g R2	yes		USA
SWBB GmbH	POLYGIS MAPSERVER 9.5 ff	yes		Germany
TAO S.A.	monoGIS 0.6	yes		Spain

The OGC Compliance Testing Program is used to establish that a product meets a particular OpenGIS Implementation Specification and fully supports all mandatory elements for the operations it specifies. The OGC provides a service to test and certify compliance of a WMS at version 1.1.1. There is no OGC procedure to certify compliance of a WMS at their newer version 1.3.0. As a result it is up to the individual developer to test their own compliance with the WMS at the 1.3.0 level and then claim compliance.

Communications with a WMS operating at version 1.3.0 are specified by ISO 19128:2005. There is no ISO communication standard for a WMS operating at version 1.1.1.

[1] There is no OGC compliance test for WMS 1.3.0 so compliance cannot be certified for any product at this higher level.
[2] Country where software was developed to the best of our knowledge (location of corporate headquarters).
[3] Cadcorps' compliant WMS is also incorporated in GeonoSIS.NET 6.2 and SIS Active Server Component 6.2.
[4] MapInfo's compliant WMS is also incorporated in Envinsa 4.0 and MapXtreme Java Edition 4.8.

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The Company Names and Addresses for OGC Certified WMS Compliant Products

Company Name	Address of the Headquarter Office
ABACO srl	c.so Umberto I, 4346100 Mantova, MN Italy
Autodesk	111 McInnis Parkwa, San Rafael, CA 94903 USA
BILGI GIS	Çetin Emeç Bulvari, Cevizlidere Caddesi 1/10, 06520 Ankara, Turkey
Blue Marble Geographics	397 Water Street Suite 100, Gardiner, Maine 4345 USA
Cadcorp	Sterling Court, Norton Road, Stevenage, Hertfordshire, SG1 2JY UK
Carmenta AB	info@carmenta.se
CubeWerx, Inc.	5 Rue Gamelin, Suite 506, Gatineau, Quebec J8Y 6N5 Canada
Delorme Publishing Inc.	Two DeLorme Drive P.O. Box 298, Yarmouth, ME 04096 USA
Demis bv	Rotterdamseweg183C2629 HD Delft, The Netherlands
eSpatial	iSmart 5.0Swords Business Park, Swords Co, Dublin, Ireland
ESRI	380 New York Street, Redlands, CA 92373-8100 USA
GeoTask AG	Margarethenstrasse 38, CH-4053 Basel, Germany
http://topp.openplans.org	349 West 12th Street #3, New York, NY 10014 USA
Intergraph Corporation	170 Graphics Drive, Madison, AL 35758, USA
IONIC Software s.a.	18, Rue de Wallonie 4460, Grâce - Hollogne, Belgique, Belgium
lat/lon	Poth GbR Meckenheimer Allee 176 D-53115 Bonn, Germany
Luciad NV	Luciad NV Gaston Geenslaan 9, B-3001 Leuven, Belgium
MapInfo Corporation	One Global View Troy, NY 12180 USA
Mapsolute GmbH	Düsseldorfer Str. 40a, 65760 Eschborn, Germany
MicroImages, Inc.	11th Floor - Sharp Tower, 206 South 13th Street, Lincoln, NE 68508-2010 USA
NETCAD	Cyber Plaza, B Blok No:409, Cyberpark 06800, Bilkent/Ankara, Turkey
Oracle Corporation	500 Oracle Parkway Redwood Shores, CA 94065 USA
SWBB GmbH	Am Neunkircher Weg 3, 66459 Kirkel, Germany
TAO S.A.	Sancho de Ávila, 110-130, 4º CM – 08010-Barcelona, Spain

TNTmap 2006:72

Comparison of Web Map Service (WMS) Viewers

Free or demo map viewers (commercial and/or FREE applications)

	Sites using other developer's WMS				Sites using TNTserver		
Web Site:	MNDNR	USGS	WA Gov.	Devecigil	Public Atlas	Dyas Designs	Devecigil
Service Product:	MapServer	ESRI	ESRI	Blue Marble	MicroImages	MicroImages	MicroImages
Content Tested:	MN FSA	National Atlas	Australia	Pol. Bound.	MN FSA	MN FSA	MN FSA
TNTmap Viewer	OK	OK	OK	OK	OK	OK	OK
ArcExplorer	OK	OK	C	OK	D	OK	OK
Autodesk Mapguide	C	L	C	C	L	D	L
CadCorp Map Browser	OK	OK	C	OK	OK	OK	OK
CubeWerx's CubeXPLOR	D	D	C	D	C	C	C
Dapple	OK	OK	OK	OK	OK	OK	OK
Gaia	OK	OK	OK	OK	OK	OK	OK
Galdos WMS Viewer	D	D	L	L	L	L	L
GeoNOVA Map Viewer	OK	OK	C	OK	D	OK	OK
GeoViewer	OK	OK	OK	D	OK	OK	OK
Google Earth	OK	D	D	OK	OK	OK	OK
gvSIG	OK	OK	OK	D	L	OK	OK
Intergraph OGC Viewer	OK	OK	OK	C	OK	OK	C
InterMap Viewer	OK	OK	C	OK	OK	OK	OK
Mapbender	C	C	C	D	C	C	L
Owsview	OK	OK	OK	OK	OK	OK	OK
SEDAC Map Client	OK	OK	OK	C	OK	OK	C
uDig 1.1.0-RC8	OK	OK	OK	OK	OK	OK	OK

Viewers used via the installed version of TNTmap (FREE application)

	Sites using other developer's WMS				Sites using TNTserver		
Web Site:	MNDNR	USGS	WA Gov.	Devecigil	Public Atlas	Dyas Designs	Devecigil
Service Product:	MapServer	ESRI	ESRI	Blue Marble	MicroImages	MicroImages	MicroImages
Content Tested:	MN FSA	National Atlas	Australia	Pol. Bound.	MN FSA	MN FSA	MN FSA
viewer launched by TNTmap's Windows application							
TNTmap Viewer	OK	OK	OK	OK	OK	OK	OK
Google Earth	OK	OK	OK	OK	OK	OK	OK
Google Maps	OK	OK	OK	OK	OK	OK	OK
World Wind	OK	OK	OK	D	OK	OK	OK
viewer launched by TNTmap's Mac widget application							
TNTmap Viewer	OK	OK	OK	OK	OK	OK	OK
Google Earth	OK	OK	OK	OK	OK	OK	OK
Google Maps	OK	OK	OK	OK	OK	OK	OK

Viewers used via the web version of TNTmap (FREE application)

	Sites using other developer's WMS				Sites using TNTserver		
Web Site:	MNDNR	USGS	WA Gov.	Devecigil	Public Atlas	Dyas Designs	Devecigil
Service Product:	MapServer	ESRI	ESRI	Blue Marble	MicroImages	MicroImages	MicroImages
Content Tested:	MN FSA	National Atlas	Australia	Pol. Bound.	MN FSA	MN FSA	MN FSA
viewer launched by TNTmap's Windows web application							
TNTmap Viewer	OK	OK	OK	OK	OK	OK	OK
Google Earth	OK	OK	OK	OK	OK	OK	OK
Google Maps	OK	OK	OK	OK	OK	OK	OK
World Wind	L	D	OK	D	OK	OK	OK
viewer launched by TNTmap's Mac web application							
TNTmap Viewer	OK	OK	OK	OK	OK	OK	OK
Google Earth	OK	OK	OK	OK	OK	OK	OK
Google Maps	OK	OK	OK	OK	OK	OK	OK

MN FSA	1-m color orthoimage of Minnesota of ~1 GB acquired by USDA/FSA/NRCS in 2003.		
WA Gov.	Western Australia Government	Pol. Bound.	Political Boundaries
OK	Works okay.	L	Layers do not appear for selection.
C	Connection to WMS is not established.	D	Selected layers are not displayed.

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TNTmap 2006:72

URLs for Web Map Services (WMSs) and Viewers

Web Map Service (WMS)	URL to access WMS
MNDNR (MapServer)	http://156.98.35.213/cgi-bin/wms?map=DELI_WMS_MAPFILE&
USGS (ESRI)	http://gisdata.usgs.net/servlet/com.esri.wms.Esrimap?
WA Gov. (ESRI)	http://atlas.walis.wa.gov.au/servlet/com.esri.wms.Esrimap?
Devecigil (Blue Marble)	http://www.devecigil.net/mymap/GeoMapServer.ashx?
Public Atlas (MicroImages)	http://publicatlas.microimages.com/cgi-bin/tntgateway.cgi?
Dyas Designs (MicroImages)	http://www.dyasdesigns.com/tntgateway/tntgateway.cgi?
Devecigil (MicroImages)	http:// www.devecigil.net/tntgateway/tntgateway.cgi?

Web Map Service viewer (desktop application)	URL to access WMS viewer
TNTmap Viewer	http://www.microimages.com/TNTmap/
Gaia	http://www.thecarbonproject.com/dev.php
Google Earth	http://earth.google.com/download-earth.html
gvSIG	http://www.gvsig.gva.es/index.php?id=descarga-gvsig&L=2
Dapple	http://dapple.geosoft.com/default.asp
uDig 1.1.0-RC8	http://udig.refractions.net/confluence/display/UDIG/Downloads
CadCorp Map Browser	http://www.cadcorp.com/products_geographical_information_ systems/map_browser.htm

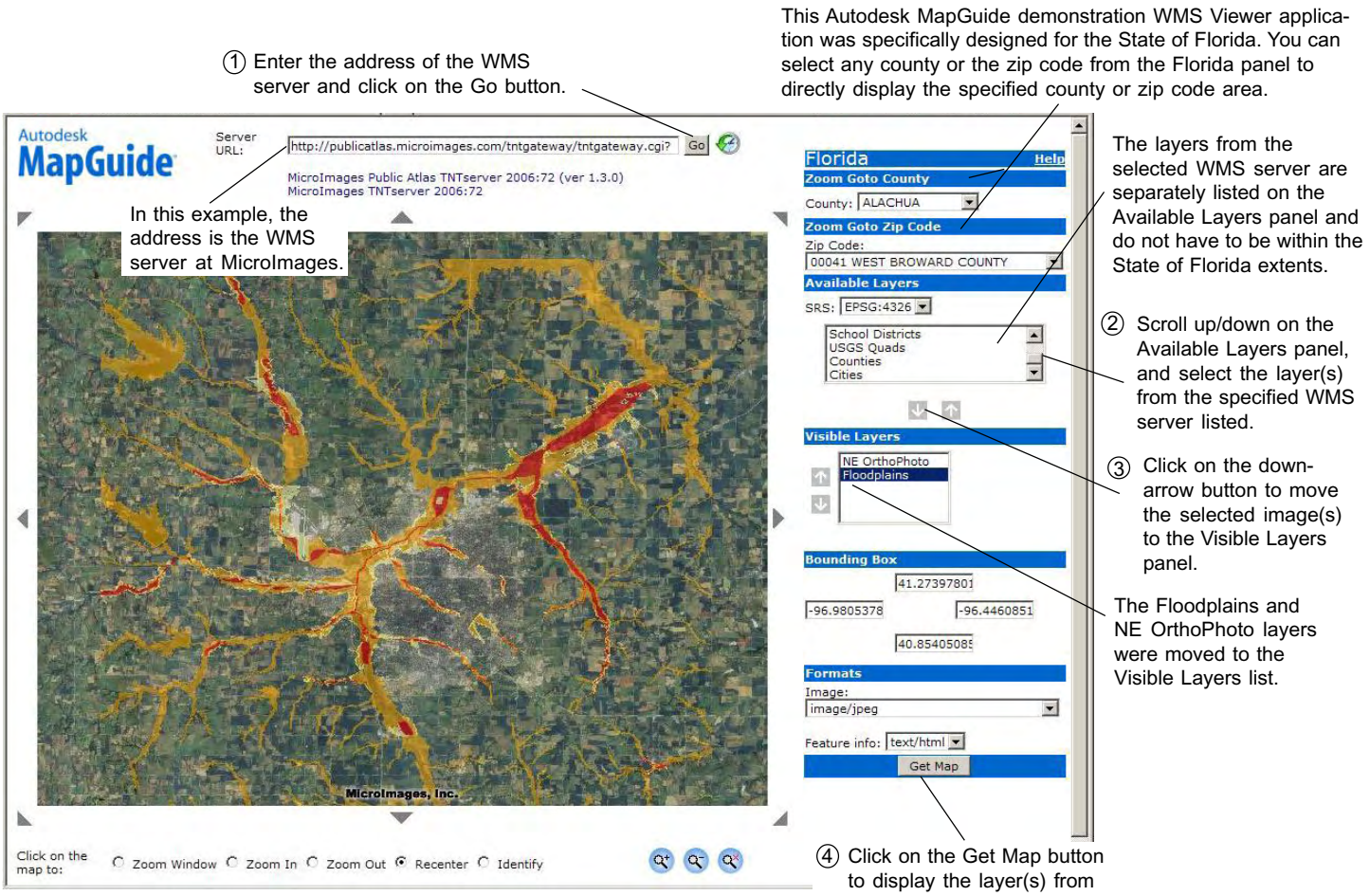
Web Map Service viewer (web application)	URL to access WMS viewer
TNTmap Viewer	http://www.microimages.com/TNTmap/
ArcExplorer	http://www.geographynetwork.com/arcexplorer/arcexplorer.html
CubeWerx's CubeXPLOR	http://demo.cubewerx.com/demo/cubexplor/cubexplor.cgi?
GeoViewer	http://demo.ionicsoft.com/geoviewer/
GeoNOVA Map Viewer	http://gov.ns.ca/GeoNova/services/ogc_clients.asp
Galdos WMS Viewer	http://its.demo.galdosinc.com/wms/viewer/
Intergraph OGC Viewer	http://www.wmsviewer.com/main.asp
InterMap Viewer	http://www.fao.org/geonetwork/srv/en/main.home
Mapbender	http://www.mapbender.org/index.php/Main_Page
Owsview	http://cgdi-dev.geoconnections.org/prototypes/owsview/index.html
SEDAC Map Client	http://beta.sedac.ciesin.columbia.edu/mapviewer/
Autodesk MapGuide	http://data.mapguide.com/wmsviewer/servlet/com.autodesk. wmsviewer.WmsViewer?request=startviewer

Product cited	Company-Organization	URL for more information
TNTmap Viewer	MicroImages, Inc	http://www.microimages.com/
TNTserver	MicroImages, Inc	http://www.microimages.com/
ArcExplorer	ESRI	http://www.esri.com/
Autodesk MapGuide	Autodesk, Inc.	http://usa.autodesk.com/
Blue Marble	Blue Marble Geographics	http://www.bluemarblegeo.com/
Cadcorp Map Browser	Cadcorp, Inc.	http://www.cadcorp.com/
CubeWerx's CubeXPLOR	CubeWerx, Inc	http://www.cubewerx.com/
Dapple	Geosoft, Inc	http://www.geosoft.com/
ESRI	ESRI	http://www.esri.com/
Gaia	Carbon Project, Inc	http://www.thecarbonproject.com/
Galdos WMS Viewer	Galdos Systems, Inc	http://www.galdosinc.com/
GeoViewer	IONIC Software	http://www.ionicsoft.com/
GeoNOVA Map Viewer	GeoNOVA	http://gov.ns.ca/GeoNova/
Google Earth	Google	http://www.google.com/
Google Maps	Google	http://www.google.com/
gvSIG	Generalitat Valenciana	http://www.gva.es/
Intergraph OGC Viewer	Intergraph Corporation	http://www.intergraph.com/
InterMap Viewer	GeoNetwork	http://geonetwork-opensource.org/
Mapbender	OSGeo	https://www.osgeo.org/
Owsview	Government of Canada	http://cgdi.gc.ca/
SEDAC Map Client	SEDAC	http://sedac.ciesin.columbia.edu/
uDig 1.1.0-RC8	Refractions Research	http://www.refractions.net/
World Wind	NASA	http://www.nasa.gov/

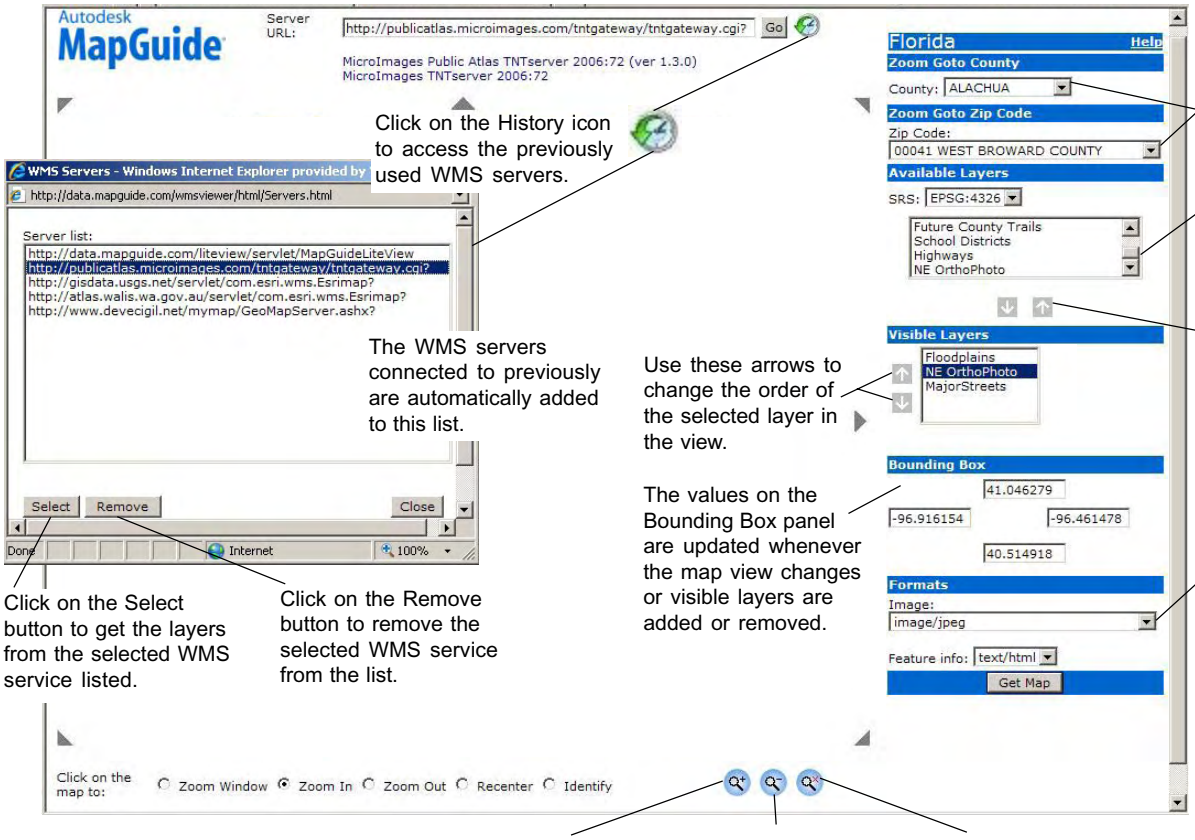
TNTserver 2006:72

Using Autodesk's MapGuide to View WMS Layers

Name:	Autodesk MapGuide WMS Viewer (Autodesk MapGuide 6.5)
Developer:	Autodesk, Inc. located at http://usa.autodesk.com/
Use:	Display maps published by Autodesk MapGuide LiteView and by other WMS servers.
OGC:	WMS 1.1.1
Design:	Web application
Access:	Automatically used in your browser if the site is accessed from http://data.mapguide.com/wmsviewer/servlet/com.autodesk.wmsviewer.WmsViewer?request=startviewer
Browsers:	Firefox, Internet Explorer, Safari
Licensing:	Proprietary (free)
Formats:	jp2, jpeg, png, png (ColorPalette), png (TrueColor), png (TrueColor+interlaced), png (ColorPalette + interlaced), vnd.google-earth.kml+xml, svg+xml
CRS:	EPSG
Size:	*unknown*
Notes:	Can not access group of layers; can only display layers from one WMS server at a time.



