

Checking Spatial Properties Using Tile Maps

Standard web tilesets (Google Maps, Bing Maps, Google Earth, and NASA World Wind) can contain millions of small individual raster files organized in different zoom level directories and their nested subdirectories. It is thus not practical to assess the completeness and speed of display of a web tileset by examining its file structure or by viewing every tileset area at every different zoom level. Therefore, TNTmips Pro provides tools for verifying the integrity of web tilesets you might acquire from various sources. Processes that link to, modify, or create web tilesets by default construct small *tile maps* that record the spatial distribution of tiles, their file formats, and tile sizes at each zoom level. You can use the tile map at each zoom level to

- examine its spatial coverage
- assess the completeness of its coverage
- identify missing tiles
- view the file format of every tile
- identify tiles in non-optimal formats.



A Google Maps tileset with orthoimagery of Sequoia and Kings Canyon National Parks in California, USA (zoom level range 4 to 17). This tileset has problems with tile formats such as you might find in web tilesets created outside TNTmips.

You can use tile maps in conjunction with the Validate Tileset process to identify and correct problems with your tilesets (see the Technical Guide entitled *Tilesets: Validating Structures*).

A tile map is actually a series of TNT raster objects, one for each zoom level in the tileset. Each tile map raster has one cell for each tileset tile, color-coded to identify the file format of the corresponding tile file (green for JPEG, red for 8-bit

PNG tiles, and yellow for 24-bit PNG tiles). An accompanying size map uses cell values to record the stored size of the tile files in KB, so brighter grays in the display indicate large tile files. You can display tile maps and size maps in TNTmips to see the spatial distribution of tiles at each zoom level, their file formats, and their sizes; DataTips for the tile maps and size maps list the file format and size in KB (respectively) for particular locations. Tileset versions of the tile maps are also automatically created so you can view the tilemaps in your favorite web geoviewer. Examples of tilemaps and size maps are illustrated below.

Moving large web tilesets from one physical drive location to another is problematic because current desktop computer operating systems are not optimized to deal with copying the very large number of directories and files that make up a web tileset. Thus it is possible for the copy process to fail at some point, leaving one or more tileset zoom levels incomplete. Comparing tile maps from different zoom levels can help you identify such problems in the resulting tileset.



Zoom level 13 tile map (left) and stored tile size map (right) for the national parks tileset. This tileset was created using the option for 24-bit PNG tiles (yellow) instead of 8-bit PNG for edge tiles. While most fully-opaque interior tiles are in JPEG format (green), a few interior tiles are in 24-bit PNG format; DataTips for one such interior tile are shown. These opaque PNG tiles have much larger stored sizes than equivalent JPEG tiles, and would thus require longer download times, slowing the display of the tileset in a geobrowser.

Zoom level 13 tile map after the tileset was processed in Validate Tileset to convert fully-opaque PNG tiles to JPEG and convert remaining edge 24-bit PNG tiles to 8-bit PNG (red).

Tile maps can also be useful in identifying tile format issues that might affect the performance (download speed) of your tileset when it is viewed in a browser on the Internet. In web tilesets that depict aerial or satellite images, interior tiles that are fully populated with image data are commonly stored in JPEG format because its lossy compression minimizes the stored size and maximizes the download speed of these tiles.

(over)

(When you create or merge tilesets you can set the image quality level for JPEG tiles to control the compression level and thus the stored sizes of the tiles.)

The PNG format (8- or 24-bit) may be used for edge tiles in image tilesets so that the portions of tiles outside the image boundary can be transparent. (Map tilesets rendered from geometric data may use 8-bit PNG format for all tiles to provide transparency for areas in between the map features.) However, PNG files use lossless rather than lossy compression, so PNG tiles at either bit-depth require more storage and longer download times than JPEG tiles. For a Google Maps or Bing Maps tileset with a tile size of 256 by 256 pixels, a fully-populated image tile might be 10 to 20 KB in size in JPEG format, 50 to 60 KB in 8-bit PNG format, and 150 to 175 KB in 24-bit PNG format. Thus the optimal tile format combination for image tilesets uses JPEG for all fully-populated interior tiles and 8-bit PNG for all edge tiles. The color-coding of tile formats in tile maps makes it easy to identify the locations of tile format problems that would slow the web display of the tileset: PNG format used for fully-opaque

interior tiles and 24-bit PNG used for edge tiles instead of 8-bit PNG. An example of such problems and the results of correcting them in the Validate Tileset process are shown in the illustrations on the front side of this page.

If you have a local copy of a third-party web tileset, you can use the Link to Tileset process in TNTmips Pro (see the Technical Guide entitled *Tilesets: Link to a Structure*) to create a TSD link file that enables its use in TNT processes. This procedure by default also creates a tilemap for the tileset, which you can use as described above to assess the completeness of the tileset and correct any tile format problems. MicroImages also strongly recommends that you use the Validate Tileset process to check the integrity of any third-party tileset you acquire.

For any local copies of web tilesets that already have a TSD link file but do not yet have a tilemap, you can use the Tileset Manager (see the TechGuide entitled *Tilesets: Managing Structures*) to create a tilemap. All processes in TNTmips Pro that modify or create a new web tileset also by default construct tilemaps.