In the illustration above, the Floodplains layer is displayed over the NE OrthoPhoto layer. These two layers are from the different atlases published by the WMS server at MicroImages.



Click on the History icon to access the previously used WMS servers.

The WMS servers connected to previously are automatically added to this list.

Click on the Select button to get the layers from the selected WMS service listed.

Click on the Remove button to remove the selected WMS service from the list.

Select any county and/or zipcode in Florida to zoom into.

Scroll down/up to see all layers from the specified WMS server.

Click on the up-arrow button to remove the selected layer(s) from the Visible Layers list.

Use these arrows to change the order of the selected layer in the view.

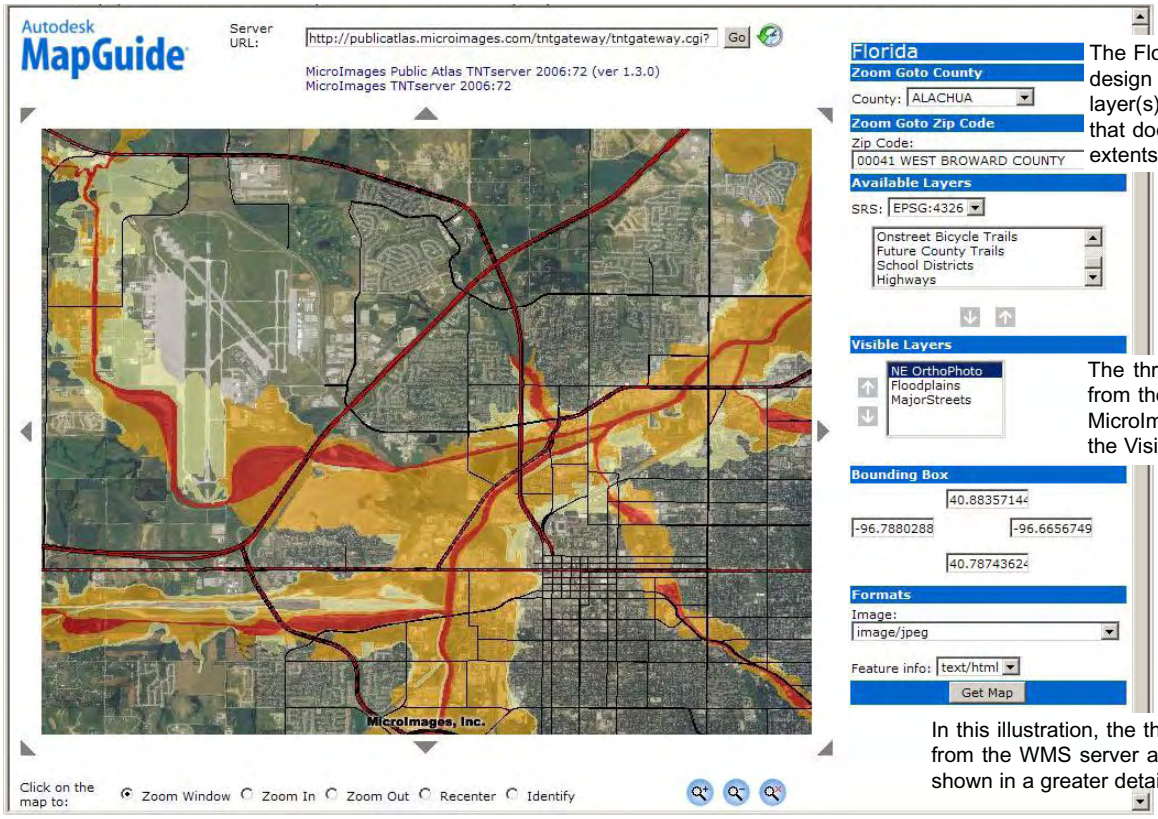
The values on the Bounding Box panel are updated whenever the map view changes or visible layers are added or removed.

Select a format from the drop-down list to change the format in which the map is displayed.

Click on this icon to zoom in around the center of the image.

Click on this icon to zoom out around the center of the image.

Click on this icon to revert to the preceding map request bounding box.



The Florida panel is active by design even when viewing a layer(s) from a WMS server that does not serve maps in the extents of the State of Florida.

The three layers selected from the WMS server at MicroImages are listed on the Visible Layers panel.

In this illustration, the three layers selected from the WMS server at MicroImages are shown in a greater detail.

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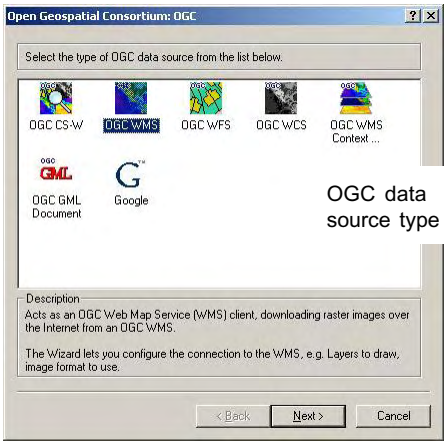
TNTserver 2006:72

Using Cadcorp's SIS Map Browser to View WMS Layers

Name: Cadcorp SIS Map Browser 6.2.876 (07 November 2006 Release)
Developer: Cadcorp, Inc. located at http://www.cadcorp.com
Use: Viewing and querying geodata from (OGC) specified data sources
OGC: WMS 1.1.1, WFS 1.0, WCS, GML 2.1.2
Design: Executable program
Access: Download executable for local use from
http://www.cadcorp.com/products_geographical_information_systems/map_browser.htm
Platforms: Windows only
Licensing: Free but proprietary
Extensible: *unknown*
Formats: gif, jpeg, png
CRS: EPSG
Size: 32 MB

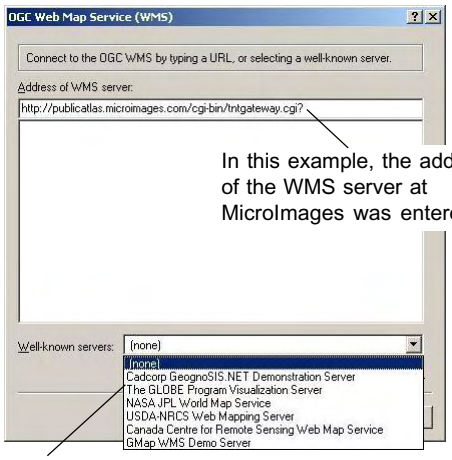
① Select Map/Add/OGC Overlay from the menu.

② Select OGC WMS from the type of OGC data source list.



OGC data source type list

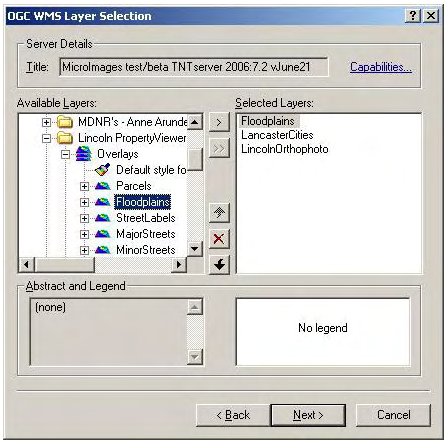
③ Enter the address of the WMS server.



In this example, the address of the WMS server at MicroImages was entered.

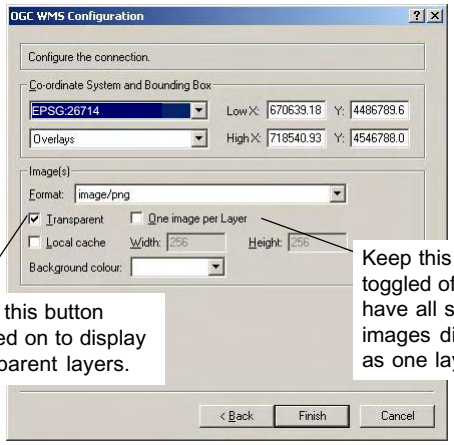
You can also add OGC overlays from the WMS servers listed.

④ Select the images from the specified WMS either individually or as a group.



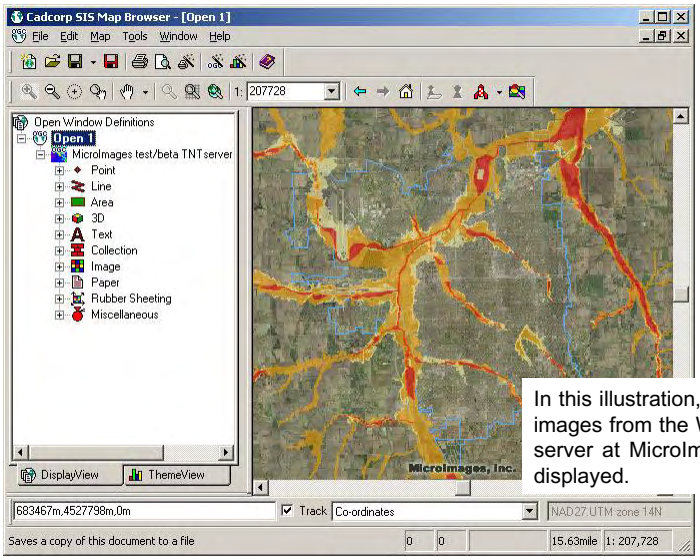
In the illustration above, three layers from the Lincoln Property Viewer atlas were individually selected for display.

⑤ Accept the default settings for OGC WMS Configuration.



Keep this button toggled on to display transparent layers.

Keep this button toggled off to have all selected images displayed as one layer.



In this illustration, selected images from the WMS server at MicroImages are displayed.

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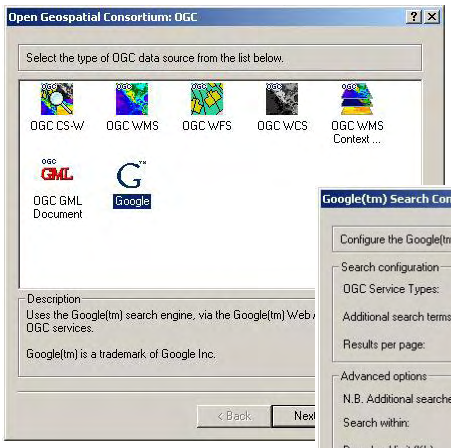
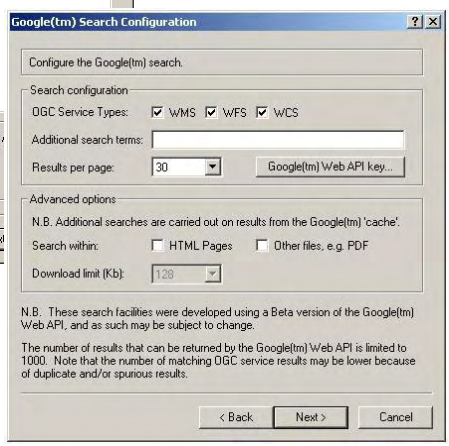
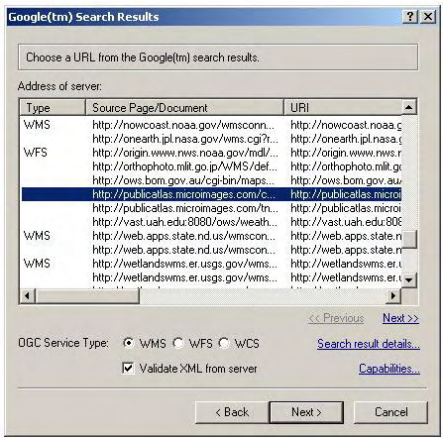


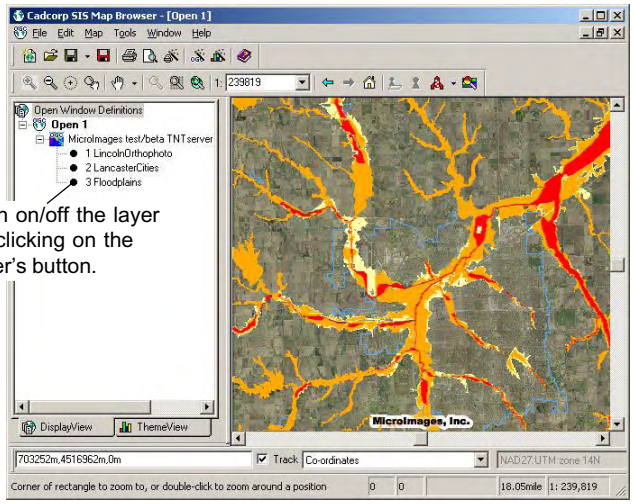
When you select Google for the type of OGC data source in step 3, the sites offering WCS, WFS, or WMS are listed via Google search.



The Wizard opens the Google(tm) Search Configuration window where you can change the search parameters.

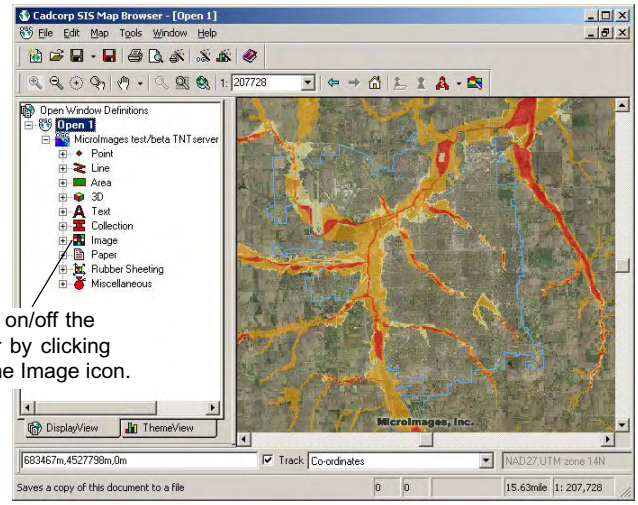


In this example, the WMS server at MicroImages, which is listed along with the other WMS, WFS and WCS servers, was selected and the layers from this server were added as described in steps 4-5.



Turn on/off the layer by clicking on the layer's button.

In the illustration above, the selected images from the WMS server at MicroImages are displayed as one image per layer since the One image per Layer button in OGC WMS Configuration window was toggled on in step 5. Note that transparency is not supported when the images are displayed as one image per layer.



Turn on/off the layer by clicking on the Image icon.

In the illustration above, the selected images from the WMS server at MicroImages are displayed as one layer since the One image per Layer button in OGC WMS Configuration window was toggled off in step 5.

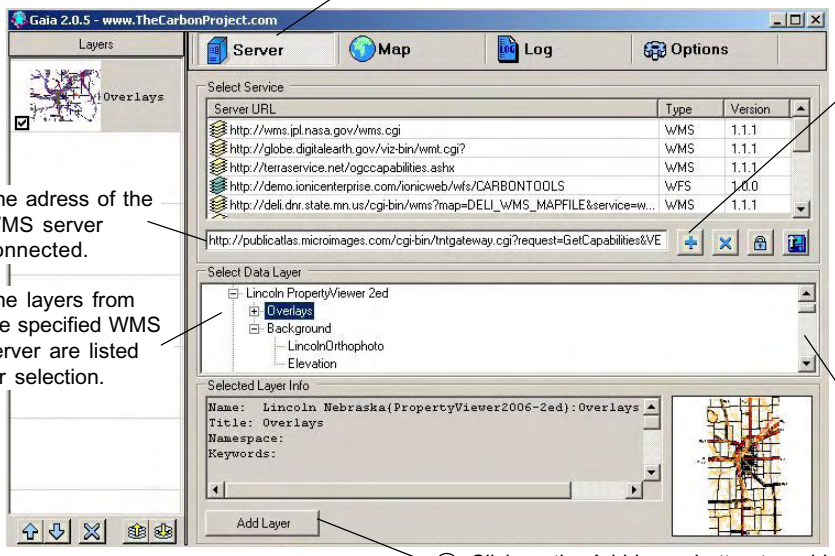
TNTserver 2006:72

Using Carbon Project's Gaia to View WMS Layers

Name:	Gaia 2.0.5
Developer:	Carbon Project located at http://www.thecarbonproject.com/
Use:	Open-geospatial viewer to access any OGC compliant WMS or WFS
OGC:	WMS 1.1.1, WFS 1.0.0, GML 3.0
Design:	Executable program
Access:	Download executable for local use from http://www.thecarbonproject.com/dev.php
Platforms:	Windows only
Licensing:	Open Source but copyrighted
Formats:	jp2, jpeg, png, png (ColorPalette), png (TrueColor), png (TrueColor+interlaced), png (ColorPalette + interlaced), vnd.google-earth.kml+xml, svg+xml
CRS:	EPSG
Size:	518.5 KB

① Click on the Server tab to open the Server panel.

② Click on the *Add a service to the list* icon to open the Add Service... window.

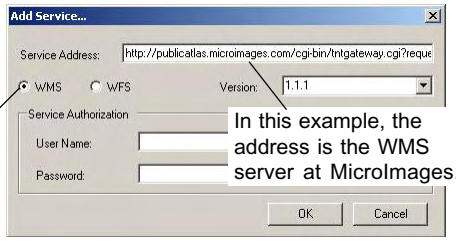


The adress of the WMS server connected.

The layers from the specified WMS server are listed for selection.

Add a service to the list icon

③ Enter the address of the WMS server, and click on the OK button.



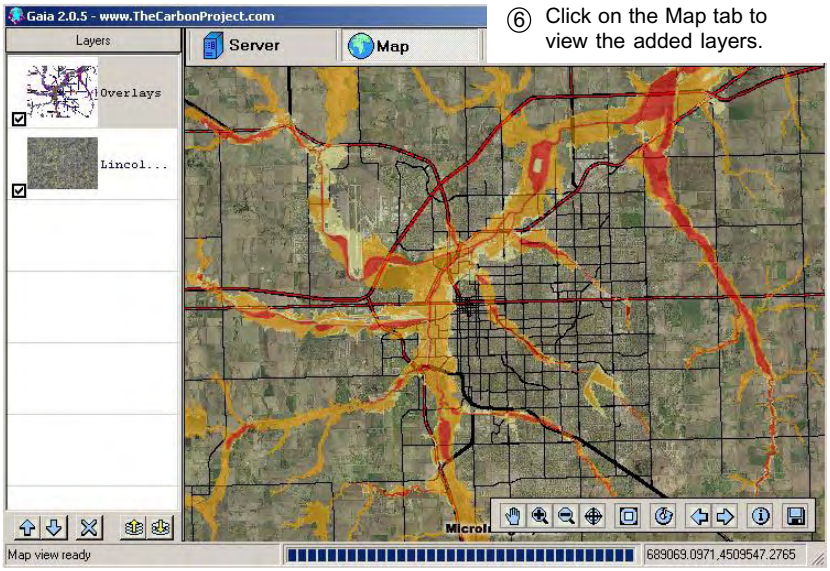
Toggle on the WMS button

In this example, the address is the WMS server at MicroImages.

④ Scroll down the list of layers and select the desired layer/group.

⑤ Click on the Add Layer button to add the selected layer/group to the Layers list.

⑥ Click on the Map tab to view the added layers.



In the illustration at the right, the Overlays group from the Lincoln Property Viewer atlas, which is one of the many atlases published by the WMS server at MicroImages, is displayed over the LincolnOrthophoto layer. Note that you can also select and display the layers in groups individually using the Select Data Layer section of the Server panel as shown in the illustration above.

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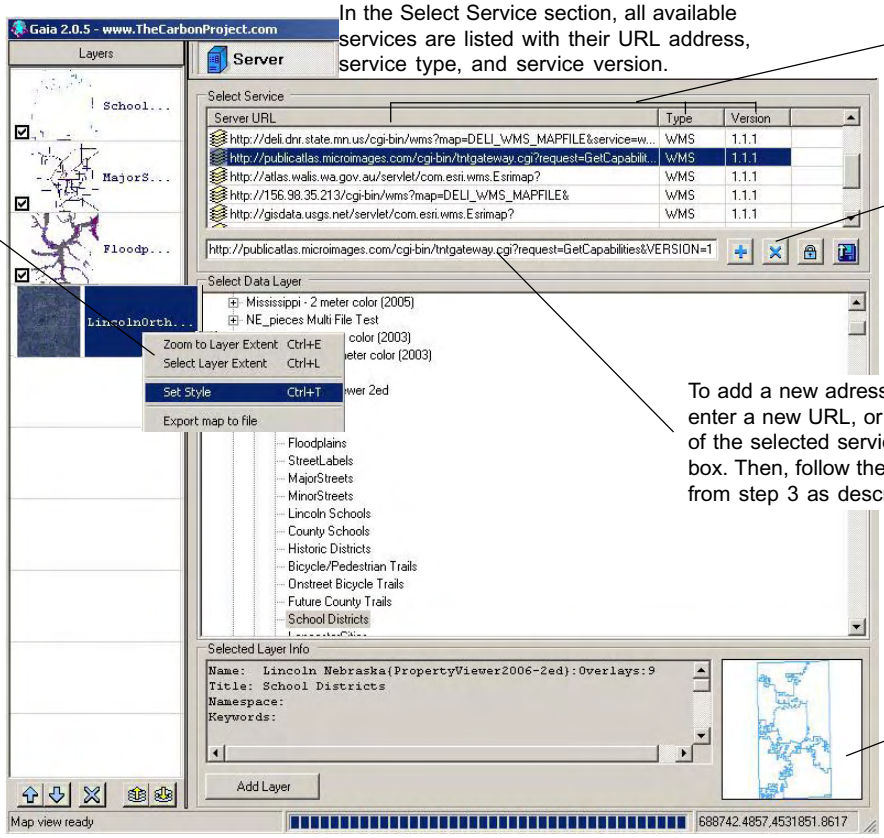
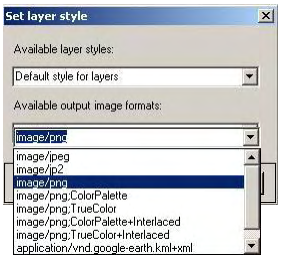


In the Select Service section, all available services are listed with their URL address, service type, and service version.

Click on the header of any column to sort the list alphabetically according to the selected column.

Click on this icon to remove the selected service from the Server list.

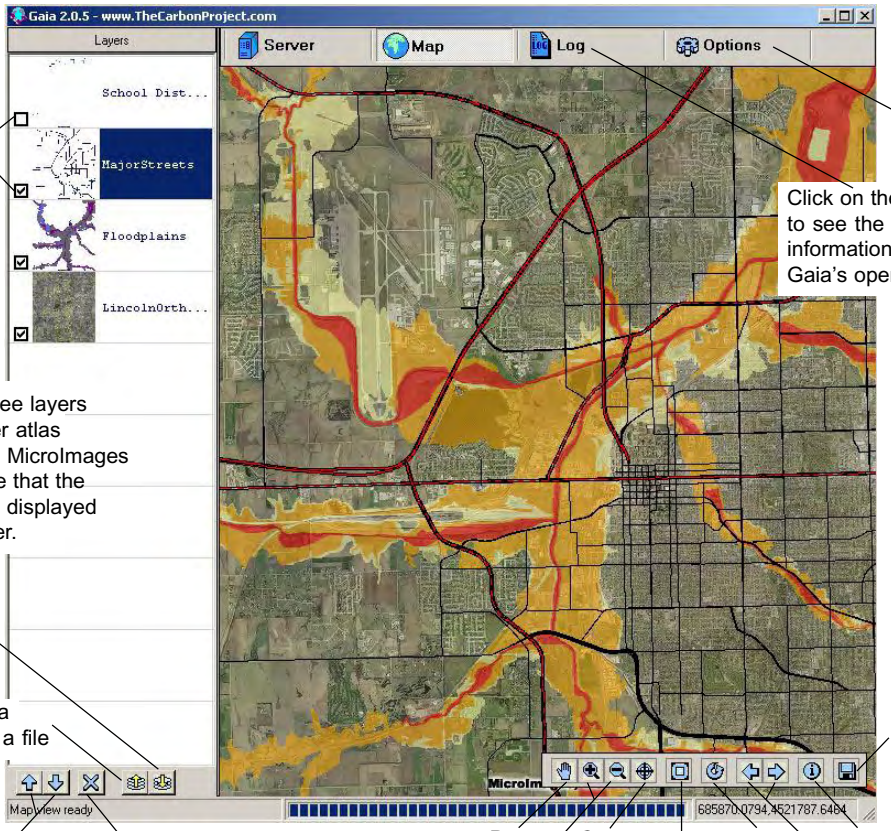
Right-click on any layer and select Set Style from the menu to open the Set layer style window.



Select the format in which the map is displayed from the available output image formats list.

To add a new adress to the list enter a new URL, or edit the URL of the selected service in the text box. Then, follow the directions from step 3 as described.

Preview box automatically displays the image overview when you select the layer.



Show/hide layers in the Map view by toggling on/off the checkbox of the layers.

Click on the Options tab to change various configurations of map view, display, and proxy settings.

Click on the Log tab to see the errors and information regarding Gaia's operation.

In the illustration at the right, three layers from the Lincoln Property Viewer atlas provided by the WMS server at MicroImages are shown in greater detail. Note that the transparent Floodplains layer is displayed over the LincolnOrthophoto layer.

Click to save current session to a file

Click to load a session from a file

Save image

Click on these icons to change the order of the selected layer.

Click on this icon to remove the selected layer from the Layers list.

Pan

Zoom in/out

Center

Zoom to full extent

Refresh

Go to previous/ next region extent

Info

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TNTserver 2006:72

Using ESRI's ArcExplorer Web to View WMS Layers

Name:	ArcExplorer Web Services Edition
Developer:	ESRI located at http://www.esri.com/
Use:	Viewing and querying geodata from ArcIMS, and WMS servers
OGC:	WMS 1.1.1, WMC 1.0
Design:	Web application
Access:	Automatically used in your browser if the site is accessed from http://www.geographynetwork.com/arcexplorer/arcexplorer.html
Browsers:	Firefox, Internet Explorer, Safari, Netscape
Licensing:	Free but copyrighted and proprietary
Formats:	*unknown*
CRS:	*unknown*
Size:	*unknown*
Notes:	Can not access group of layers, can not organize layers unless they are added individually

① Toggle on the *services from other Internet Servers* button and click on OK when prompted, or click on the Add Services icon in the toolbar.

The startup message is displayed when you first open ArcExplorer Web.

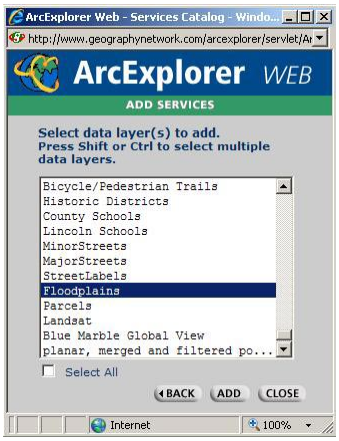
Add Services icon

② Enter the address of the WMS server and click on the OK button.

You can select predefined WMSs or ArcIMS servers using the drop-down menu.

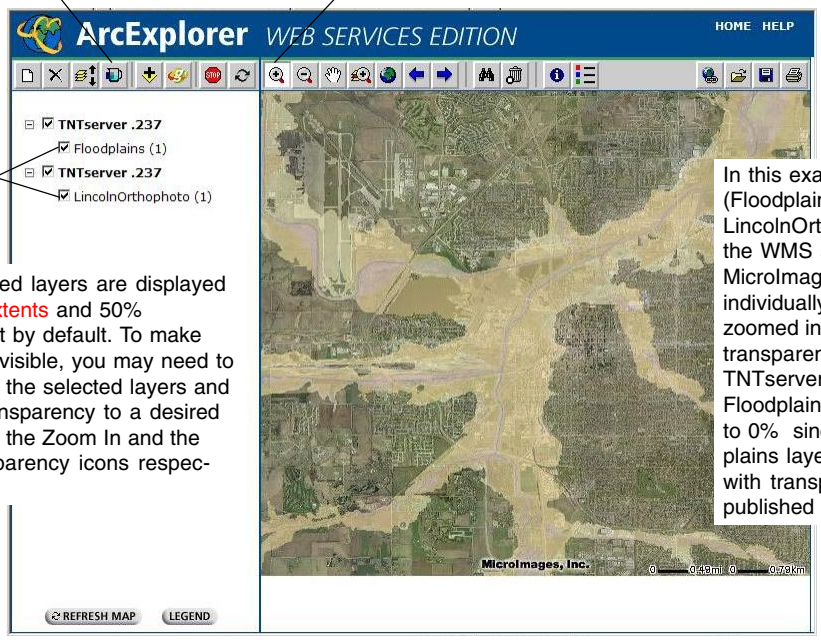
In this example, the address is for the WMS server at MicroImages.

③ Select the desired layer(s) and click on the ADD button.



Set Transparency icon

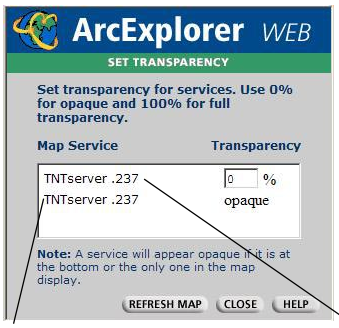
Zoom In icon



④ Toggle on the checkbox of the added layer(s) and click on the REFRESH MAP button.

The selected layers are displayed in world extents and 50% transparent by default. To make the layers visible, you may need to zoom in to the selected layers and set the transparency to a desired level using the Zoom In and the Set Transparency icons respectively.

In this example, two layers (Floodplains and LincolnOrthophoto) from the WMS server at MicroImages are added individually and displayed zoomed in. Note that the transparency for the TNTserver with the Floodplains layer was set to 0% since the Floodplains layer was designed with transparency when published by MicroImages.



TNTserver with LincolnOrthophoto layer.

TNTserver with Floodplains layer.

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Click to remove all map services and start a new map.

Click to change the order of the map services.

Click to add services from Geography Network.

Use these icons for zooming in/out, panning, and returning to global extents.

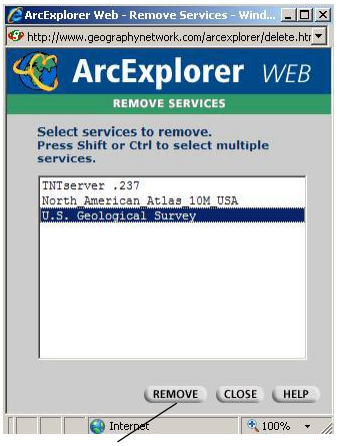
Click to go to the next/ previous map display.

Click to query attributes.

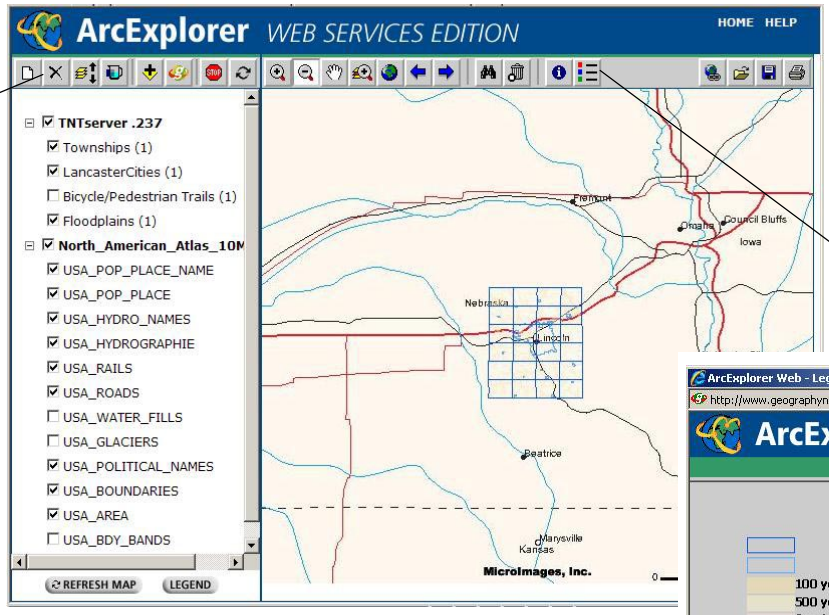
Click to create link to map.

Click to print the map with its legend.

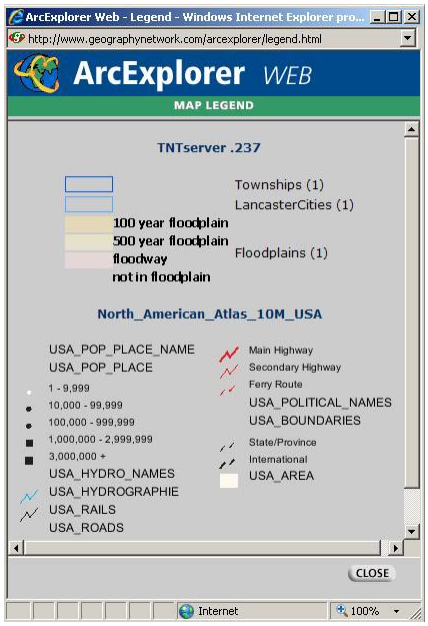
Clicking on the Remove Services icon opens the dialogue where you can highlight the server(s) to remove.



Click on this button to delete the highlighted server(s) and all its layers from the map.



Clicking on the View Map Legend icon displays the legends of the visible layers from each server.



The layers selected from the WMS servers can be displayed over the layers selected from the other available servers using ArcExplorer. In this example, the selected layers of the Lincoln Property Viewer atlas from the WMS server at MicroImages are displayed over the selected layers of the North American Atlas from the USGS EROS Data Center, which is one of the ArcIMS servers predefined in ArcExplorer.

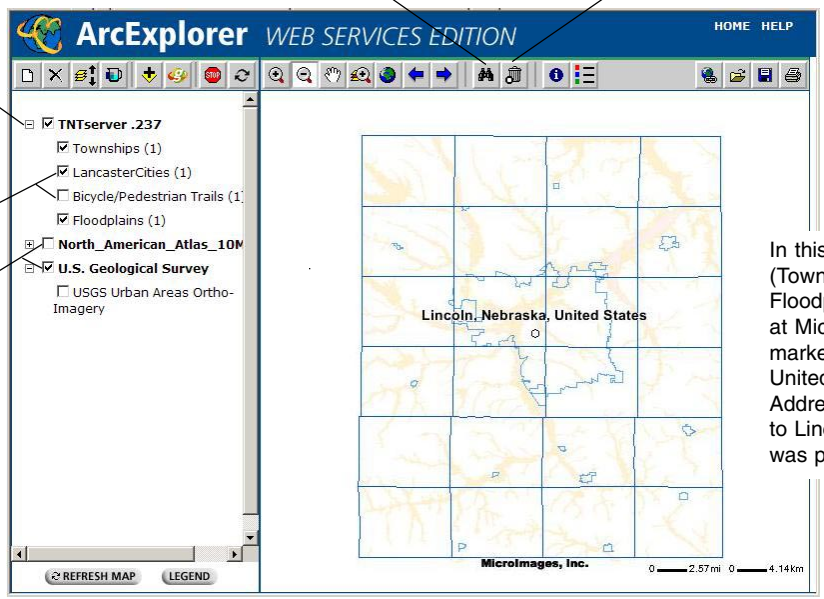
Find Places/ Addresses icon

Remove Marker icon

Click to expand/ collapse the server to see the available layers.

Show/hide layers by toggling on/off the checkbox for the layers.

Show/hide servers by toggling on/off the checkbox for the servers.



In this example, the three layers (Townships, LancasterCities, Floodplains) from the WMS server at MicroImages are shown with a marker of Lincoln, Nebraska, United States. The Find Places/ Addresses tool was used to zoom to Lincoln, NE and the marker was placed at this location.

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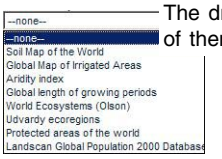
TNTserver 2006:72

Using FAO's InterMap to View WMS Layers

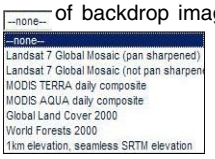
Name: InterMap - interactive map viewer
Developer: Food and Agricultural Organization of the United Nations (FAO) located at http://www.fao.org/
Use: Display geospatial data from FAO units and other organizations
OGC: WMS
Design: Web application
Access: Automatically used in your browser if the site is accessed from http://www.fao.org/geonetwork/srv/en/main.home
Browsers: Firefox, Internet Explorer, Safari
Licensing: Free application
Formats: *unknown*
CRS: *unknown*
Size: *unknown*

The list of predefined maps.



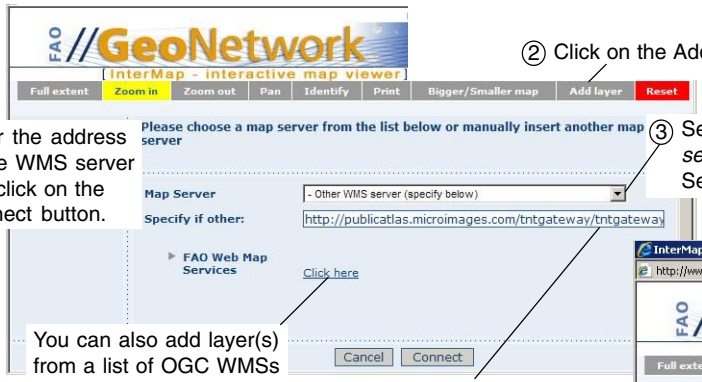
The drop-down list of thematic layers

You can create your own map composition using the base layers listed, and/or thematic layers/backdrop images drop-down menus



The drop-down list of backdrop images

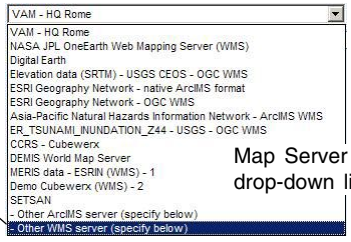
① Click on any link in the list of predefined maps, or click on either of the CREATE buttons.



② Click on the Add layer button.

④ Enter the address of the WMS server and click on the Connect button.

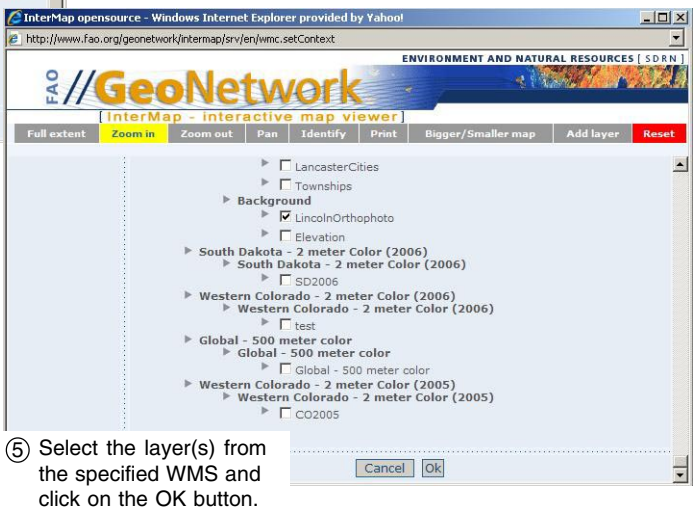
③ Select - *Other WMS server* from the Map Server drop-down list.



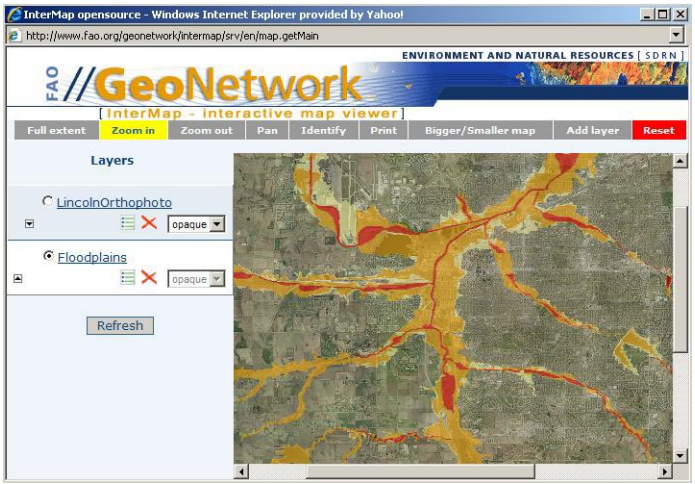
Map Server drop-down list.

You can also add layer(s) from a list of OGC WMSs currently available from FAO using this link.

The address entered is a WMS server at MicroImages.



⑤ Select the layer(s) from the specified WMS and click on the OK button.



In the illustration at the left, the Floodplains layer is displayed over the LincolnOrthophoto layer. These two layers are from the Lincoln property Viewer atlas, which is one of the atlases published by the WMS server at MicroImages.

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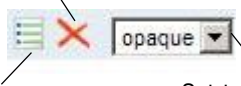
Use these buttons for zooming in/out, panning, and returning to full extent.

Click on this button to print the map with the legends of the layers.

Click on this button to change the size of the map view.

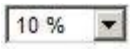
Use Up and Down icons to change the order of the layer(s).

Click on this icon to remove the layer.

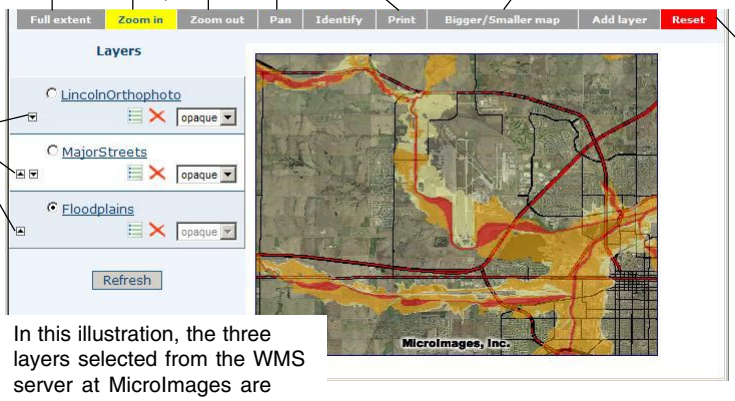


Click on the Legend icon to display the legend in html format.

Set transparency by choosing the transparency percentage from the drop-down list.

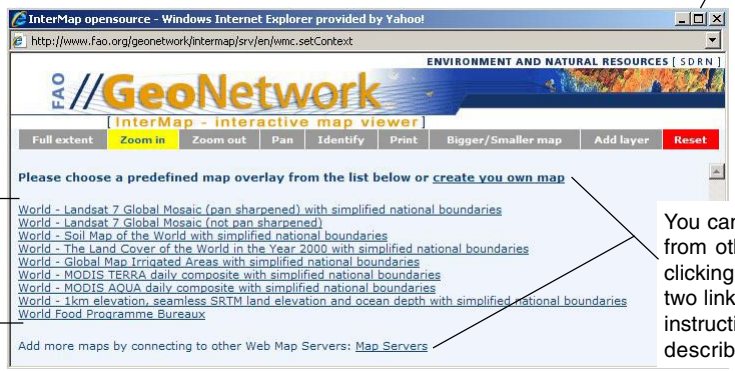


In this illustration, the legend of the Floodplains layer is shown.



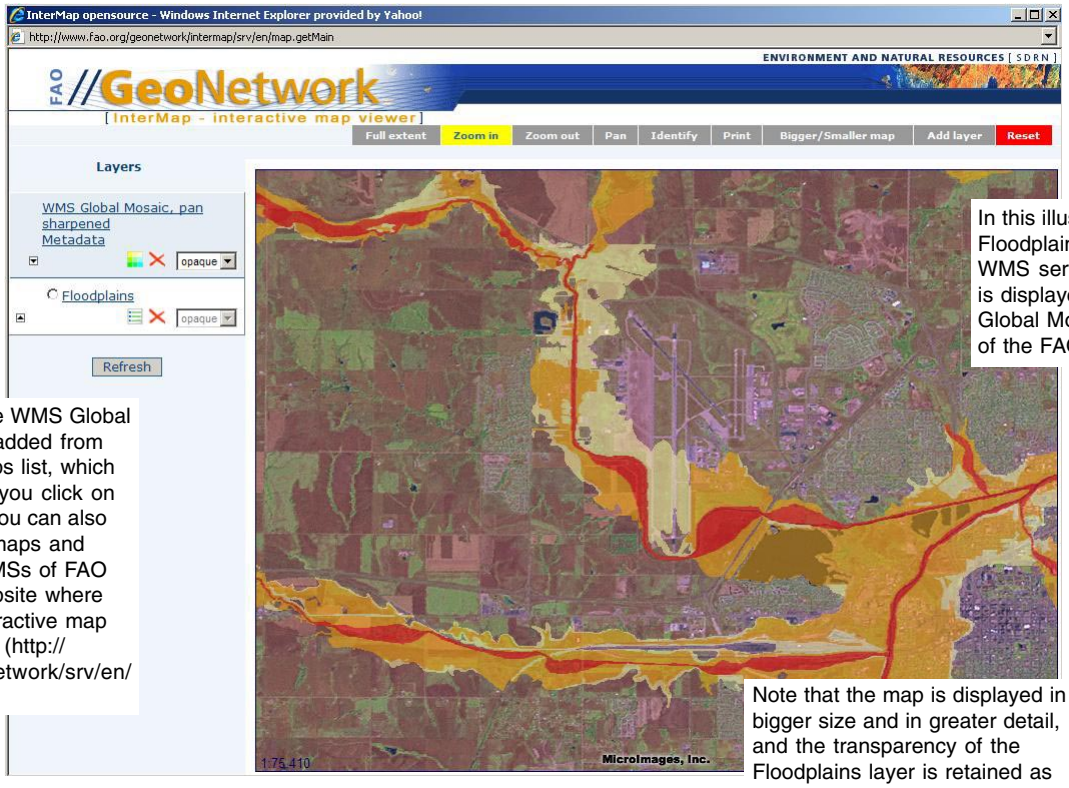
In this illustration, the three layers selected from the WMS server at MicroImages are shown in greater detail.

Click on the Reset button to delete all available layers and get predefined maps listed.



Click on the link of any predefined map listed to display it.

You can also add layers from other WMS servers by clicking on either of these two links and following the instructions in steps 2-5 as described.



In this illustration, the Floodplains layer from the WMS server at MicroImages is displayed over the WMS Global Mosaic, which is one of the FAO predefined maps.

In this example, the WMS Global Mosaic layer was added from the predefined maps list, which is accessed when you click on the Reset button. You can also select predefined maps and layers from the WMSs of FAO sites using the website where the InterMap - interactive map viewer is launched (http://www.fao.org/geonetwork/srv/en/main.home)

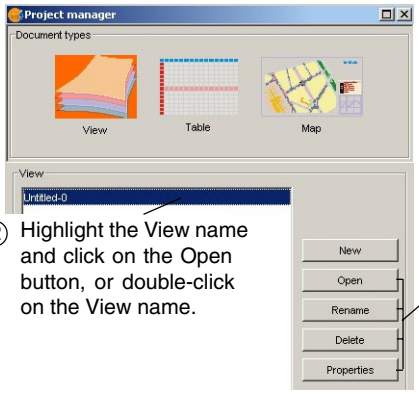
Note that the map is displayed in bigger size and in greater detail, and the transparency of the Floodplains layer is retained as published by MicroImages.

TNTserver 2006:72

Using Generalitat Valenciana's gvSIG to View WMS Layers

Name:	gvSIG 1.0.1 (04 January 2007 latest release)
Developer:	Generalitat Valenciana located at http://www.gva.es/
Use:	Manage geographic information, display and query geodata from local or remote sources
OGC:	WMS 1.3.0, WCS 1.0.0, WFS 1.0.0, GML 2.1.2, CSW 2.0
Design:	Executable program
Access:	Download executable for local use from http://www.gvsig.gva.es/index.php?id=descarga-gvsig&L=2
Platforms:	Windows, Mac OS X, Linux
Licensing:	Open Source but copyrighted
Formats:	jp2, jpeg, png, png (ColorPalette), png (TrueColor), png (TrueColor+interlaced), png (ColorPalette + interlaced), vnd.google-earth.kml+xml, svg+xml
CRS:	EPSG and other available reference systems
Size:	42.08 MB

① In the Project manager window, click on the View icon and then on the New button.

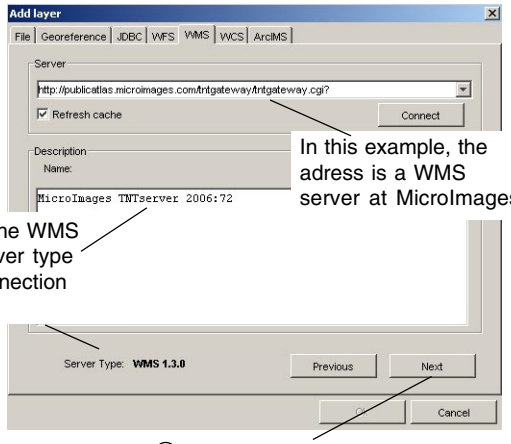


② Highlight the View name and click on the Open button, or double-click on the View name.

These buttons are inactive until a View name is highlighted.

③ Click on the Add layer icon or select View/Add layer from the main menu.

④ Click on the WMS tab, enter the URL of the WMS server and click on the Connect button.



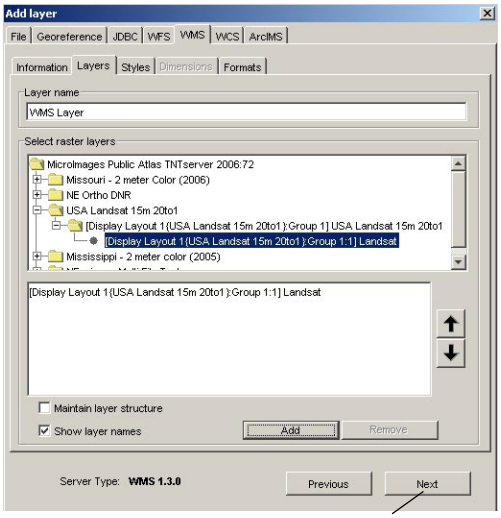
In this example, the adress is a WMS server at MicroImages.

The description of the WMS server and the Server type appear when a connection is established.

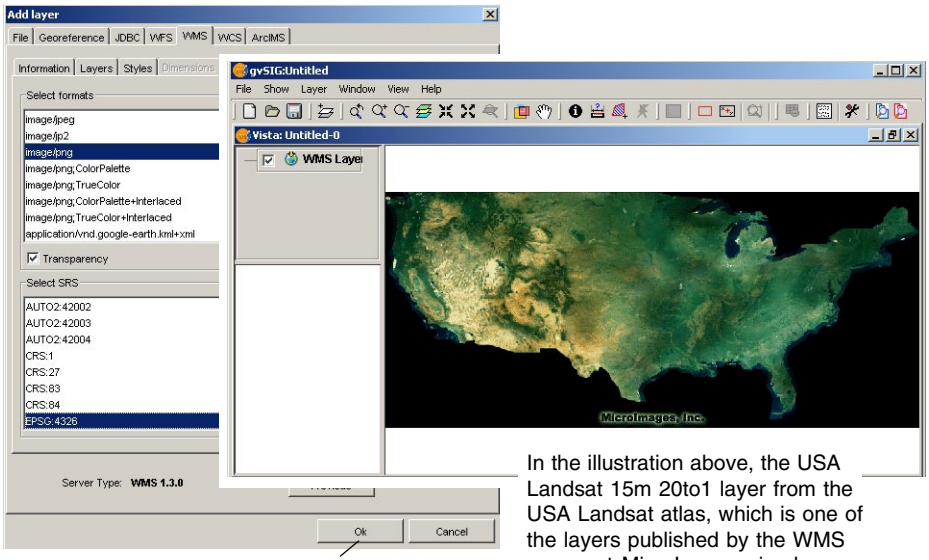
⑤ Click on the Next button.

You may need to select Show/Project manager from the main menu if the Project manager is not open by default. Also note that the Add layer icon in the toolbar and the Add layer option in the View menu are visible only when the View window is active.

⑥ Click on the Layers tab, expand the desired layer group(s), highlight the layer(s)/group(s) to display, and click on the Add button.



Clicking on the Next button switches to the Styles tab so you can either accept the default style or select another style. Click on the Formats tab or the Next button to accept the default style automatically.



In the illustration above, the USA Landsat 15m 20to1 layer from the USA Landsat atlas, which is one of the layers published by the WMS server at MicroImages, is shown.

⑦ On the Formats tabbed panel, select an image format and a Coordinate Reference System, and click on the OK button.

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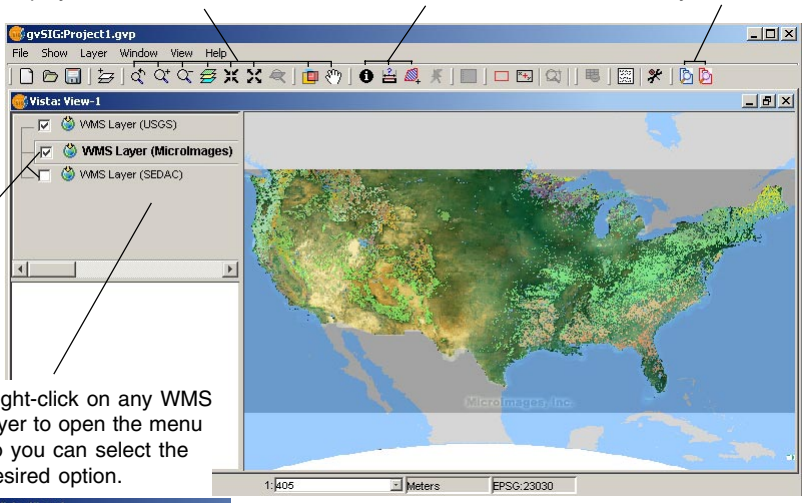
Use these icons for zooming in/out, panning, and returning to the previous display or maximum extents.

Use these icons to query attributes and measure distances/areas.

Click to search geodata and find by Gazetteer

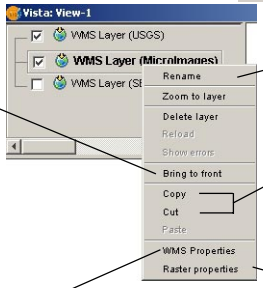


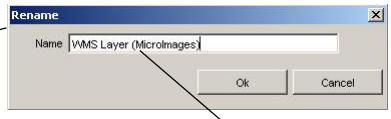
Show/hide WMS layers by toggling on/ off the checkbox of each WMS layer.

In the illustration at the left, the Forest Cover Types layer from the National Atlas of the USGS WMS server is displayed with 50% transparency over the USA Landsat layer from the WMS at MicroImages.

Right-click on any WMS layer to open the menu so you can select the desired option.

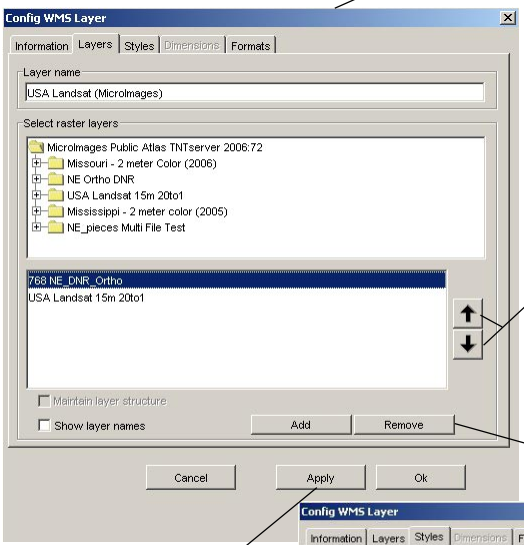
To change the order of the WMS layers in the View window, you can either select this option, or drag and drop the active layer in the desired position.

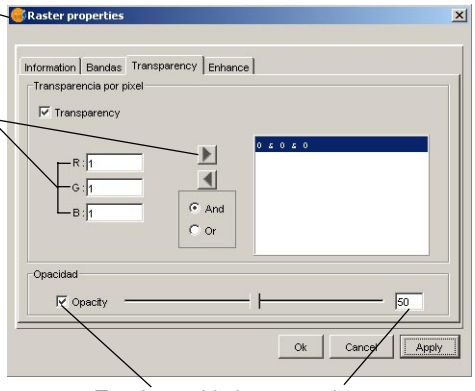




Edit the name of the layer and click on OK.

Select to copy/cut the WMS layer and paste it into the existing or another view.





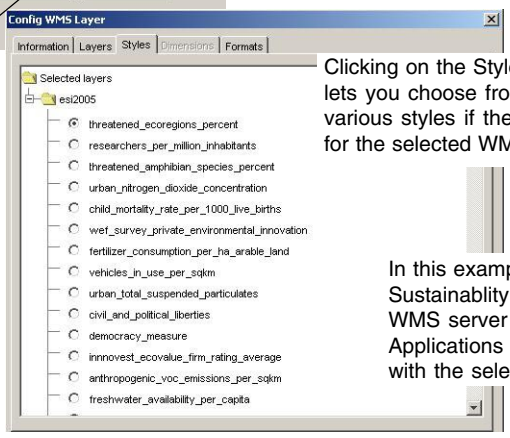
Enter the RGB values for the pixels to be shown transparent and click on the right arrow.

Use these arrows to move the highlighted layer(s) up or down in the display order.

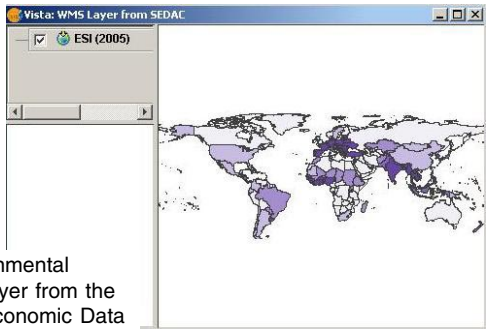
Click to remove the highlighted WMS layer(s)/group(s) from the list.

Toggle on this button and enter the transperancy percentage to apply to the layer.

Click on this button to redraw the view with your changes before clicking on the OK button.



Clicking on the Styles tab lets you choose from various styles if they exist for the selected WMS layer.



In this example, the Environmental Sustainablity Index (ESI) layer from the WMS server at the Socioeconomic Data Applications Center (SEDAC) is shown with the selected style.

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TNTserver 2006:72

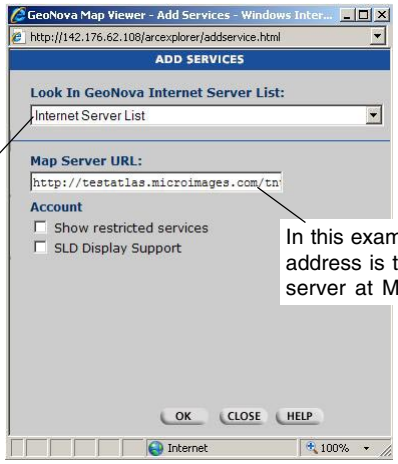
Using GeoNOVA's Map Viewer to View WMS Layers

Name: GeoNova Map Viewer
Developer: Geographic Gateway to Nova Scotia (GeoNOVA) located at http://www.gov.ns.ca/geonova/home/default.asp
Use: Viewing and querying geodata of Nova Scotia Province in Canada and other WMS servers
OGC: WMS 1.1.1, WMC 1.0
Design: Web application
Access: Automatically used in your browser if you click on the GeoNOVA Map Viewer link on the site accessed from http://gov.ns.ca/GeoNova/home/products/softpage/geonova_map_viewer.asp
Browsers: Firefox, Internet Explorer, Safari
Licensing: Free application
Formats: *unknown*
CRS: *unknown*
Size: *unknown*

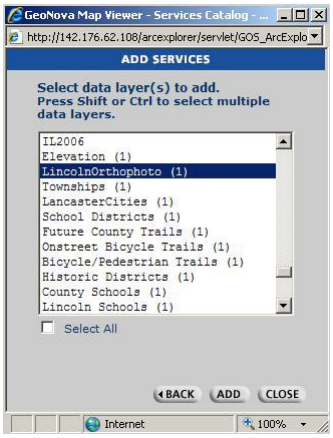
① Click on the Add Services icon in the toolbar.

Add Services icon

② Enter the address of the WMS server and click on the OK button.



③ Select all, or the desired layer(s) and click on the ADD button.

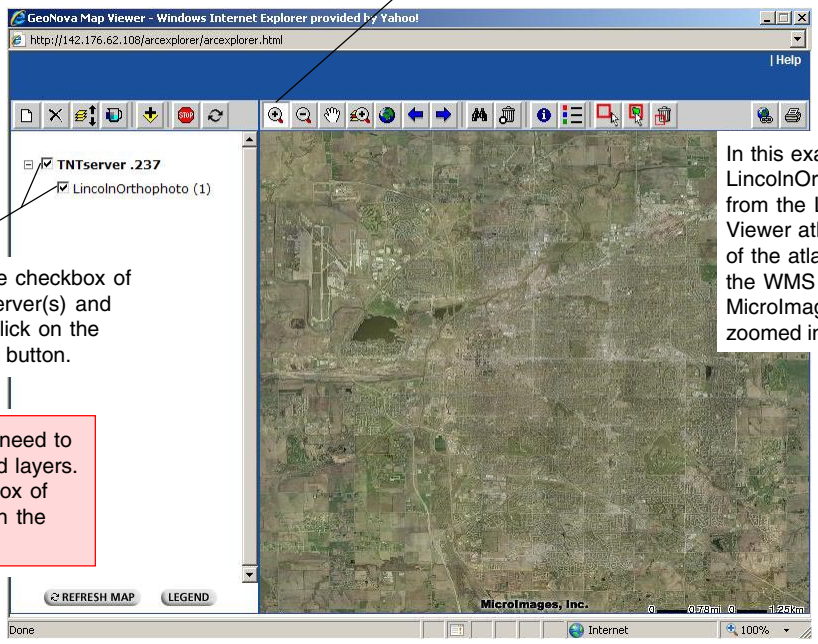


You can select any predefined GeoNova Internet Server using the drop-down menu.

In this example, the address is the WMS server at MicroImages.

Scroll down for more services.

Zoom In icon



In this example, the LincolnOrthophoto layer from the Lincoln Property Viewer atlas, which is one of the atlases published by the WMS server at MicroImages, is displayed zoomed in.

④ Toggle on the checkbox of the added server(s) and layers, and click on the Refresh Map button.

To make the layers visible, you may need to zoom in to the extents of the selected layers. Make sure you toggle on the checkbox of the server(s) and layers, and click on the Refresh Map button.

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Click to remove all map services and start a new map.

Click to change the order of the map services.

Use these icons for zooming in/out, panning and extent-based relocation.

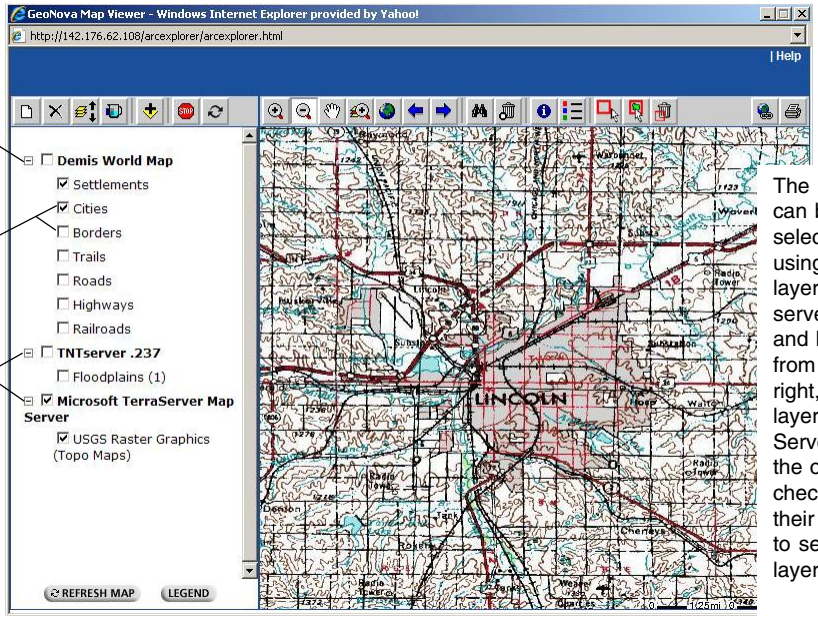
Click to go to the next/ previous map display.

Click to query attributes.

Click to display the legend of the visible layers from each server.

Click to create link to map.

Click to print the map with its legend.



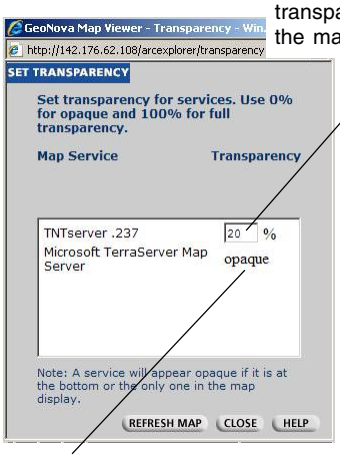
Click to expand/ collapse the server to see the available layers.

Show/hide layers by toggling on/off the checkbox of the layers.

Show/hide servers by toggling on/off the checkbox of the servers.

The layers selected from the WMS servers can be displayed together with the layers selected from the other available servers using GeoNOVA. In this example, various layers were added from the two predefined servers, Microsoft TerraServer Map Server and Demis World Map, along with the layers from a TNTserver. In the illustration at the right, USGS Raster Graphics (Topo Maps) layer from Microsoft TerraServer Map Server is shown zoomed in to Lincoln, while the other servers are hidden. Toggle on the checkbox of the hidden servers to make their layers visible. Note that you may need to set the transparency and change the layer order to get better display results.

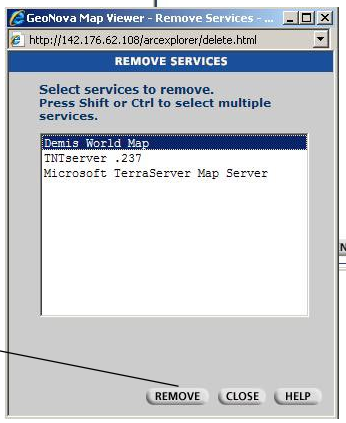
Clicking on the Set Transparency icon opens the dialogue where you can type the desired transparency value for the map service.



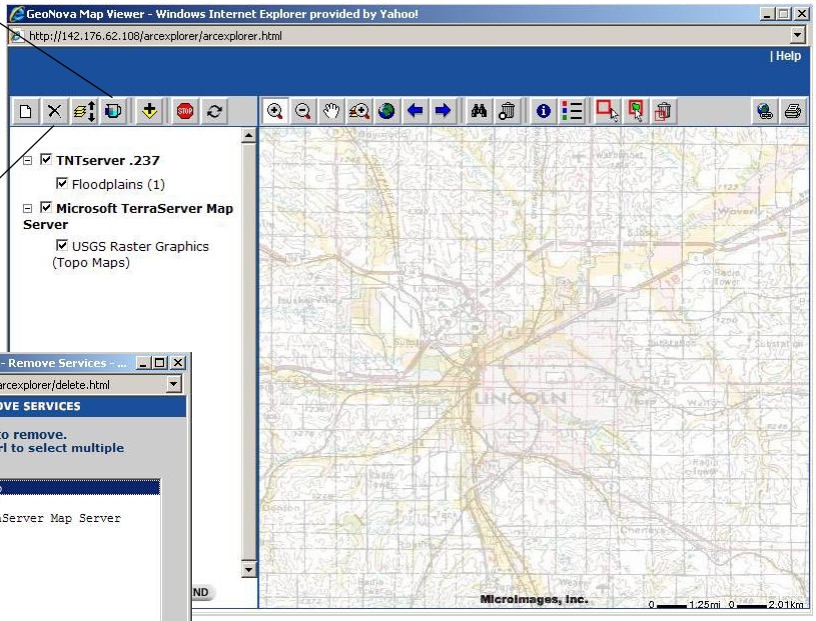
When you change the order of the servers, layers from the

server at the bottom become opaque automatically. Note that the layers from other servers are displayed with 50% transparency by default.

Clicking on the Remove Services icon opens the dialogue where you can highlight the server(s) to remove.



Click on this button to delete the highlighted server(s) and all its layers from the map.



In the illustration above, the Floodplains layer from the WMS server at MicroImages is displayed over the USGS Raster Graphics (Topo Maps) layer from Microsoft TerraServer Map Server with 20% transparency. Note that the 20% transparency applies to the whole layer. Since the format of the layer can not be changed to PNG using GeoNOVA, the null values, which are transparent in the image in PNG format, are displayed opaque white when no transparency is applied.

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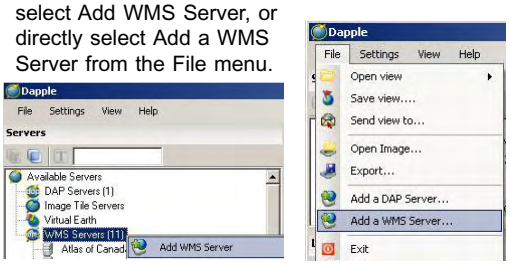
Using Geosoft's Dapple to View WMS Layers

Name:	Dapple 1.0.12.0 (21 November 2006 latest release)
Developer:	Geosoft, Inc. located at http://www.geosoft.com
Use:	Visualizing, presenting, and sharing geoscientific data on desktop computers
OGC:	WMS
Design:	Executable program
Access:	Download executable for local use from http://dapple.geosoft.com/
Platforms:	Windows only
Licensing:	Open Source but copyrighted
Extensible:	*unknown*
Formats:	*unknown*
CRS:	*unknown*
Size:	13.8 MB

① Right-click on the WMS Servers on the Available Servers list and select Add WMS Server, or directly select Add a WMS Server from the File menu.



② Enter the address of the WMS server.

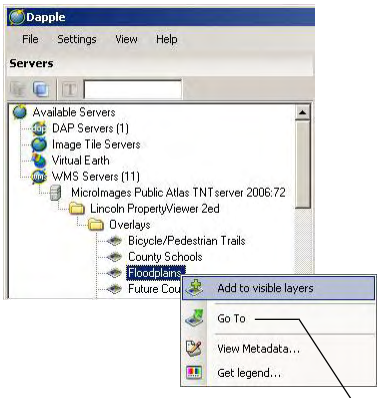
In this example, the address is the WMS server at MicroImages.

The WMS server at MicroImages gets listed along with the other available WMS servers.

③ Navigate to the image from the specified WMS server

In this example, the Floodplains layer is selected from the Lincoln Property Viewer atlas, which is one of the many atlases published by the WMS server at MicroImages.

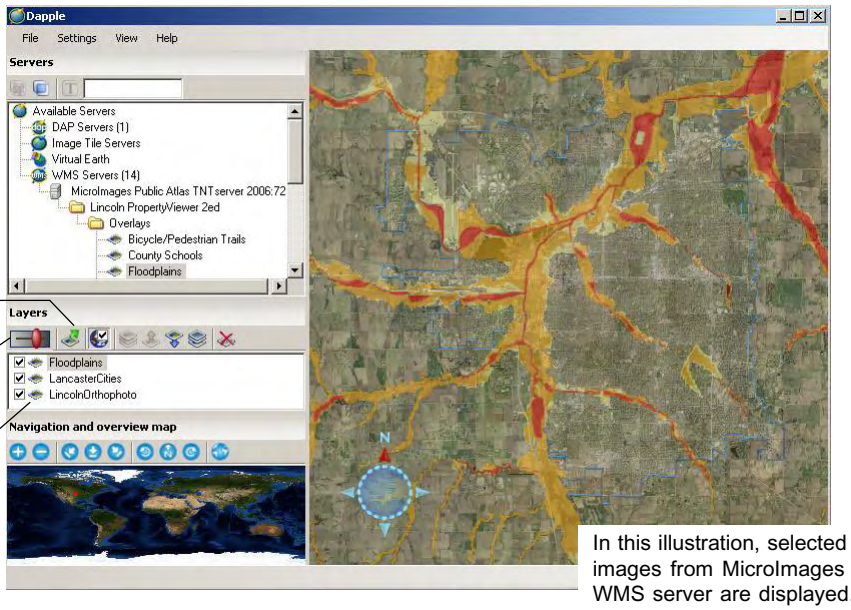
④ Double-click on the image name, or right-click on the image name and select Add to visible layers from the menu.



The Go To icon rotates the global view to display the area of the selected layer.

The transparency of the selected layer can be set using this slider.

Three layers from the Lincoln Property Viewer atlas were individually selected and added to the visible layers list for display.



In this illustration, selected images from MicroImages WMS server are displayed.

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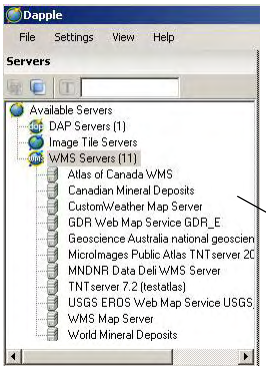
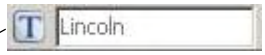


In the illustration above, all available servers are listed. Note that only the *Show layers that intersect the current view* icon is active when all layers are shown.

Click on this icon to see the data layers that intersects with the current view.

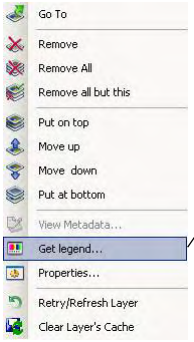
Click on this icon to see all the available data layers.

The previously added WMS servers are also retained along with the default servers.

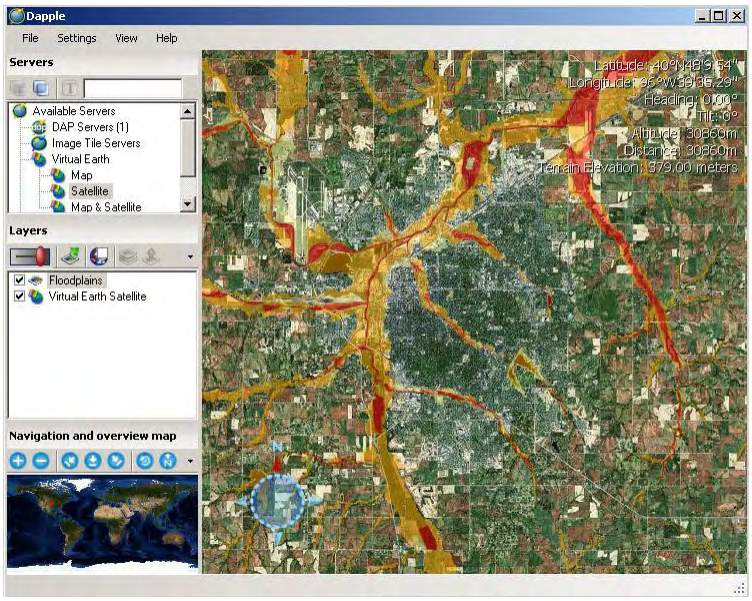


Type in the box and click on the *Show layers with text* icon to query the active servers that provide the data matching the search parameters.

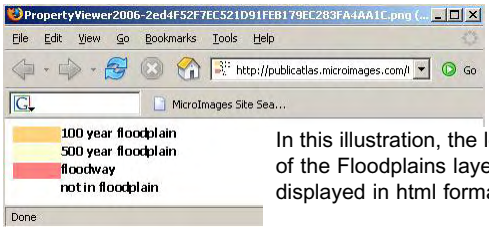
You can also reach these icons using the right mouse button menu for the selected layer.



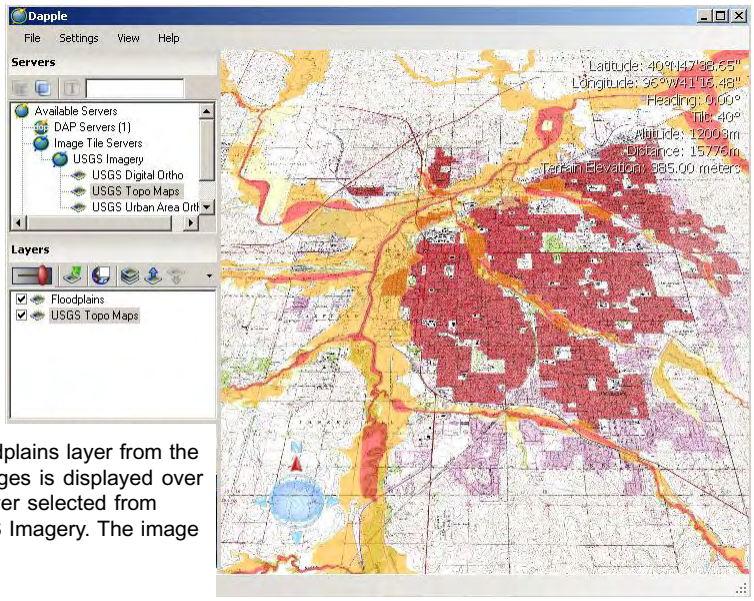
Select Get legend from the menu to display the legend associated with the currently selected layer in html format.



The layers selected from the WMS servers can be displayed over the layers selected from the other available servers using Dapple. In this example, the Floodplains layer from the WMS server at MicroImages is displayed over the Virtual Earth Satellite layer.



In this illustration, the legend of the Floodplains layer is displayed in html format.



In this example, the Floodplains layer from the WMS server at MicroImages is displayed over the USGS Topo Maps layer selected from Image Tile Servers/USGS Imagery. The image is tilted down 40 degrees.

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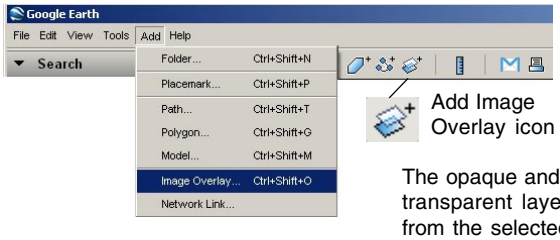
Using Google Earth to View WMS Layers

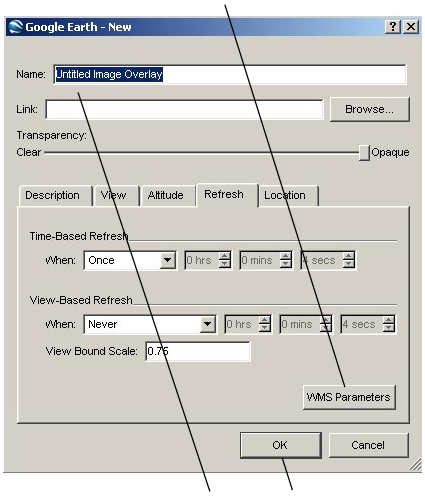
Name:	Google Earth 4.0.2722 (08 January 2007 latest release)
Developer:	Google, Inc. located at http://www.google.com/
Use:	Display the earth by overlaying images on a 3D globe.
OGC:	WMS 1.1.1
Design:	Executable program
Access:	Download executable for local use from http://earth.google.com/download-earth.html
Platforms:	Windows, Mac OS X, Linux
Licensing:	Free but proprietary and copyrighted
Formats:	jpg, bmp, gif, tiff, tga, png
CRS:	EPSG
Size:	14.3 MB

① Select Add/Image Overlay from the main menu, or click on the Add Image Overlay icon.

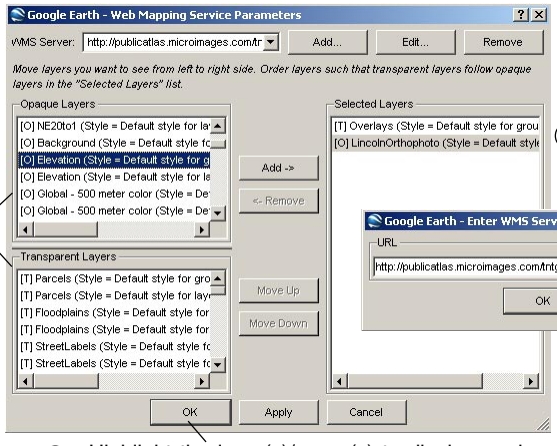


Add Image Overlay icon

② Select the Refresh tab and click on the WMS Parameters button.



③ Click on the Add button to add a new WMS server.



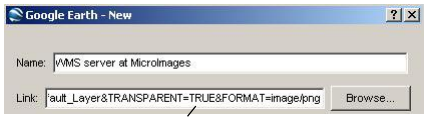
The opaque and transparent layers from the selected server are listed in different panels.

④ Enter the address of the WMS server and click on the OK button.

In this example, the address is the WMS server at MicroImages.

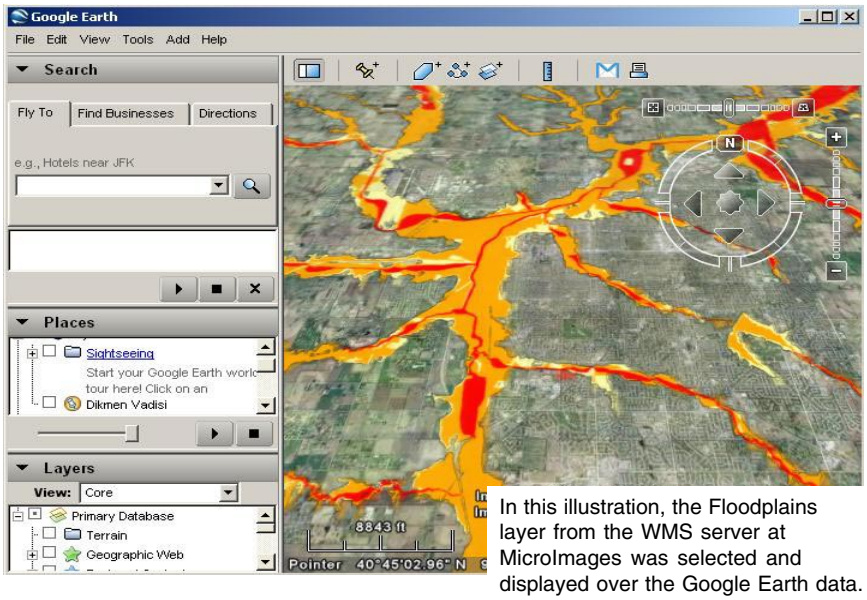
⑤ Highlight the layer(s)/group(s) to display, and move the highlighted layer(s)/group(s) from left to right by clicking on the Add button, then click on OK.

⑥ Change the name of the overlay and click on the OK button to complete the process.



When the URL of the WMS server is entered, this link is automatically updated. Image format and transparency are changed here.

Note that you may need to edit the link to the WMS server for transparency and image format. In this example the format is changed from jpeg to png and the transparency is changed from False to True.



In this illustration, the Floodplains layer from the WMS server at MicroImages was selected and displayed over the Google Earth data.

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Click to add a placemark for a location.

Click to add a path (line or lines).

Click to hide/display the Search, Places and Layers panels.

Click to add a polygon.

Click to add an image overlay on the Earth.

Click to measure a distance or area.

Click to email view or image.

Use the Search panel to find places and directions and manage search results.

Use the slider or the buttons to tilt the image up/ down.

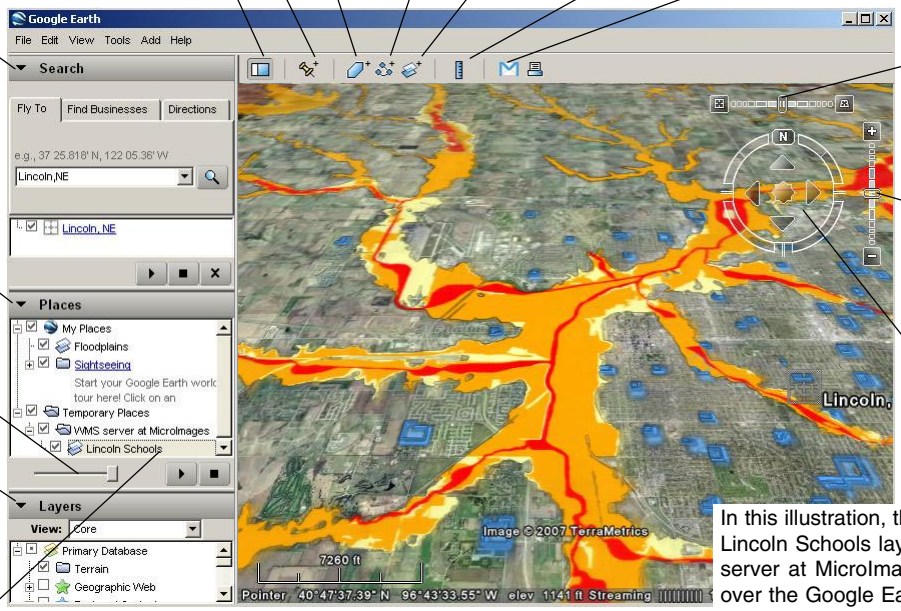
Use the Places panel to locate, save, organize, and revisit placemarks.

Use the slider or the buttons to zoom in/out.

Use the slider to change the transparency of the highlighted layer.

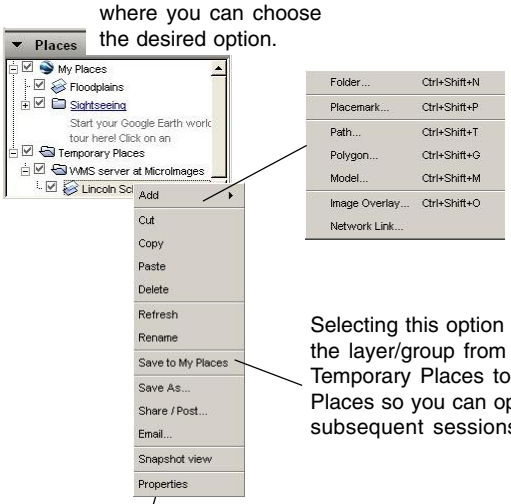
Use the direction arrows to move the view in the desired direction.

Use the Layers panel to display points of interest predefined by Google Earth.



In this illustration, the Floodplains and Lincoln Schools layers from the WMS server at MicroImages are displayed over the Google Earth data. These layers were zoomed in and tilted down using the sliders.

Highlight any layer/group listed in the Temprorary Places section of the Places panel and right click to open the menu where you can choose the desired option.

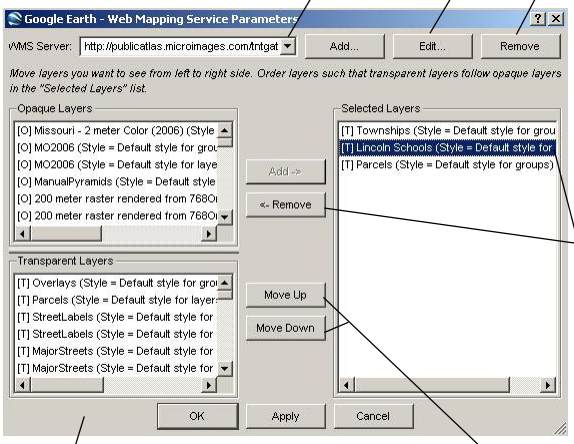


Selecting this option moves the layer/group from Temporary Places to My Places so you can open it in subsequent sessions.

Click to access the default WMS servers along with the previously used ones.

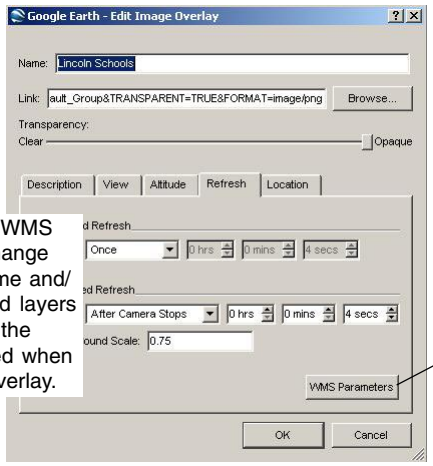
Click to edit the address of the selected WMS server.

Click to remove the selected WMS server.



Click to remove the highlighted WMS layer(s)/ group(s) from the Selected layers list.

Use these buttons to change the display order of the highlighted layer/group.



Right-clicking on a WMS overlay lets you change the layer/group name and/ or which server and layers are selected using the same interface used when adding an image overlay.

Clicking on this button reopens the WMS Parameters window where you can reorganize the layers.

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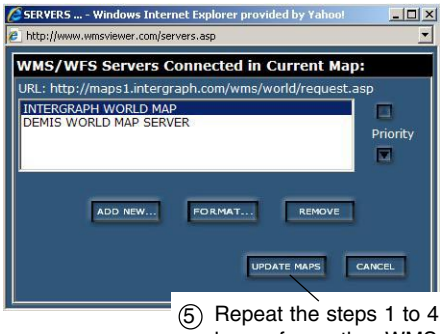
Using Intergraph's OGC Viewer to View WMS Layers

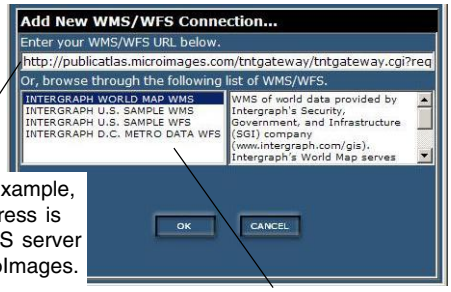
Name:	OGC Viewer 03.00.00.05 (21 June 2006 latest release)
Developer:	Intergraph Corporation located at http://www.intergraph.com/
Use:	Viewing and querying geodata from web servers that are operated by Intergraph or others
OGC:	WMS 1.3.0, WMC 1.1.0, WFS 1.0.0, CWS 2.0.0, SLD 0.7.2
Design:	Web application
Access:	Automatically used in your browser if the site is accessed from http://www.wmsviewer.com/main.asp
Browsers:	Firefox, Internet Explorer, Safari
Licensing:	Free but copyrighted and proprietary
Formats:	jp2, jpeg, png, png (ColorPalette), png (TrueColor), png (TrueColor+interlaced), png (ColorPalette + interlaced)
CRS:	EPSG
Size:	4.2 MB

① Click on the Edit Servers button

② Click on the Add New button.



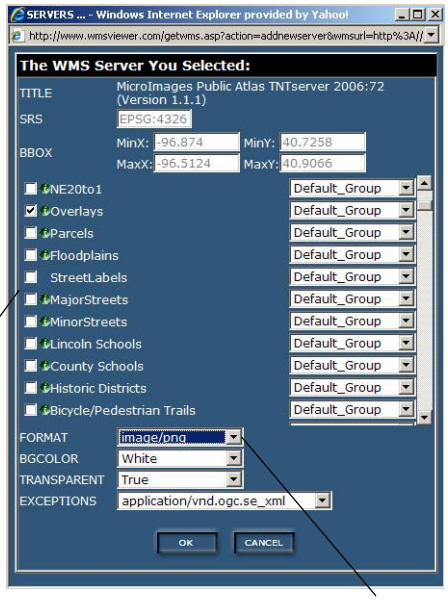
③ Enter the address of the WMS server and click on the OK button.



In this example, the address is the WMS server at MicroImages.

You can add any pre-defined WMS/WFS server selecting from the list.

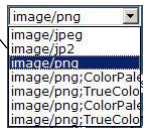
④ Select the desired layer(s)/group(s) and click on the OK button.



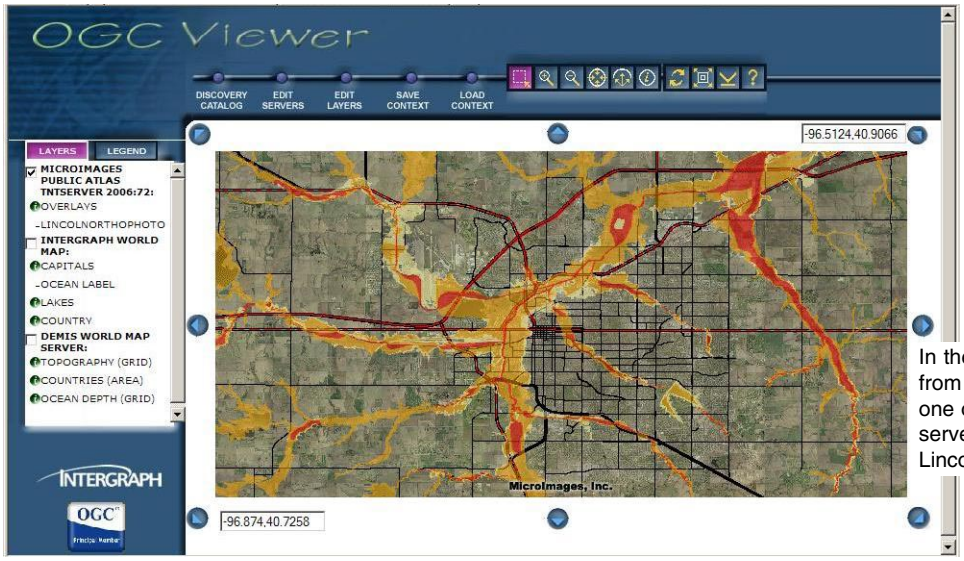
Note that the individual layers are listed along with the groups of layers so they can be selected and displayed individually.

Select image format from the drop-down list.

In this example the format was set to png to retain the transparency of the layers.



⑤ Repeat the steps 1 to 4 if you want to add layers from other WMSs, and click on the Update Maps button.



In the illustration at the left, the Overlays group from the Lincoln Property Viewer atlas, which is one of the atlases published by the WMS server at MicroImages, is displayed over the LincolnOrthophoto layer.

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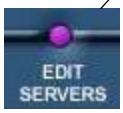
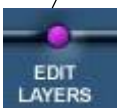
Click to search/ retrieve OGC WMS/WFS compatible data.



Clicking on this button opens the Servers window.



Clicking on this button opens the Layers window.

Use these buttons to save/load WMS context documents.

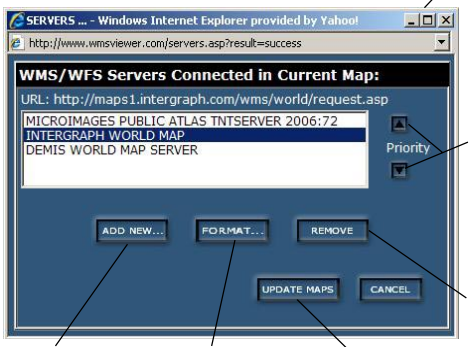
Use these icons for zooming in/ out, recentering, and panning.

Click to query attributes.

Click to refresh map view.

Click to fit all selected maps into the map view.

Click to return to original startup map view.



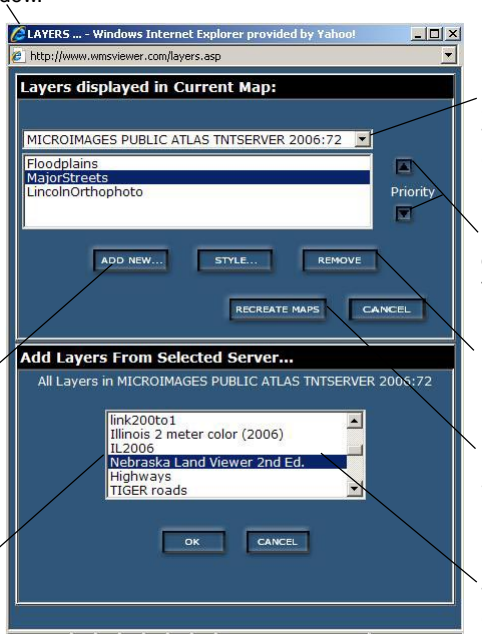
Use these buttons to change the order of the highlighted server.

Click on this button to remove the highlighted server.

Click on this button to add a new WFS/WMS server, or select a predefined server to connect to.

Click on this button to select an image format for the highlighted server.

Click on this button to update the viewer with your selections.



Clicking on this button opens the Add Layers From Selected Server dialogue where the layers from the selected WMS/ WFS server are listed.

Specify the WMS/WFS server to add layers from using the drop-down list of the servers in the current map.

Use these buttons to change the order of the highlighted layer.

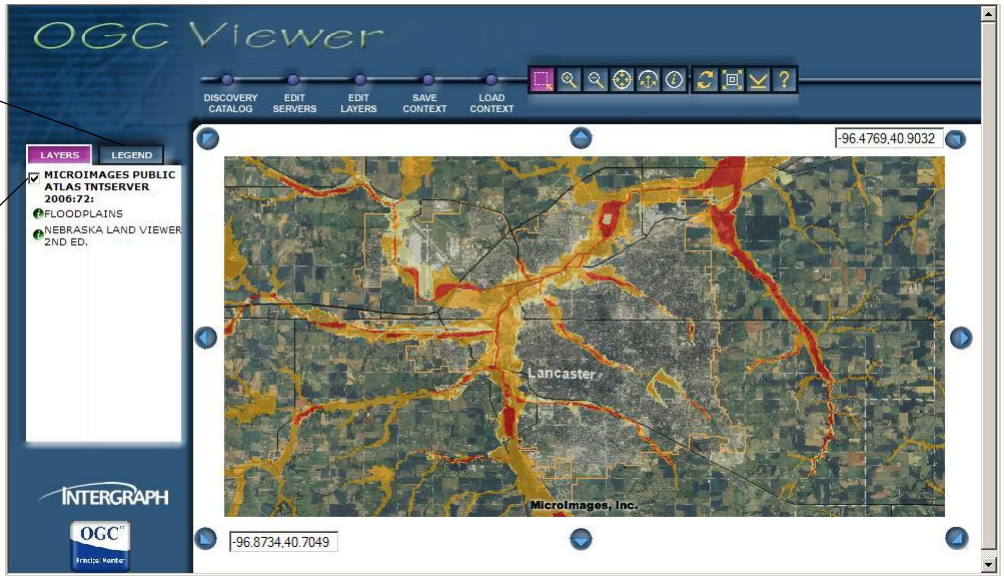
Click on this button to remove the highlighted layer.

Click on this button to update the viewer with your changes.

Highlight the layer to add and click on the OK button.

Click on the Legend tab to display the legend.

Show/hide servers by toggling on/off the checkbox of the server.



In the illustration above, the Floodplains layer from the WMS server at MicroImages is displayed over the Nebraska Land Viewer group. Note that the Intergraph World Map and Demis World Map Server, which constitue the original startup map view, were removed.

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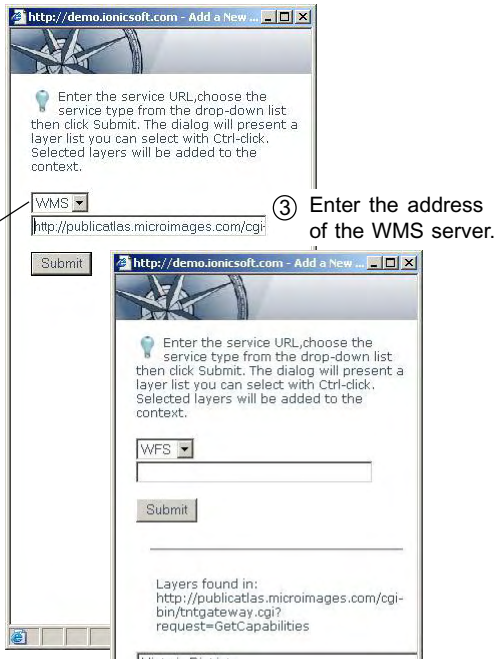
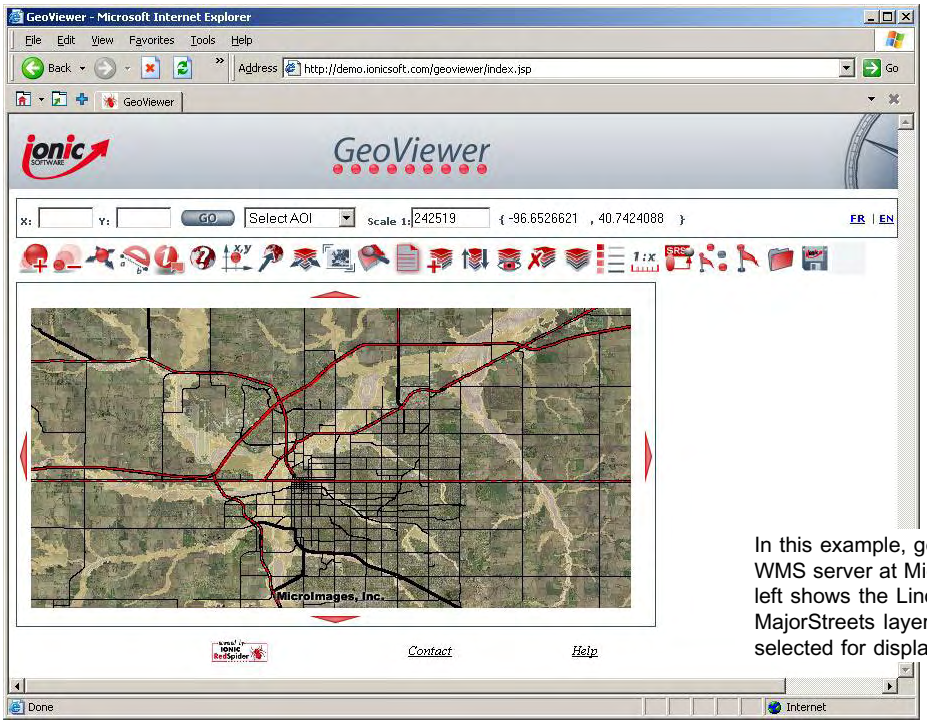
Using IONIC's GeoViewer to View WMS Layers

Name:	IONIC RedSpider GeoViewer (RedSpider Web 3.4)
Developer:	IONIC Enterprise, Inc. located at www.ionicsoft.com
Use:	Viewing and querying geodata from WMS, WFS, and WCS data sources
OGC:	WMS 1.1.1, WFS 1.0, WCS/CPS, GML
Design:	Web application
Access:	Automatically used in your browser if the site is accessed from http://demo.ionicsoft.com/geoviewer/
Browsers:	Firefox, Internet Explorer, Safari
Licensing:	Proprietary (demo version can be used for free)
Extensible:	*unknown*
Formats:	*unknown*
CRS:	EPSG
Size:	*unknown*
Notes:	Can not access group of layers

① Click on the Add a New Service to Your Context icon.





In this example, geodata layers were added from the WMS server at Microimages. The illustration on the left shows the LincolnOrthophoto, Floodplains, and MajorStreets layers, which were individually selected for display since a group can not be added.

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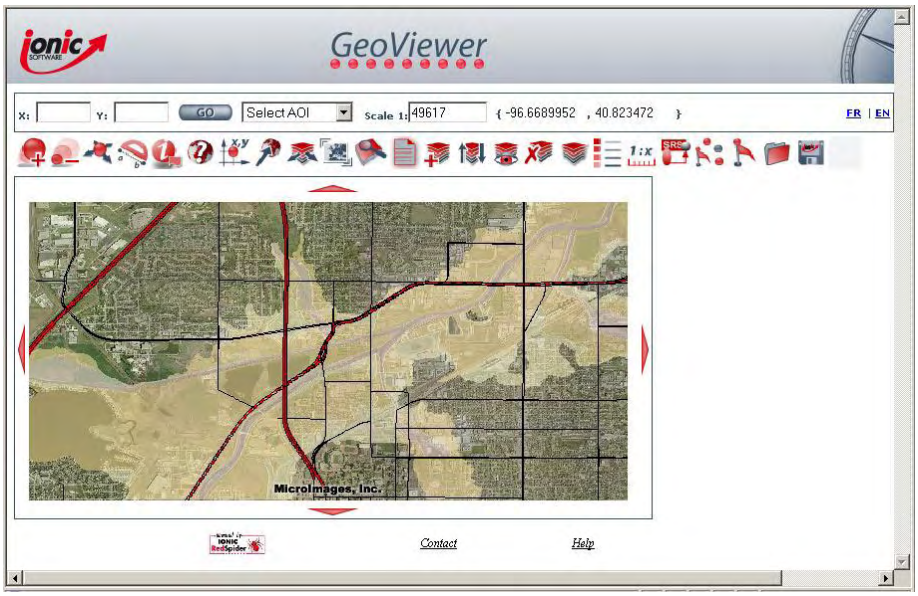
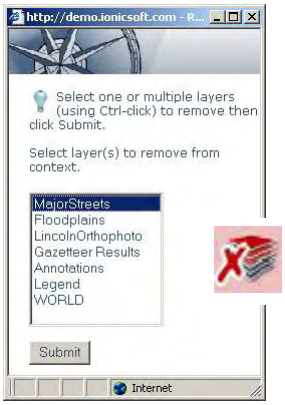
You can use the icons in the main view to perform various tasks that apply to individual layers based on your selections.

Use Discover Resources in a Catalog icon to query an OpenGIS Catalog service (CS-W) to retrieve layers.

Use Load context from file icon to load a context document which is a locally saved XML file.

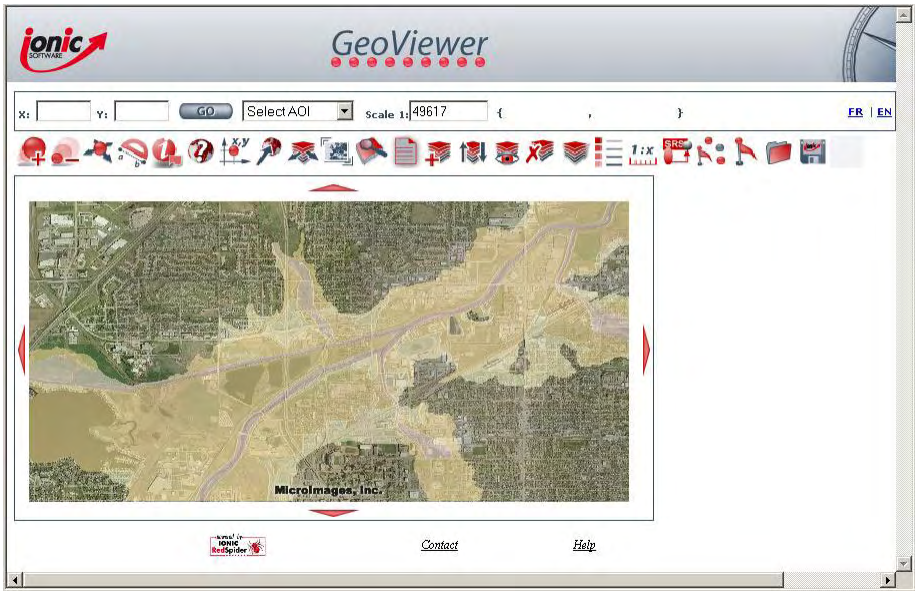
Use the Add Layer from GML icon to open a saved GML document or edit/ paste a GML.

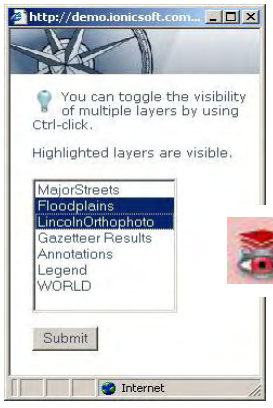




Remove Layers icon

In the illustration above, the three layers selected from the WMS server at MicroImages are shown in greater detail. These layers are listed in the Remove Layers window where you need to highlight the layer to be removed.





Change Layers Visibility icon

In the illustration above, the two layers highlighted in the Change Layers Visibility window are shown. You can also get the same view by removing the MajorStreets layer.

TNTserver 2006:72

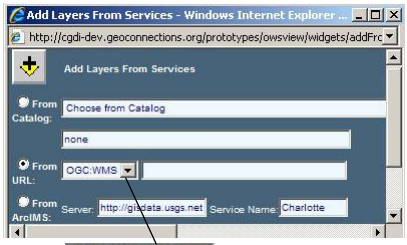
Using Owsview to View WMS Layers

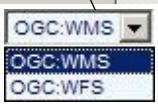
Name:	owsview
Developer:	The Government of Canada located at http://cgdi.gc.ca/
Use:	View and query geospatial data from CGDI and other WMS and WFS servers
OGC:	WMS 1.1.1, WFS 1.0.0, GML 2.0, CAT 2.0, WMC 1.1.0, SLD 1.0.0
Design:	Web application
Access:	Automatically used in your browser if the site is accessed from http://cgdi-dev.geoconnections.org/prototypes/owsview/index.html
Browsers:	Firefox, Internet Explorer, Safari
Licensing:	Free application
Formats:	gif, png, jpeg
CRS:	EPSG
Size:	*unknown*

① Click on the Add Layers From Services icon.

Add Layers From Services icon

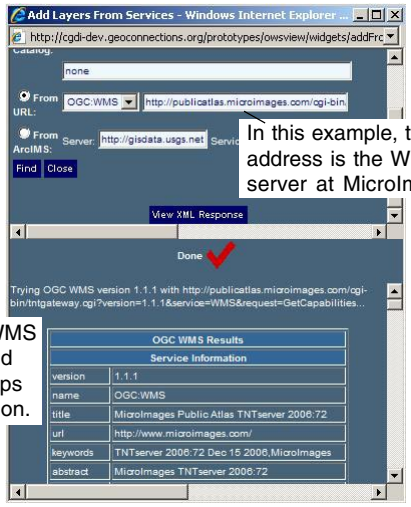
② Toggle on the From URL button and select OGC:WMS from the drop-down menu.





OGC data source drop-down menu

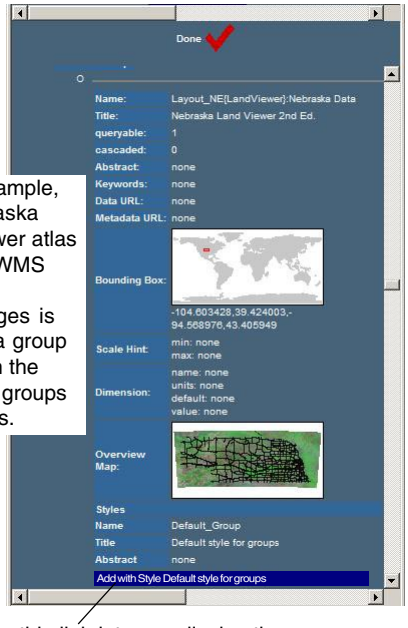
③ Enter the address of the WMS server and click on the Find button.



In this example, the address is the WMS server at MicroImages.

The information on WMS server connected and available layers/groups are listed in this section.

④ Scroll down on the list of layers and click on the Add... link for the desired layer or group.



In this example, the Nebraska Land Viewer atlas from the WMS server at MicroImages is listed as a group along with the the other groups and layers.

Clicking on this link lets you display the group in the Map View. Note that each layer in this group is also listed separately to be added and displayed individually.

⑤ Highlight the added layer/group and click on the Refresh icon

Refresh icon

In this example, all layers from the NE Land Viewer atlas, which is one of the many atlases published by the WMS server at MicroImages, are displayed as a group.

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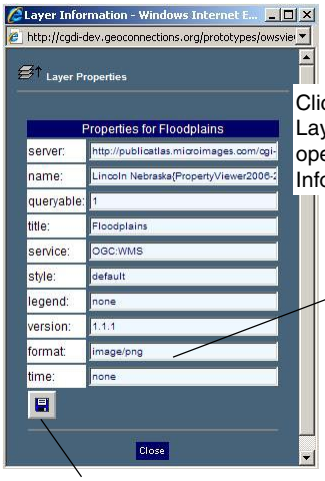
Use navigation icons for zooming in/out, panning, and returning to global extents.

Use these icons to measure distance, query attributes, add features, and digitize.

Use these icons to find placenames, zip codes, NTS sheets, and watersheds from the CGDI database.

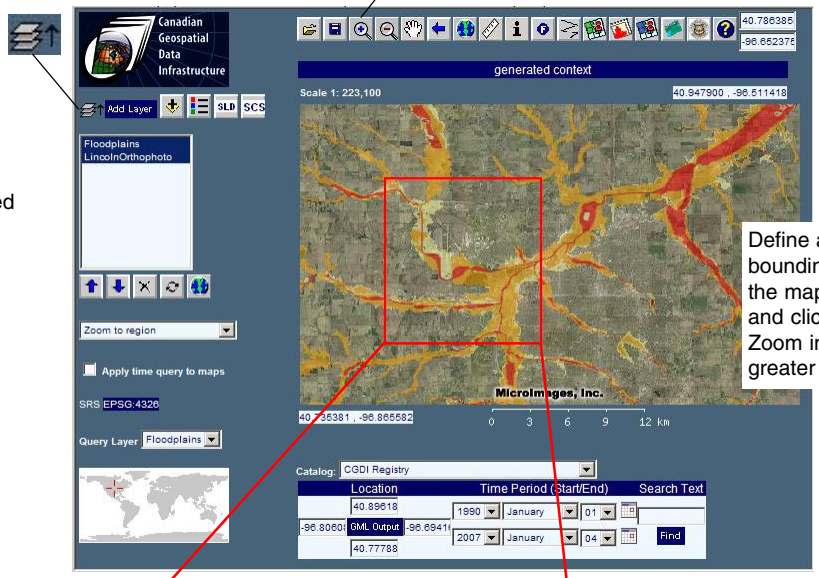


Clicking on the View Layer Properties icon opens the Layer Information window.

In this example the format was changed from jpeg to png to display the Flood-plains layer with transparency.

Click on this button to save the changes.

Zoom in icon



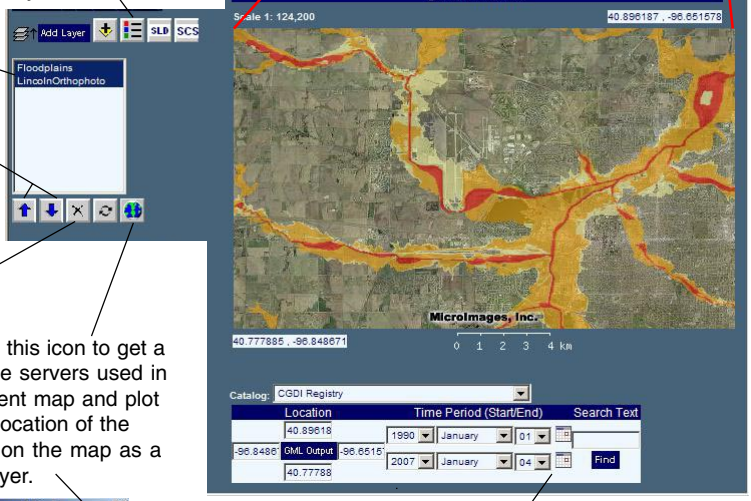
Define a bounding box in the map window and click on the Zoom in icon for greater detail.

Click on this icon to display the legend associated with the highlighted layer.

Highlight the layer(s) that you want to view.

Use Up and Down icons to change the order of the high-lighted layer(s).

Click on the Delete icon to remove the highlighted layer(s).



In the illustration at the left, two layers of the Lincoln Property Viewer atlas from the WMS server at MicroImages are shown in greater detail. Note that the transparent Flood-plains layer is displayed over the LincolnOrthophoto layer.

Click on this icon to get a list of the servers used in the current map and plot the geolocation of the servers on the map as a WMS layer.

Search panel lets you browse for online maps and data by querying catalogs, registries, and GeoConnections' Discovery Portal.

The Server Locations layer is added to the Layers list in addition to the pop-up window above. Highlight the Server Locations layer and click on the Refresh button to display the locations of the servers on the map.

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TNTserver 2006:72

Using Refractions Research's uDig to View WMS Layers

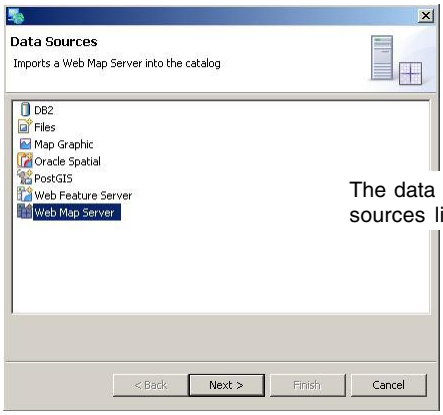
Name:	User-friendly Desktop Internet GIS 1.1.0-RC8 (03 January 2007 latest release)
Developer:	Refractions Research located at http://www.refractions.net/
Use:	Viewing and editing spatial data
OGC:	WMS 1.3.0, WFS 1.1.0, GML 3.0, SLD 1.0, CAT, WMC 1.0, WMS Post
Design:	Executable program
Access:	Download executable for local use from http://udig.refractions.net/confluence/display/UDIG/Downloads
Platforms:	Windows, Macintosh, Linux
Licensing:	Open Source but copyrighted
Formats:	*unknown*
CRS:	EPSG and other available reference systems
Size:	66.2 MB
Notes:	Can not access group of layers

① Select File/New/New Layer from the menubar, or click on the New icon

The New icon

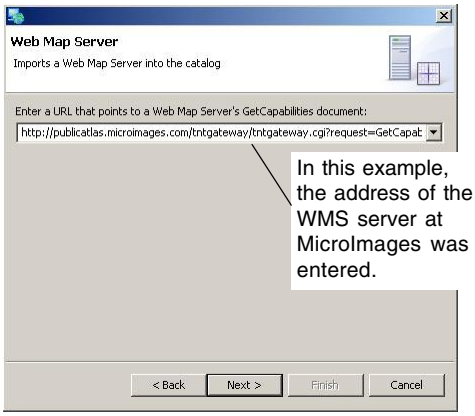
Selecting Layer/Add from the menubar adds a new layer to a specified map. If there is no map opened, a new layer is automatically added to a new map.

② Select Web Map Server from the Data Sources window.



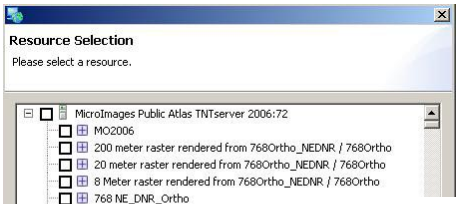
The data sources listed

③ Enter the address of the WMS server.

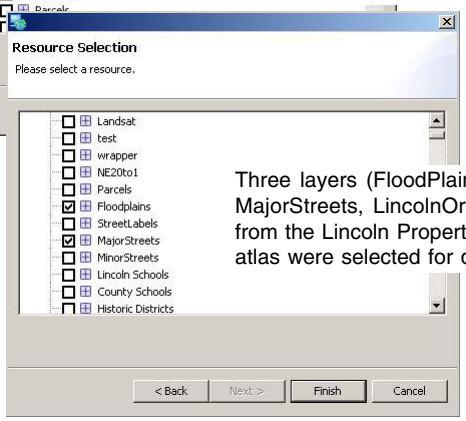


In this example, the address of the WMS server at MicroImages was entered.

④ Select the layer(s) from the specified WMS.

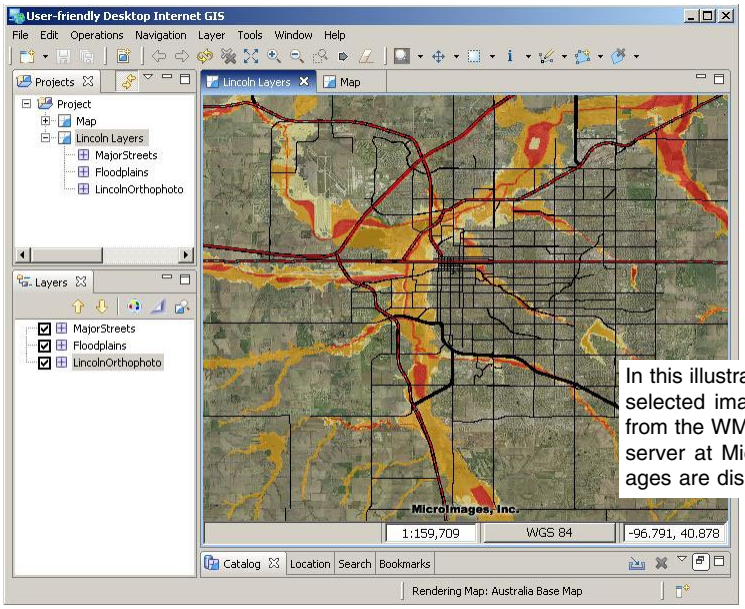


All layers from the server at MicroImages are listed for selection.



Three layers (FloodPlains, MajorStreets, LincolnOrthophoto) from the Lincoln Property Viewer atlas were selected for display.

Once the WMS server or any other data source is specified, it is imported into a catalog so that you can add layers directly in subsequent sessions.



In this illustration, selected images from the WMS server at MicroImages are displayed.

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Click to minimize the view.

Click to maximize the view.

Select and Edit Geometry

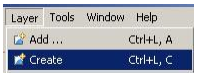
Create Polygon Geometry

Delete Feature

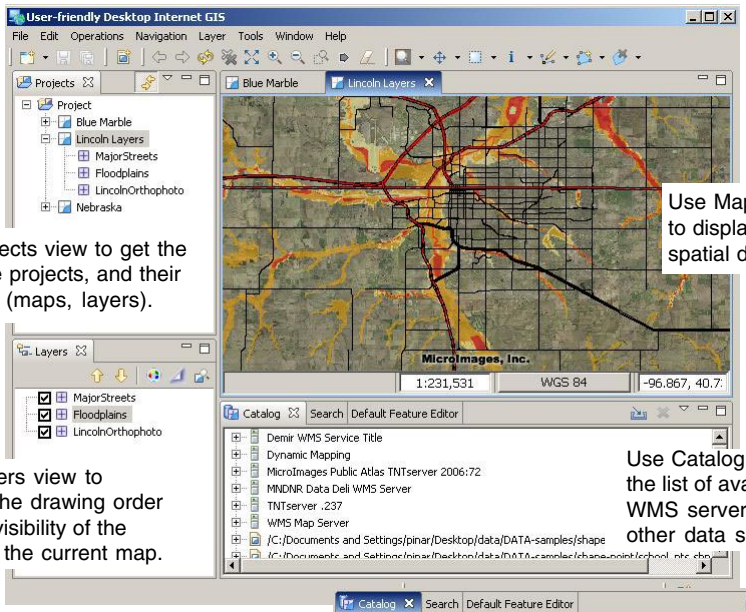
Click on this icon to link the Project view to the Map Editor.

Click on the tab of the desired map to activate it in the Map Editor.

These editing icons and their drop-down menus become active when a new layer is created or a file in shapefile format is the active layer.



Select Layer/Create from the menubar to create a new layer.



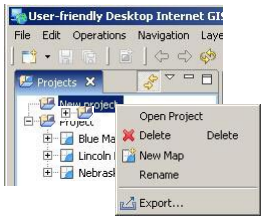
Use Map Editor to display and edit spatial data.

Use Projects view to get the list of the projects, and their contents (maps, layers).

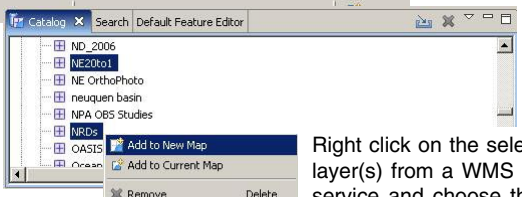
Use Layers view to change the drawing order and the visibility of the layers in the current map.

Use Catalog view to get the list of available WMS servers and other data sources.

Selecting Export from the following menus allows you to save appropriate layers as files in shapefile format or as an OpenGIS Web Services (OWS) Context document.

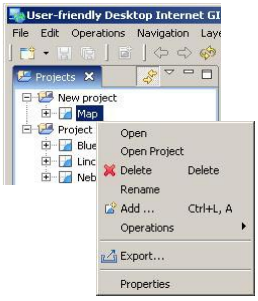


Right click on a project in the Projects view to open the Project menu.

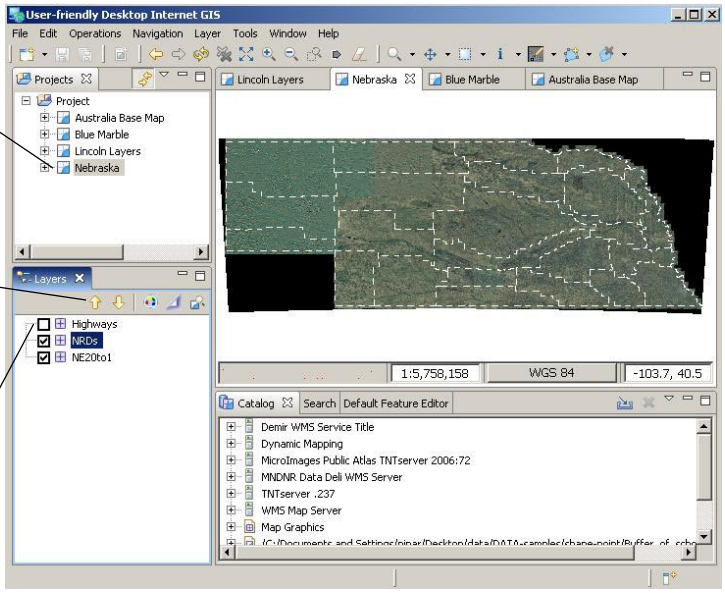


Right click on the selected layer(s) from a WMS service and choose the appropriate option to add the selected layers(s) to a new or current map.

In the illustration below, the layers (Highways, NRDs, NE20to1) were selected from the WMS server at MicroImages and added to a new map.



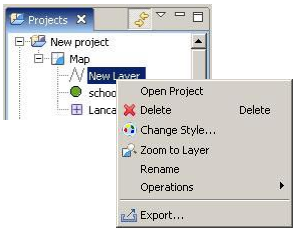
Right click on a map in the Projects view to open the Map menu.



Double click on the Map Name to open the map in the Map Editor.

To change the order of the layers, drag and drop the selected layer in the Projects view or use these buttons.

The checkbox is toggled off to hide the layer in the Map Editor.



Right click on a layer in the Projects view to open the Layer menu. You can also access the Layer menu by right clicking on a layer in the Layers view.

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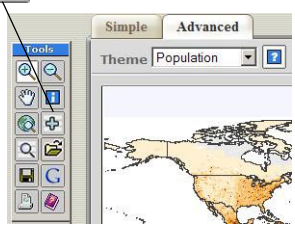
TNTserver 2006:72

Using SEDAC's MapViewer to View WMS Layers

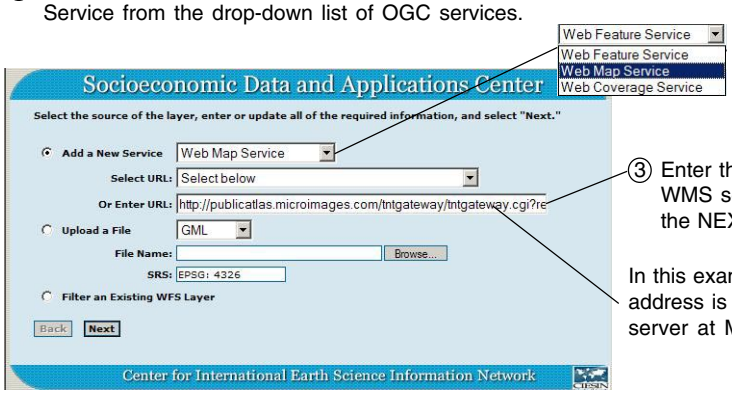
Name: SEDAC MapViewer v1.0 (beta)
Developer: Socioeconomic Data and Applications Center (SEDAC) located at http://sedac.ciesin.columbia.edu/
Use: Viewing and querying geodata relevant to human interactions in the environment
OGC: WMS, WFS, WCS
Design: Web application
Access: Automatically used in your browser if the site is accessed from http://beta.sedac.ciesin.columbia.edu/mapviewer/
Browsers: Firefox, Internet Explorer, Netscape
Licensing: Free application
Formats: *unknown*
CRS: EPSG
Size: *unknown*

① Activate the Advanced tab and click on the Add Layer icon.

Add Layer icon



② Toggle on Add a New Service button and select Web Map Service from the drop-down list of OGC services.

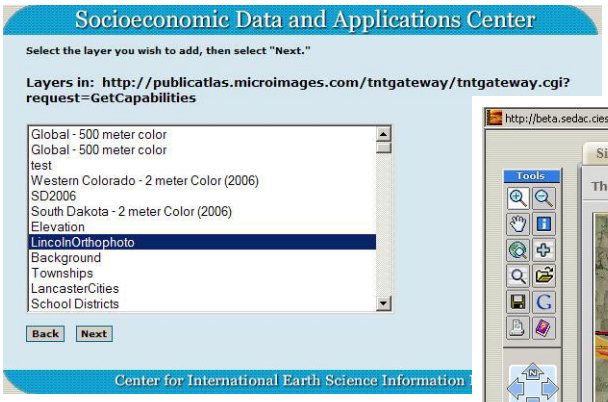


The list of available OGC services.

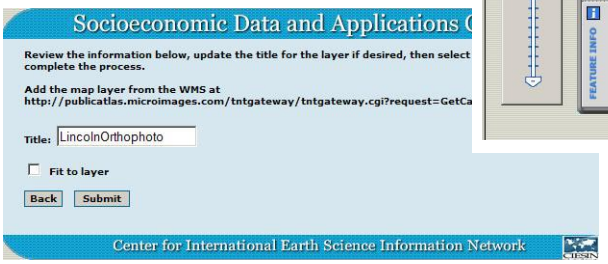
③ Enter the address of the WMS server and click on the NEXT button.

In this example, the address is the WMS server at MicroImages.

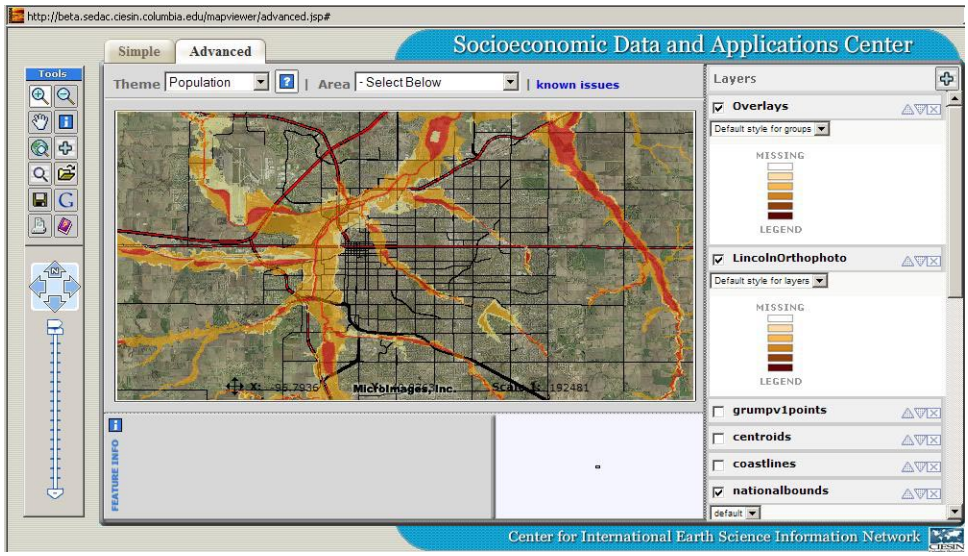
④ Select the desired layer/group and click on the Next button.



⑤ Update the title for the layer if desired and click on the Submit button to complete the process.



⑥ Repeat the steps 1 to 5 if you want to add more WMS layers.



In the illustration above, the Overlays group from the Lincoln Property Viewer atlas, which is one of the atlases published by the WMS server at MicroImages, is displayed over the LincolnOrthophoto layer.

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Use these icons for zoooming in/ out, panning, and returning to the maximum extents.

Click to get feature info.

If you click on the Add Layer icon when the Simple tab is active, you can add layers only from predefined WMS, WFS, and WCS servers. You need to have the Advanced tab active to add layers from other WMS, WFS, and WCS servers.

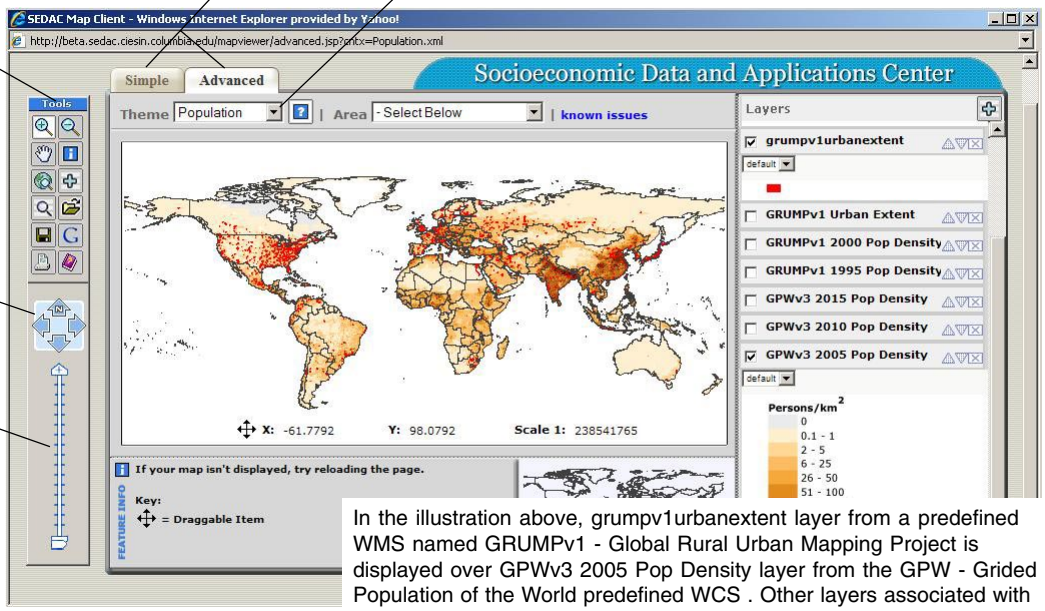
Selecting a theme from the drop-down list automatically adds layers associated with the selected theme from various predefined WMS, WFS, and WCS services. In this example, the Population theme was selected.

Click to save/load a context. Note that these icons are active when the Advanced tab is pressed.

Click to print the map.

Click the direction arrows to move the view in the desired direction.

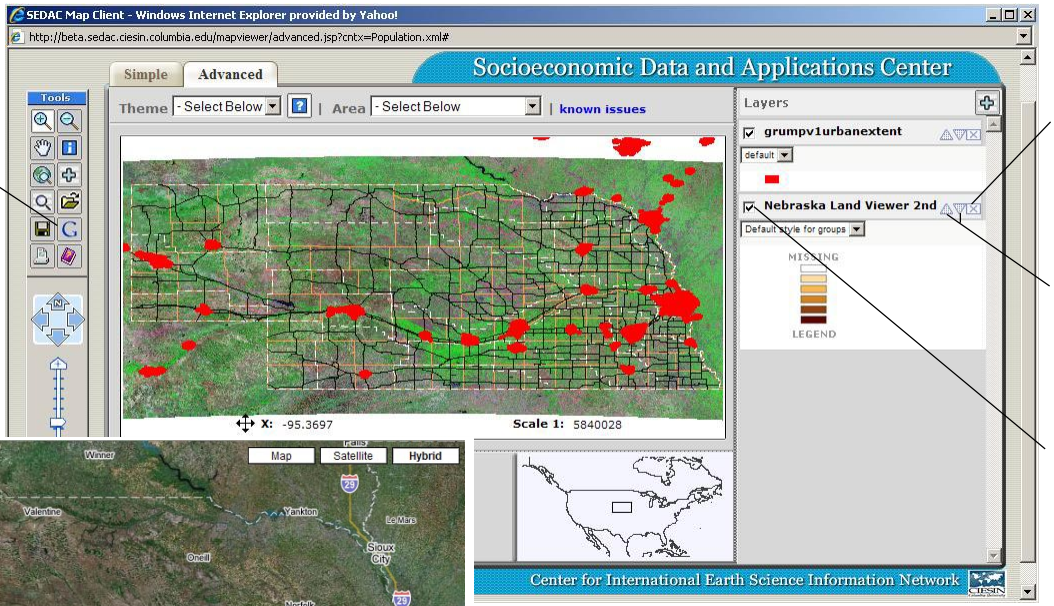
Use the zoom slider to zoom in or out.



In the illustration above, grumpv1urbanextent layer from a predefined WMS named GRUMPv1 - Global Rural Urban Mapping Project is displayed over GPWv3 2005 Pop Density layer from the GPW - Grided Population of the World predefined WCS . Other layers associated with the Population theme are listed in the Layers panel. Note that these layers are hidden in the view window.

Google icon

Clicking on this icon allows you to render the current map extents in Google Maps with the Google Maps content only.



Click to remove the layer from the Layers list.

Click to change the order of the layer.

Show/hide layers by toggling on/off the checkbox for the layers.

In the illustration above, grumpv1urbanextent layer is displayed over the Nebraska Land Viewer group from the WMS server at MicroImages.

In the illustration at the left, the extents of the current map shown in the above illustration are rendered in Google Maps.

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Additional WMS Viewers

The following are the technical characteristics of several client programs that advertise they are compliant with Web Map Service 1.1.1 and offer access to map and image materials using this OGC standard. During the time period of December 2006 - February 2007 these clients did not appear to be functional and their use for providing access to WMS layers could not be evaluated or reported in more detail. This might result from many factors including that their operation for this purpose was not understood or that they were temporarily non-operational during the testing period. A table is available in the *Technical Reference Manual for the Installation, Management, and Operation of TNTserver 2006:72 and TNTmap 2006:72* summarizing the results of testing these and many other operational WMS-compliant clients against several web sites that publish the identical large image layer via their WMS.

The following demostrations of the commercial/non-commercial products failed to retrieve a WMS layer from the web sites tested although they advertise that they support a WMS.

CubeWerx's CubeXPLOR™

Name:	CubeXPLOR™
Developer:	CubeWerx, Inc located at http://www.cubewerx.com/
Use:	Viewing geodata from CubeSERV® WMS and other WMS servers.
OGC:	WMS 1.1.1, SLD 1.0, GML 2.0
Design:	Web application
Access:	Automatically used in your browser if the site is accessed from http://demo.cubewerx.com/demo/cubexplor/cubexplor.cgi?
Browsers:	Internet Explorer, Safari
Licensing:	Free but copyrighted and proprietary
Formats:	tiff, bmp, jpeg, gif and png
CRS:	EPSG and other available reference systems
Notes:	Can not retrieve a WMS layer from various WMS servers tested

Galdos' WMS Viewer Client

Name:	WMS Viewer Client
Developer:	Galdos Systems, Inc located at http://www.galdosinc.com/
Use:	Viewing geodata from Galdos FreeStyler™ and other WMS servers.
OGC:	WMS 1.1.1
Design:	Web application
Access:	Automatically used in your browser if the site is accessed from http://its.demo.galdosinc.com/wms/viewer/
Browsers:	Internet Explorer
Licensing:	Free but copyrighted and proprietary
Formats:	geotiff, tiff, jpeg, gif, wbmp and png
CRS:	EPSG and other available reference systems
Notes:	Can not retrieve a WMS layer from various WMS servers tested

OSGeo's Mapbender

Name:	Mapbender 2.4.1
Developer:	Open Source Geospatial Foundation (OSGeo) located at http://www.osgeo.org/
Use:	Viewing geodata from WMS servers.
OGC:	WMS 1.1.1
Design:	Web application
Access:	Automatically used in your browser if you click on the map application link on the site accessed from http://www.mapbender.org/index.php/Main_Page
Browsers:	Internet Explorer, Safari
Licensing:	Open Source
Formats:	geotiff, tiff, jpeg, gif, wbmp and png
CRS:	EPSG
Notes:	Can not retrieve a WMS layer from various WMS servers tested